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Working Paper

Comparative advantage and prospective structural adjustment in Eastern Europe

Kiel Working Papers, No. 477

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Suggested citation: Klodt, Henning (1991) : Comparative advantage and prospective structural adjustment in Eastern Europe, Kiel Working Papers, No. 477, <http://hdl.handle.net/10419/577>

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Kiel Working Paper No. 477

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**COMPARATIVE ADVANTAGE AND PROSPECTIVE
STRUCTURAL ADJUSTMENT IN EASTERN EUROPE**

by

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May 1991

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The Kiel Institute of World Economics

ISSN 0342-0787

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Federal Republic of Germany

Kiel Working Paper No. 477

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AG 2594 / 91 / 47
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I. Introduction

The member countries of the Council of Mutual Economic Assistance (CMEA) are facing a deep adjustment crisis as central planning is fading and viable markets are not yet established. It is widely accepted that this transition will require a fundamental re-organization of sectoral specialization in Eastern Europe. It seems less clear, however, which sectoral patterns will probably emerge when these countries are integrated into the open world economy.

The paper is intended to explore the prospective direction of structural adjustment in light of the comparative advantage of the CMEA countries. Future patterns of specialization will be determined, it is argued, by the specific properties of East European human capital and by flows of technology from West to East. For this purpose, a distinction is made between two types of high-tech industries that differ with respect to the international mobility of their technology. By contrast to conventional trade models, the analysis suggests an increasing import pressure from Eastern Europe for those high-tech industries where technical knowledge can easily be transferred across national borders.

II. Mobile and immobile Schumpeter industries

Conventional models of international product cycle trade would predict that Eastern Europe's trade with the West, for instance with the EC countries, will be dominated by an exchange of Eastern low-tech for Western high-tech. High-tech goods are assumed to be produced in highly developed countries only, because R&D capacities are concentrated in this region (due to the availability of R&D-specific human capital) and because the demand for new products is highly income elastic (a product cycle version of the Linder hypothesis). In the course of time, it is further assumed,

products are maturing, production processes are standardizing, and production is shifting to low-wage regions. According to these models, the East European countries would be expected to become net importers of sophisticated product cycle products and net exporters of standardized, mature products.¹

This hypotheses, however, has already been falsified in the case of another group of countries that entered world markets in the seventies, namely the newly industrializing countries (NICs) of South-East Asia. These countries were also facing a comparative disadvantage in generating technical progress as they lacked appropriate R&D facilities and the specific human capital that is required for innovative activities. Nevertheless, they gained significant world market shares in specific high-tech goods, such as modern consumer electronics or data processing equipment. All in all, the best-known South-East Asian NIC's - Hong Kong, Singapore, South Korea and Taiwan - increased their share in world exports of high-tech goods from 2 per cent in 1970 to more than 10 per cent in the late eighties.

In the light of traditional product cycle models there are only two possible explanations for the observation that industrial countries are importing, for instance, a substantial amount of microelectronic products from South East Asia: either the Asian NIC's have already overtaken the advanced industrial countries, or microelectronic products

¹ The product cycle was introduced into the theory of international trade by Raymond Vernon (1966). It took more than a decade, however, until the first formal model of product cycle trade was presented (Krugman, 1979). It predicts a strong correspondence between the hierarchy of countries with respect to the level of economic development and the hierarchy of export goods with respect to their position in the product cycle. This pattern of interregional trade is still a common feature of recently developed models in the context of "modern growth theory" (see, e.g., Grossman, Helpman, 1990).

are not to be classified as high-tech goods any longer. A brief glance at per-capita income levels and R&D expenditures of the microelectronics industry indicates that - quite obviously - both explanations are wrong. The success story of South East Asia is apparently based on reasons that are not covered by conventional trade theory. Hence, it seems at least conceivable that Eastern Europe will also deviate from the path prescribed by the product cycle and will be able to join the Asian NICs.

It is the central hypothesis of this paper that the above described shifts in the pattern of high-tech trade are mainly reflecting an increased international mobility of technical knowledge. Less developed countries have gained access to up-front technologies by establishing communication ties to advanced countries and by attracting foreign affiliates of research-intensive multinationals. Inventing and developing new products is still a domain of industrial countries, but the technical knowledge that arises from these activities is increasingly provided as a headquarter service to foreign affiliates in low-wage countries. If this is true, a comparative advantage of highly developed countries in industrial R&D no longer guarantees a comparative advantage in producing high-tech goods.¹

The growing potential for international technology transfer mainly arises from technical progress in information and communication technologies. In the past two decades, new developments in microelectronics have facilitated communication over long distances by providing a variety of new techniques and by substantially reducing the costs of transmitting information. Monitoring and supervising foreign affiliates and transferring technical knowledge to low-wage countries are less costly (that is to say: more profitable) than in previous periods.

¹ See Giddy (1978), Vernon (1979, 1982).

However, the potential for internationalizing the production of high-tech goods is quite different across industries, above all depending on the extent of synergy effects between inventing and producing new products. In non-electrical machinery or in the aerospace industry, for instance, the successful development of new products depends on intense personal contacts between scientists, engineers and production workers, and it is often virtually impossible to draw a sensible institutional borderline between research and production departments of individual enterprises. It is very unlikely that such industries will shift production of high-tech goods to low-wage countries because an international transfer of their technology would require the transfer of a substantial part of their employees. These industries may be called immobile Schumpeter industries.

On the other hand, there are industries like the production of computers and other microelectronic appliances where the development of new products is in general concentrated in specific research departments with an autonomous scientific and technical research staff. Formal and informal links to production departments are of minor importance. Hence, a geographical separation of R&D and production is technically feasible without substantial losses of synergy effects. If qualification requirements in production are relatively minor, it may be profitable to carry out R&D activities in an industrial headquarter country and to shift the production of new goods to foreign affiliates in low-wage regions. Industries with such features may be called mobile Schumpeter industries.

If the cost-advantage of low-wage regions is not offset by the transaction costs of transferring technical knowledge across borders and of monitoring production abroad, less developed countries will be able to gain a comparative advantage in specific high-tech industries, namely in mobile

Schumpeter industries. In contrast to traditional product cycle theory, a theory that explicitly takes account of the differences between mobile and immobile Schumpeter industries is in fact able to trace the main thread of the success stories of the Asian NIC's that are based upon exports of products from mobile Schumpeter industries.¹ In this view, the enriched potential for an internationalization of production in mobile Schumpeter industries is the main reason why advanced industrial countries are facing intensified competition in high-tech industries from low wage regions.

III. Will Eastern Europe be able to join the Asian NICs?

What are the implications of these considerations for Eastern Europe? Empirical studies on Asian NICs are indicating that there are two essential prerequisites for taking part in the internationalization of mobile Schumpeter industries (Göbel et al., 1988; Hiemenz, Langhammer, 1989): Firstly, an opening of domestic capital markets for foreign investors is required, since flows of technology across national borders are mainly achieved by establishing foreign affiliates of technology intensive headquarter companies.² Secondly, some minimum qualification standards of the labour force must be met, since the application of imported technical knowledge is facilitated if workers have acquired specific social communication techniques and "have learned how to learn".

¹ For a formal model of product cycle trade with mobile and immobile Schumpeter industries see Klodt (1990).

² An outstanding exception is South Korea, where the transfer of technology was mainly accomplished by technical cooperation between domestic and foreign firms and where the inflow of complementary physical capital was financed by international borrowing (Dee, 1986).

In the past, the CMEA countries were almost closed economies striving for autarchy within the Eastern trading bloc and impeding the inflow of Western capital. Their currencies were non-convertible, capital markets were almost non-existent, and external trade was a state monopoly. As a result, access to Western technology was limited and their main export products in East-West-trade were standardized labour intensive or resource intensive goods (Kostrzewa, 1988).¹

Since the pulling-down of the iron curtain, however, foreign investors are highly welcome. At least three East European countries - Poland, Czechoslovakia and Hungary - are seriously engaged in removing the impediments to international capital and technology transfer.² The other CMEA countries are significantly lagging behind, but in the long run they will have no choice but converting to market economies and integrating into the international division of labour.

With respect to the second prerequisite for attracting foreign technology - the qualification of the labour force - Eastern Europe is in a better position than South East Asia. Except for Yugoslavia, the share of illiterates in adult population is almost negligible, and the share of scientists, engineers and technicians in the labour force is even similar to that in highly developed countries (Table 1). Nevertheless, it would be ill-considered to conclude that the East European stock of human capital is equivalent to the West European one. The UNESCO-statistics are only displaying information on formal qualification, and formal

¹ The CMEA countries themselves have often blamed the Cocom-list for their difficulties in getting access to Western technology. Most experts agree, however, that Cocom has only raised the price and not prevented the transfer of technology. There is little doubt that the technological backwardness of Eastern Europe results from home-made reasons and not from American collusion.

² For an analysis of the actual state of foreign direct investment in Eastern Europe see Inotai (1990).

Table 1 - Educational Level by Country (a)

	Illiterates (b)	Scientists, engineers and technicians (c)
Eastern Europe		
USSR	1.0	1.1
Poland	1.2	1.0
Czechoslovakia	1.0	1.4
Hungary	1.1	.9
Bulgaria	2.0	1.5
Romania	2.0	.
Yugoslavia	10.4	.7
Western Europe		
Germany	1.0	1.2
France	1.0	1.0
Spain	7.1	.2
Portugal	16.0	.2
Greece	9.5	.1
America		
Argentina	6.1	.3
Brazil	25.5	.1
Mexico	9.7	.6
United States	.5	.7
Canada	1.0	.5
Asia		
Rep. of Korea	12.4	.3
Hongkong	22.7	.
Singapore	17.1	.3
Malaysia	30.4	.7
Japan	1.0	1.1
(a) Latest available year. - (b) Percentage of total population aged 15 years and over. - (c) Percentage of total labour force		

Source: UNESCO (1989).

qualification is at best a rough indicator of market-oriented human capital.

As a matter of fact, the whole educational system beyond the iron curtain was exposed to strong political pressure. Applicants for academic jobs could often substitute scientific qualification by ideological assertions.

International contacts among scientists and researchers were restricted and it was difficult to get access to the international scientific community. Moreover, working in Eastern research institutions was hampered by the limited availability of modern scientific equipment. All this led to a quality differential between East and West - especially in the field of engineering and applied research. It would be quite difficult for Eastern scientists and researchers to compete with their Western colleagues on equal terms.

A similar qualification differential can be observed at the shop-floor. Most East European workers have completed a formal vocational training. But their human capital is adapted to an outdated capital stock and to the requirements of a centrally planned economy. The exposure to international competition makes a lot of this human capital obsolete. All in all, it seems rather unlikely that the East European countries will challenge the position of EC countries in generating technical knowledge for mobile or immobile Schumpeter industries.

The formal qualification in Eastern Europe can be regarded, however, as an approving base for applying modern technologies imported from the West. Technology intensive multinationals should feel attracted to a low-wage labour force that can easily be integrated in the production of technically sophisticated products. When Eastern Europe opens up to foreign direct investment it may gain a significant comparative advantage in mobile Schumpeter industries. The experience of South East Asia in the past two decades has demonstrated that such a strategy may well result in extraordinarily high growth rates not only for specific industries but also for the economy as a whole.

It is a well-known fact in international trade theory that long-term comparative advantages of countries are only

Table 2 - Scientists, Engineers and Technicians by Sector of Performance (per cent)

	Year	Productive Sector				Higher education sector		General service sector		Total	
		integrated R&D		non-integrated R&D		scien- tists, engi- neers	tech- ni- cians	scien- tists, engi- neers	tech- ni- cians	scien- tists, engi- neers	tech- ni- cians
		scien- tists, engi- neers	tech- ni- cians	scien- tists, engi- neers	tech- ni- cians						
Eastern Europe											
Poland	1987	2.4	18.0	13.7	33.6	14.9	.	9.1	8.3	40.1	59.9
Czechoslovakia	1987	20.3	17.6	27.8	18.7	3.1	1.6	7.4	3.5	58.6	41.4
Hungary	1987	24.8	25.0	7.4	5.7	12.0	5.1	12.9	7.1	57.1	42.9
Bulgaria	1987	36.7	13.8	(a)		21.5	.	23.0	5.0	81.2	18.8
Yugoslavia	1987	15.5	13.4	9.7	6.6	20.1	8.2	19.1	7.4	64.4	35.6
Western Europe											
Germany	1985	35.7	33.1	(a)		11.2	5.4	7.9	6.7	54.8	45.2
France	1986	16.6	34.7	(a)		13.3	8.4	8.5	18.5	38.4	61.6
Spain	1985	20.9	24.0	(a)		37.7	.	11.3	6.1	69.9	30.1
Portugal	1986	9.9	8.8	2.3	2.1	33.1	8.6	11.4	23.8	56.7	43.3
Greece	1979	1.4	1.2	.	.	35.1	3.1	36.3	22.9	72.8	27.2
America											
Argentina	1982	2.8	2.3	11.4	6.3	31.6	7.3	24.2	14.1	70.0	30.0
Mexico	1984	11.4	27.2	(a)		17.3	24.2	7.4	12.5	36.1	63.9
United States	1986		73.7			14.4		11.9		100.0	
Canada	1986	29.7	17.8	(a)		27.4	6.2	10.9	8.0	68.0	32.0
Asia											
Rep. of Korea	1986	29.6	20.5	(a)		20.7	13.8	10.4	5.0	60.7	39.3
Singapore	1987	27.8	14.3	(a)		34.7	11.0	6.3	5.9	68.8	31.2
Japan	1987	49.5	11.3	(a)		29.0	1.8	6.7	1.7	85.2	14.8

(a) Non-integrated R&D included in integrated R&D.

established by immobile production factors (Leamer, 1984). Physical capital and technical knowledge of mobile Schumpeter industries are no such factors; they can be employed everywhere in the world where complementary factors are available and where the rates of return are promising. As the Leontief-paradox has pointed out, even capital-rich countries may face a comparative disadvantage in capital intensive industries. Equivalently, research intensive countries can turn out as net-importers in high-tech industries if the technical knowledge of these industries is internationally mobile and a complementary labour force is available in less research intensive countries.

The labour market of Eastern Europe seems well prepared for providing the qualifications required by mobile Schumpeter industries. Nevertheless, a successful adoption of the NIC-strategy will call for substantial shifts in the allocation of scientific personnel. The share of scientists, engineers and technicians working in the productive sector of Eastern Europe is quite similar to the corresponding share in the EC. But within the productive sector, East European researchers are heavily concentrated on non-integrated R&D (Table 2), i.e. on R&D which is mainly carried out in research institutions that were originally intended to provide scientific and technical assistance to state-owned companies. In most cases, however, they were not able to come out with market oriented innovations, and companies were forced to carry out the necessary R&D activities on their own. It seems hardly imaginable that these research institutions will be of great use for establishing viable high-tech industries in years to come.

In addition, the sectoral distribution of researchers is still reflecting the priority of socialist planners for the primary sector, i.e. agriculture and mining (Table 3). In South East Asia, by contrast, scientific capacities are almost exclusively devoted to manufacturing industries. It

Table 3 - Scientists, Engineers and Technicians Engaged in R&D Performed in the Productive Sector by Branch of Economic Activity (per cent)

	Year	Agriculture, Forestry, Hunting and Fishing	Mining	Manufacturing	Utilities	Construction	Transport & Communication	Other-Activities	Total
Eastern Europe									
Poland	1987	11.6	74.4	(a)	0.6	7.0	3.5	2.9	100.0
Czechoslovakia	1985	9.6	4.1	69.4	.	5.9	3.5	7.5	100.0
Hungary	1987	6.7	3.8	63.4	3.6	5.2	2.3	15.0	100.0
Bulgaria	1987	10.0	8.3	68.4	1.6	5.7	5.3	0.7	100.0
Yugoslavia	1987	10.4	15.4	41.2	0.0	5.8	17.6	9.6	100.0
Western Europe									
Germany	1985	0.1	0.9	95.1	0.5	0.4	1.0	2.0	100.0
France	1986	1.4	1.9	69.4	(b)	21.7	0.6	5.0	100.0
Spain	1985	0.4	26.8	51.8	5.0	2.9	2.8	10.3	100.0
Portugal	1986	0.1	1.1	62.7	9.7	0.0	11.9	14.5	100.0
Greece	1976	26.6	16.2	23.6	.	5.9	10.0	17.7	100.0
America									
Argentina	1982	41.6	8.6	14.1	31.0	0.4	1.1	3.2	100.0
Canada	1986	0.0	1.5	69.5	2.9	.	5.2	20.9	100.0
Asia									
Rep. of Korea	1983	1.0	0.4	89.2	1.0	2.5	0.7	5.2	100.0
Singapore	1987	2.0	0.0	75.9	.	0.8	21.3	(c)	100.0
Japan	1987	0.1	0.3	95.8	.	2.2	1.6	0.0	100.0

(a) Included in mining. - (b) Included in manufacturing. - (c) Included in transport & communication.

Source: UNESCO (1989).

can be expected that Eastern Europe will have to redirect its scientific efforts away from primary industries in order to improve the overall efficiency of R&D and the competitiveness of manufacturing.

Following these considerations, one may conclude that future changes in the global pattern of international trade will be determined by an increasing competitiveness of Eastern Europe in mobile Schumpeter industries. It is much more difficult, however, to predict the East European export performance in individual branches of manufacturing. The border lines between the three types of industries (low-tech, mobile high-tech, immobile high-tech) are smooth and variable. In chapter II of this paper, for instance, microelectronics was identified as a mobile Schumpeter industry. This classification seems to be valid for consumer electronics or data processing equipment; yet it cannot sensibly be applied to integrated circuits where technical know-how is mainly acquired by learning-by-doing and an international transfer of technical experience is almost impossible. Hence, that part of microelectronics industry should be assigned to the category of immobile Schumpeter industries.¹

Similar intra-industry differences can be observed for other manufacturing industries as well. Thus the classification adopted in Table 4 should be interpreted as no more than a tentative scheme for illustrative purposes, not as a basis for seriously predicting the actual shape of structural adjustment in Eastern Europe in the years to come.

¹ It should be noted, however, that the final stage in producing integrated circuits, i.e. assembling and mounting of chips, is not subject to significant learning-curve effects. As a consequence this activity is often detached from proceeding production stages and shifted to low-wage regions (offshore assembling).

Table 4 - Employment by Industry (percentage share in total manufacturing)

	Year	Mobile Schumpeter industries				Immobile Schumpeter industries				Low-tech industries
		Total	Industrial, chemicals, other chemical products	Rubber products, plastic products n.e.c.	Electrical, office, office, computing machinery	Total	Machinery n.e.c.	Transport equipment	Professional goods	
Eastern Europe										
Poland	1987	15.3	4.8	2.9	7.6	22.3	12.6	8.5	1.2	62.4
Czechoslovakia	1987	12.4	4.5	1.3	6.6	31.7	21.3	9.9	0.7	55.9
Hungary	1987	19.3	5.3	1.9	12.1	21.4	9.7	7.5	4.2	59.3
Bulgaria	1987	16.6	5.0	2.6	9.0	19.4	13.4	6.0	(a)	64.0
Yugoslavia	1987	14.9	4.5	2.8	7.6 (b)	16.1	8.4	7.1	0.6	69.0
Western Europe										
Germany	1987	29.0	8.5	4.8	15.7	30.6	14.9	13.5	2.2	40.4
France	1975	20.7	6.4	4.2	10.1 (b)	24.4	10.0	12.9	1.5	54.9
Spain	1986	17.4	6.1	4.9	6.4	19.8	7.9	11.4	0.5	62.8
Portugal	1986	13.3	5.3	3.2	4.8	8.8	2.9	5.5	0.4	77.9
Greece	1983	14.5	6.1	3.8	4.6	9.0	2.3	6.5	0.2	76.5
America										
United States	1986	23.0	5.0	4.4	13.6	24.0	9.4	11.2	3.4	53.0
Canada	1986	16.8	5.2	4.4	7.2	28.0	6.5	10.5	1.1	55.2
Asia										
Rep. of Korea	1986	26.9	3.9	9.0	14.0	13.0	4.8	6.6	1.6	60.1
Singapore	1987	44.7	2.8	4.1	37.8 (b)	15.4	6.9	6.3	2.2	39.9
Japan	1987	27.6	3.6	5.3	18.7	19.6	9.3	8.3	2.0	52.8

(a) Included in machinery n.e.c. - (b) Office and computing machinery included in machinery n.e.c.

Source: UN (1989).

With these caveats in mind, Table 4 describes the sectoral specialization of different countries on mobile and immobile high-tech and low-tech industries. It reveals the comparably low share of mobile Schumpeter industries in Eastern Europe. An integration into the international division of labour will probably drive the industry structure of these countries closer to the structure of countries like South Korea or Singapore.

Adopting the strategy of South East Asia does not necessarily imply, however, a specialization on the same niches, i.e. on products related to microelectronics. The traditional industry structure of Eastern Europe will perhaps be more favourable to technological cooperation with Western companies in other mobile Schumpeter industries like industrial chemicals or chemical-related products. In these industries the East European countries are in a good position for merging the increased potential of international technology transfer with their industry-specific human capital that was acquired in the past.

There are two central implications of this prospective development for Western Europe:

- International competition in high-tech trade will intensify. At present, West European protectionists are mainly concerned about increasing import pressure from Eastern Europe in labour intensive industries. In the ongoing negotiations between the EC and Eastern Europe they are striving for exempting so-called sensitive industries (like textiles and food) from association agreements. Up to now, they have apparently not recognized that a much stronger import pressure from Eastern Europe may emerge in some high-tech industries.
- Import competition from low-wage regions will extend to further high-tech industries. The EC is already facing a

comparative disadvantage in trade with microelectronic products (i.e. imports are higher than exports), mainly because Asian NICs have successfully attracted internationally mobile technical knowledge in this area. It can be expected that East European countries will also be able to participate in the internationalization of high-tech industries. It seems rather unlikely, however, that they will directly compete with South-East Asia in microelectronics. Instead, their structure of human capital seems most promising for importing chemical-based technology. Western Europe may have to reduce its productive capacities in these mobile Schumpeter industries as well.

Irrespective of such sector-specific considerations West European countries should be ready to face intensified competition in the whole area of mobile Schumpeter industries. They will be forced, hence, to strengthen their position in immobile Schumpeter industries in order to preserve their high income levels.

IV. Conclusions

In light of the deep economic crisis in Eastern Europe a prediction of structural adjustment based on relative factor endowment may appear to be rather daring. Admittedly, there are a huge number of problems to be solved before the former socialist countries will be able to make full use of their long-term comparative advantage. They will have to privatize state-owned companies, establish viable capital markets and create a legal framework that is conducive to market transactions and encouraging for foreign investors. On the road to achieving these aims some former CMEA countries are more ahead than others. But it seems out of the question that even the laggards will eventually convert into market economies which is the only option not guaranteed to fail.

In the course of transition, a lot of unpredictable sectoral shifts can occur. Dubious policy decisions, for instance protectionist attempts to conserve ailing industries, may well distort the specialization pattern of Eastern Europe in international trade. But specialization according to comparative advantage also requires trading partners that are not closing their markets for those products where Eastern Europe is most competitive. A non-protectionist approach towards the CMEA is probably the best support of the transformation process the EC can provide (and probably the best alternative to massive westward migration).

The past experience of West European integration has clearly demonstrated that an intensified international division of labour is beneficial to all participants. There is no reason why future eastward integration should not yield results similar to those of past integration in the West. Therefore, the EC would be well-advised to open up its markets for East European products of all kind. Temporary adjustment costs that may arise from increased import pressure on specific industries will certainly be more than outweighed by long-term gains from trade.

Abstract

Eastern Europe is facing a deep adjustment crisis that will doubtlessly require substantial shifts in sectoral specialization. The paper explores the basic forces that will determine the direction of these shifts. The comparative advantage of different East European industries will depend, it is argued, on their ability to attract internationally mobile technical knowledge and to make use of the specific East European human capital. The analysis suggests that future prospects are most promising for so-called mobile Schumpeter industries.

Zusammenfassung

Osteuropa steht in einer tiefen Anpassungskrise, die ohne Zweifel einen erheblichen sektoralen Strukturwandel erfordern wird. In diesem Beitrag geht es darum, die grundlegenden Faktoren der zu erwartenden Strukturverschiebungen zu identifizieren. Die komparative Wettbewerbsfähigkeit der verschiedenen Industriezweige wird davon abhängen - so wird argumentiert -, inwieweit es ihnen gelingt, international mobiles technisches Wissen zu attrahieren und das spezifische osteuropäische Humankapital zu nutzen. Nach dieser Analyse sind es vor allem die sogenannten mobilen Schumpeter-Industrien, denen die besten Zukunftschancen eingeräumt werden können.

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