National Differences in Technology Transfers in East European Transition Economies

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During the first decade of transition, attention was mainly focused on macroeconomic issues and the most important structural reforms. Macroeconomic stabilisation and international opening were among the major goals. They have been achieved in many countries after years of running inflation and economic instability. On the other side, major structural transformations including enterprises reshaping and massive property transfers, factors and product markets deregulation have been carried out.

Comparatively much less attention has been paid to the problems of efficiency in the production process and to the international competitiveness of domestic firms in transition economies. Implicit was the assumption that a rational price system and a free market system would be able to induce rapid efficiency gains at the firm level.

To a large extent, it can be demonstrated that the disappointing results of transition, to say the least, in almost every country in terms of growth and per capita income are rooted in the weak international competitiveness of these economies. They have proven unable to supply on the world market, with their own resources, the high value added, highly skilled labour and technology content products that would allow an increasing per capita output and real income. In many transition economies, economic growth is limited by the foreign account deficit. As a result, some countries turned to massive exports of raw materials and semi finished goods in a regressive specialization process. Others have sold out the best companies to foreign investors. In fact, all the countries under review have used both strategies with different proportions (Haudeville, 2003).

Moving to more innovative and technology advanced, better quality productions based on local capacities has been surprisingly weak. Countries with large scientific and technical capacities like Russia did not succeed in turning these assets into commercial outcome. To some extent it is due to the backward nature of the said capacities, but in many occasions it comes from the inefficient use of the available resources. This situation leaves great opportunities for a better allocation of scientific and technical resources and a better economic result. Technology transfer can be a master piece of such a process by the adoption of new successful research and development processes, the mobilisation of resources on more efficient programs as well as the implementation of more efficient program management methods. In this respect, the situation of transition economies contrasts sharply with that of developing countries where scientific and technical resources are in short supply and where the knowledge gap is wide and makes it uneasy to adopt external knowledge (Cohen and Levinthall, 1990).

Given the level of achievement in science and technology, the importance which was devoted to technical progress in the former socialist systems, the adoption of external knowledge through the process of technology transfers among others, should be rather easy and efficient. On the contrary, it appears surprisingly weak and of limited impact in almost all the transition economies.

In this paper we shall try to understand the reasons of this limited impact in East European transition economies. There is no unique explanation and we shall give three selected examples that focus on the importance of the institutional framework in the success of technology transfers.

The paper is organised as follows : in the first section we shall explain why technical capacities have been somewhat overstated in transition economies and how they have been shrinking during the first years of transition. This will provide a more realistic assessment of the potential for technology transfers in all the economies under review. In the second section we shall analyse a first example, Croatia, where the limited local capacities have been even more limited by the administrative nature of the regime and the weight of political factors. The third section will discuss the situation of Hungary, with completely different institutional responses and a marked development of new technologies and new high value added productions. The last section will deal with the case of Poland.

From a low efficiency to a financial depression of the scientific and technical system

All the economies considered in this paper have in common a rather important development of the scientific and technical activities. Some of them like Hungary and Poland have long lasting traditions of scientific excellence and technical outcome. They also share a rather similar model of organisation of science and technology, due to the very nature of the economic system and the necessity to implement the domination of central planning on the economy. This model is to a great extent very similar to the one existing in the former Soviet Union.

In the socialist era, science and technology were organised along a three-part scheme.

At the top echelon was a council or commission[1] in charge of the medium and long term planning of the scientific and technical activities for the design and selection of programs to be included in the 5 and 15-years plans.

At the executive level, the main body was the National Academy of Sciences and its network of research institutes working mostly on basic and applied research. In close cooperation with the Academy but with a lower status was the University and its numerous institutes and research centers also active in basic and applied research. Both institutions were organized along disciplinary fields. The third part, the most important by the number of people employed as well as by the amount of financial resources, was under the authority of the technical or branch ministries. This part was mostly concerned with developments of new products and new technologies in response to the demands of the ministries, not of the companies. At this point, it is important to underline that apart from some exceptions like the Scientific and Production Association, NPO, in the USSR (Couderc et Franceschi, 1998), or some selected companies in the European countries, there were no direct links between the technical institutes and the (state) companies that would be the ultimate beneficiaries of the innovations. In such a system, it is easy to understand why the economic returns of the important amount of resources devoted to science and technology were so weak. Moreover, on many occasions it could be argued that technical advance, far from being an opportunity, was a burden for the production organization. In the socialist system, there is little reward for improved efficiency in the enterprise while the whole cost of transformation of the production processes, of reallocation of the work force or new training has to be fully supported! Therefore, it should come as no surprise if scientific achievement could go along with technical backwardness, low quality goods and inefficient processes.

Within this general framework, the situation of the different member states shows various degrees of scientific and technical achievement, despite a rather active network of exchange and cooperation between countries, but they share the same kind of organization and of incentive problems.

Until the mid-nineties, few changes affected the scientific and technical system. The main change came from the more or less important reduction of budgets in response to the growing scarcity of public money. The strengthening of the budget constraint of the state and the many new emergencies that were created by the economic situation resulted in a reduced priority of research and development on the political agenda. As the organization of the sector was, almost all the funds came from the public budgets. Private funding from companies was very small and by and large unable to offset the decline of public funding. As a result, the level of activity declined. Research staff left for better paying jobs in a process of "internal

1 On the model of the GKNT in USSR.

migration". Some looked for new positions abroad in the West or in some developing countries. So the system continued to work on the old scheme but with lower and lower means, out of a limited number of strategic complexes which could be preserved.

With all the relevant restrictions concerning the patent as an indicator of innovative activity, this decline can be seen on the data for patents granted in the United States where the number of patents issued to inventors from Hungary, for example, was divided by more than 3 between 1987 and 2000.

In the second half of the decade, some structural transformations were implemented in order to improve or create relations between now private companies and the science and technology system, and to improve also the organisation of the system itself. The selection of programs to be supported and the allocation of funds as well as the assessment of research centers and research staff were among the objectives. A good example is provided by the reform that took place in Poland with the creation of the KBN. The State Committee for Scientific Research plays the role of a Ministry of Science and Technology. The Chairman of the Committee is the Minister of Science and its Secretary has a cabinet position. All the members of the scientific community holding a doctoral degree take part in the election of the12 representative members of the KBN. Each of the elected members takes the lead of one scientific department, designed along disciplinary fields. Among the elected members, two are appointed as deputy chairman of the KBN. Five Ministers or heads of central administrations are also appointed by the Prime Minister as members of the Committee.

The Committee channels the funds to the institutes and research centers, mostly from public budgets, in order to provide a minimum of resources allowing the fixed costs and some investments. Other financing is allocated according to the research programs through a peer review process conducted by the disciplinary units. It is therefore rather similar, in this respect, to Western institutions like the NSF (National Science Foundation) in the US or the CNRS (Centre National de la Recherche Scientifique) in France.

The reform of the science and technology system in Poland looks radical and impressive. However, this reform does not seem to have reached impressive results since its implementation. First of all, money is still very limited. But the dominant influence given to the scientific community may also contribute to some allocation problems in favouring academic or upstream type of projects to the detriment of more applied, market oriented developments. Even in the scientific complex, it is estimated that up to 40% of the funds are allocated to units that can be regarded as relics of the real socialism era. It did even increase in the recent years. The general evaluation of the different units does not seem effective yet.

At the same time some privatisations of institutes and research units have taken place in Poland.

Among the solutions that began to be adopted in the different countries are the privatisation of some research centers on their capacity to sell services to the private sector, the sale of technical institutes to big firms as a core of research division[2], the short listing of limited centers of excellence in strategic fields with a secured financing.

In this situation, Foreign Direct Investment (FDI), joint ventures, licensing agreements, strategic alliances seem instrumental to industrial success in transition economies.

There is a number of reasons why the economic success of companies in European transition economies is closely tied to the successful transfer of appropriate modern western technology. One is the limited amount of resources that could be spent in the recent period and the limited ability to transform scientific and technical advance into market oriented products as was explained above. It goes with the legacy of old programs oriented toward defense or state activity and without any economic potential impact. Another one is the necessity to renew the existing production equipments. The privatisation process has failed to trigger new productive investments and many equipments are obsolete or in poor conditions. Also the consumers in transition economies are now increasingly demanding better quality products, which is not possible to supply with outdated technologies and equipments. Finally, new demands like environment protection do not meet any available local technology in many situations.

Technology transfer has been defined as the transmission of know-how to suit local conditions with effective absorption and diffusion both within, and from, one country to another (Kaynak, pp. 155-156). Technology transfers have two parts of connectivity : physical and social. Physical is the

2 It must be reminded that the state enterprises are generally only production units and do not have any research activity (or financial or marketing...).

transfer of hardware and software. Social connectivity is related to the use by the members of the host country. It requests active participation of both the provider and the receiver if it is to function well.

The technology transfer follows a process which can be affected by four kinds of factors :
1 - The willingness and capabilities of the sender including the limitations or incentives that can be established by his government.
2 - The nature of the technology, the kind of channel used, the speed of the transfer itself.
3 - The willingness and capabilities of the receiver, including the inhibiting factors and the limitations or incentives coming from the host government.
4 - The feedback and reverse flows that can follow the adaptation and modification of the transferred technology.

As is widely known, the technical capacity of the receiver and the institutional environment play a crucial role in the final outcome. In this respect, governments must implement legal guidelines to protect the technology and the intellectual property rights of the sender. It must also create conditions that will make attractive the transfer for both parties involved. Legal and regulatory framework is part of the latter. Given its very nature and its relation with the investment process, technology transfer needs to be part of a rather long term project. It therefore needs some kind of institutional stability.

On these different factors affecting technology transfers, the experience of the European transition economies appears to be quite diversified. We shall look at three examples : Croatia, Hungary and Poland.

Croatia : looking for new incentives with limited resources

The situation of Croatia regarding technology transfers can be summarised by the importance of administrative controls and the limitation of local capacities in science and technology. In this context the authorities are addressing the problem by improving the system of incentives for the potential technology senders, specially in the case of transfers accompanying direct investments. Among the former Yugoslav Republics, Croatia was one of the less liberalised, at least until the death of F. Tudjman and the election of S. Mesic in January 2000. Since the declaration of independence, the regime established by F. Tudjman proved nationalistic but very similar to the former Yugoslavia as concerns the organization of the economy. According to a survey of studies made by Koyama (2001), at the end of 1999, the share of the private sector was still well under 50% and some 80% of the companies were still under state control. With a very limited financial market, most of the privatisations that were undertaken went to the political friends of the ruling party. Research and development remained weak. Foreign investment was not attracted by the institutional framework and the volume of domestic capital remained very limited. In this situation, the country experienced a sharp decline in GNP until 1994, increased by the destructions of the civil war and the breaking out of the former trade relations with the rest of the federation.

Concerning technology transfers, a questionnaire study based on face to face interviews clearly shows the gap between the expectations and what is offered in four categories of services including technology, finance and other kinds of services to enterprises. Most industrial sectors in Croatia suffer from obsolescence of large parts of the capital stock inherited from the past period. Some companies enjoyed pre-war exports and international reputation and are now trying to recover from market losses during the war.

The technological advantages of Croatian firms are rooted in their past successes and are predominantly located in pharmaceutical and food technologies, while absolute and relative activity in electronics, as measured by the patenting level, remains marginal. Many firms are involved in the shift from survival and passive adjustment to a more active restructuring, including the research and development sector.

The table 1 gives a list of some recent technology transfers in Croatia.

Numerous examples exist in Croatia to illustrate situations where innovation is constrained by the lack of physical capital despite the relative supply of human capital. The general level of education is good and resources in skilled labour are available even for highly skilled engineers. Due to the limited number of foreign investments, they lack on the job training in new technologies or experience in international cooperation. So it is likely that the main limiting factor in the case of Croatia is the low level of productive investment and more specifically, of foreign investment.

To address this problem, Croatia passed in July 2000 a new investment promotion law. This law regulates the promotion of investments of Croatians as well as of foreign physical or institutional investors with the aim to stimulate investment and economic growth in the

Table 1 : TECHNOLOGY TRANSFERS IN CROATIA

CASE NUMBER	INDUSTRY OF TRANSFEROR	SIZE OF TRANSFEROR	INDUSTRY AND COUNTRYOF TRANSFEREE	SIZE AND TYPE OF RECIPIENT FIRM	ORGANIZATION OF TRANSFER
1. Hartmann Bilokalnik	Paper	Medium (>100<500 employees)	Paper Denmark	Medium-sized state firm	Initially Joint venture than wholly-owned subsidiary
2. Slavonija Slad	Food	Small<100 employees	Food Belgium	Small state firm	FDI
3. Ericsson –Nikola Tesla	Telecom. equipment	Very large (>10000 employees)	SweedenTelecom. equipment	Very large >1000 employees	Acquisition
4. Siemens	Eletronics and others	Very large (>10000 employees)	Germany Telecom.equipment, electrical utility	Very large >1000 employees	Acquisition
5. Podravka	Food, beverages	Very large (>10000 employees)	Food Denmark	Very large (>10000 employees)	Joint Venture
6.DINA	Chemistry	Very large (>10000 employees)	Chemistry USA	Very large (>10000 employees)	Technology agreement
7.Billa	Distribution-Shopping	Very large (>10000 employees)	Distribution Austria	Very large (>10000 employees)	FDI
8.Pliva	Pharmaceutical	Very large (>10000 employees)	Pharmaceutical- USA	Very large (>10000 employees)	Technology agreement
9.Mijo Veeners	Machinery	Medium (>100< employees)	Wood Belgium	Medium (>100 <500 employees)	Joint venture

Republic of Croatia. The law creates new incentives if they contribute to the environment protection or meet one or more of the following criteria :

- introduction of new equipment and modern technology ;
- introduction of new production processes and new products ;
- development of employment and education of manpower ;
- modernisation and improvement of business ;
- development of production with higher degree processing ;
- increase of economic activities in the parts of the Republic of Croatia where economic growth and employment fall behind the state average ;
- development of new services ;
- saving of energy ;
- improvement of information activities, cooperation with foreign financial institutions ;
- adjustment of Croatian economy to European standards.

For the investments exceeding the amount of 10 million kunas (1 US $ is about 8 kunas), profit tax rate will be at 7% during the first 10 years of activity, under the condition that not less than 30 persons have been employed since the beginning of the operation.

For the investments of more than 20 million kunas, the tax rate will stand at 3% under the condition of a minimum employment of 50. For the same amount of investment, the tax rate is reduced to 0% during 20 years if the number of employees is more than 75 since the first year of operations.

In addition to these fiscal advantages the protection of intellectual property rights has been reinforced.

Croatia is part of the World Intellectual Property Organisation. The duration of the protection for patents is 20 years starting from the date of filing the application. Micro organisms and microbiological processes are patentable under the Croatian law. But Croatia also intends to join the Hague agreement on industrial design in the near future.

The protection of trade marks is also granted on the basis of the Industrial Property Law, regulations of the procedure for the grant of trademarks rights. The acquisition of trademarks rights is based on registration, by filling an application with the state Intellectual Property Office. The duration of the protection is ten years starting from the day of application.

So, the experience of Croatia underlines the importance of a stable and incentive institutional framework to build on a limited technological capacity and a good potential of adoption of foreign technology. The next example shows how successful this orientation can be, at least in the short term.

Hungary : transfers by selling out

As compared to the other transition economies, Hungary is the only one that has been able to markedly improve the quality and diversity of its supply. New companies, joint ventures, licensing agreements, have been successfully established in dynamic parts of the industrial and service sectors in motor vehicles, pharmaceuticals, electronics, telecoms, banking etc...

While most of the transition economies experience a regressive specialisation process, Hungary, on the contrary, improves its specialisation toward production incorporating more skilled labour and technology.

This result has been achieved through the selling out of the best enterprises to foreign investors and a marked priority to foreign investment. Hungary is the only transition economy of our panel that did not implement a mass privatisation program. So the numerous privatisations did only take place by the sale of enterprises to potential investors. Needless to say that the financial capacity of domestic investors did limit their bids to small privatisations, in many cases.

The big enterprises, some of them among the best performing of the former CAEM thanks to the long lasting reform process introduced in the country since 1968, were available to foreign investors. In this highly incentive environment, other direct investments, greenfield investments, followed. As a result, massive inflows of technology as well as capital reached Hungary[3] and made it possible to rapidly upgrade its technological capacities. Associated with the important wage differential existing between Hungary and, say, European Union countries, it makes profitable the production of many new goods and services that are now on the export list of Hungary.

Even more interesting, foreign companies are now investing in research and development in Hungary. Some are developing pre-existing activities inherited during the privatisation, other are implementing completely new fields for research and development. Such well known companies like Nokia, General Electric are already active in research in Hungary. But the trend seems to increase its speed as can be seen in everyday news. A few months ago, the American drug company Abbott Laboratories bought Biorex RT, a Hungarian biotechnology firm and is going to develop new lines of products from its subsidiary researches[4]. In the same time, private investors are going to invest 4,5 billion forints (about 15 million dollars) in creating an innovation center devoted to information technologies and biotechnologies in the town of Szeged[5].

On the other hand, recent data show that 75% of Hungarian exports are made by foreign firms or firms with foreign capital. For industrial production, it is estimated that some 60% of products are turned out in the same kind of companies (Freudenberg and Lemoine, 1999). In some selected industries, generally the most dynamics segments of industries, the figures are even higher.

This raises the difficult question of what Hungarian economy is today. It looks like the best and bigger companies are under the control of foreign interests. As such, they are submitted to the strategies of foreign decision centers that elaborate private strategies concerning the choice of product lines and the location of their different activities. Many of these strategies are world strategies reflecting the situation of competition between world oligopolies (Humbert,

3 According to the last report of the EBRD, the total of direct investments received by Hungary from 1989 to 1998 amounts to 16,45 billions dollars or 1627 dollars per capita.

4 Budapest Business Journal, 30/07/2001.

5 Id.

1993) on the global market. The development of research and production in Hungary shows that for the time being, Hungary has some advantages concerning the location of some selected activities. But it can be changed if the economic situation changes anywhere out of Hungary, or if the strategy of some MNC changes. In a recent paper, we examined the case of Hungarian Telecoms (Haudeville and Legman, 2001), which appears to be quite successful. The state monopoly was sold to a consortium of Deutsch Telecom and AMERITECH. AMERITECH already sold its participation to its German associate. The later can sell it tomorrow in exchange for a better bargain in Russia or China[6]...or to make cash.

In the case of Hungary, and in this case only to the best of our knowledge, it is possible to speak of success in technology transfers with all the benefits which are following it in terms of specialisation and competitiveness. However this success is met at the potential cost of a destructuration of the economic system and a subordinate status for domestic companies vis-à-vis their foreign stake holders.

Poland in search of technological dynamism

One of the characteristic features in the transformation of the Polish economy is its opening to co-operation with external environment. One of the aims of this openness is to raise economic effectiveness, among others, through improving the technological level of the products. To achieve this, it is necessary to transfer technologies from abroad because the possibilities to create and implement new technologies at home are insufficient. A widely understood transfer of technology into the Polish economy undergoing transformation takes different forms : imports of commodities, foreign direct investments, relocation of people with certain qualifications, purchase of licences, exchange of documentation not included in the licence purchasing agreements, providing all kinds of technical services, managerial contracts, consulting, leasing, franchising, personnel training by foreign specialists, personal contacts with foreign specialists. Although it would be difficult to empirically define which of those forms is of greatest significance in the case of technology transfer into Poland, foreign direct investments seem to play the most important role (Starzyk, 1998, p. 258).

The necessity to transfer technologies to Poland should be linked, among others, with an insufficient level of innovation in the Polish economy which can be improved through this transfer. Characteristic features of innovativeness of the Polish economy are presented in table 2.

The following observations may be formulated on the basis of the data from table 2 :

- The number of domestic patents submitted was continually decreasing,
- The number of domestic patents granted was falling,

Table 2 : INNOVATIVENESS OF THE POLISH ECONOMY IN THE YEARS 1989-1998

No.	Specification	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
1.	Submission of domestic patents	•	4105	3389	2896	2658	2676	2595	2411	2399	2407
2.	Patents granted for domestic inventions	2854	3242	3418	3443	2641	1825	1619	1405	1179	1174
3.	Polish inventions patented abroad	190	146	150	101	93	119	65	43	•	•
4.	Share of new and modernised products in industrial production sold (in %)	5,3	3,0	3,3	3,4	4,8	6,9	5,4	8,4	7,9	8,2
5.	Share of advanced technology products in industrial production sold (in %)	10,3	8,5	•	7,8	8,4	8,2	8,7	9,7	10,4	11,0
6.	Share of advanced technology products in total exports (in %)	•	•	•	•	3,4	3,4	3,6	4,3	4,6	2,4

Source : Jasinski (2001, p. 8).

6 It may not be a danger for the present time. According to private information, Hungarian telecom rates would rank among the highest in Europe and one fourth of the profit of the giant Deutsch Telecom should come from MATAV (Magyar Tavkozlesi RT) alone.

- The number of Polish inventions patented abroad was going down,
- The share of new and modernised products in the industrial production sold was relatively low (as compared with the developed countries) and it did not grow too rapidly,
- A weak growth tendency in the share of advanced technology products in the industrial production sold could be observed,
- The share of high technology products in exports was relatively low.

The reason why foreign technologies should be transferred to Poland may also be connected with the fact that the financial contribution of the state in this field is limited. As was explained in Section I, expenditures from the state budget to finance outlays for research and development are insufficient. The relevant data are presented in table 3.

Another argument justifying technology transfer to Poland is a rather passive attitude of domestic firms to the question of technological progress. Studies carried out among the Polish industrial enterprises reveal the following features of their behaviour as regards innovation (Jasinski, 2001) :

- Polish enterprises show a small interest in technology transfer.
- Licences purchased abroad play a very small role.
- The share of Polish enterprises in international transfer of technology is modest.
- Polish firms are more oriented towards purchasing, not selling the new technological thought.

Other studies conducted in Poland on a sample of 68 enterprises prove that, according to the high level managerial staff, the quality of R&D personnel and outlays for R&D were perceived as relatively insignificant factors of the competitive potential (Gorynia, 2000 ; Gorynia, Wolniak, 2001).

Therefore, the three factors presented above (the low innovativeness of the Polish economy, limited financial efforts of the state in the sphere of outlays for research and development, passive attitude of the Polish firms to technology transfer) indicate that it is justified to use all possible forms of technology transfer which lead to improvement of technological level and modernisation of the economy. As was pointed out, the main channel of technology transfer into Poland is foreign direct investments.

In the period of transformation the significance of foreign investments in the Polish economy was continually increasing (Durka, 2000). In 1991 the share of firms with foreign capital in total sales amounted to 2.8%, their share in the Polish exports amounted to 4.2% and in employment to 1.3%. The total value of foreign investments made in Poland in 1990's equalled approximately 45.7 billion USD, with a vast majority of outlays falling on the second half of the 90s. In 1998 the share of firms with foreign capital in the revenues of all the economic entities amounted to 27% and their share in employment equalled 23%. In 1999 the firms with foreign capital accounted for approximately 51% of the total Polish exports. In 1998 investment outlays of the companies with foreign capital constituted 53% of the total investment outlays. From the beginning of the inflow of foreign investments to Poland, the sector of production activity had the major part of the capital and enjoyed the greatest interest of the investors. At the end of 1999 the value of capital invested in this sphere amounted to 17.3 billion USD, which constituted 49%

Table 3 : OUTLAYS FOR R&D IN POLAND IN THE YEARS 1989-1998

No.	Specification	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
1.	Share of outlays for R&D in GDP (in %)	0,90	0,96	0,81	0,81	0,86	0,82	0,70	0,76	0,72	0,73
2.	Budgetary means for R&D as a percent of GDP	•	•	0,76	0,64	0,57	0,55	0,47	0,48	0,47	0,43
3.	Share of outlays for R&D in state budget (in %)	3,6	2,5	2,5	1,9	1,8	1,7	1,6	1,7	1,7	1,7
4.	Share of budget in outlays for R&D (in %)	•	•	•	•	•	57,3	60,2	57,8	61,6	59,0

Source : Jasinski (2001, p. 12).

of all foreign investments. The value of investments made in the sector of financial intermediary amounted to 7.9 billion USD and in the wholesale trade, retail trade and after sales service to 3.4 billion USD. In the field of production activity most investment was directed to : production of foodstuffs, beverages and tobacco, manufacturing of transport equipment, production of goods from the remaining non-metallic raw materials, production of paper for the publishing and printing industry, production of chemicals and chemical articles and manufacturing of electrical and optical equipment.

Foreign direct investment exerts a positive influence on innovativeness of the Polish firms. This thesis is confirmed by both the aggregated data of the Central Statistical Office and by the conducted surveys. The surveys, carried out on a sample of 291 enterprises (126 firms with foreign capital, 165 firms with Polish capital) proved that the firms with foreign capital were more willing to introduce new technological solutions than the domestic firms, although discrepancy between the results for both groups was relatively small - 6 percentage points (Weresa, 2001). Access to the results of studies on R&D and the use of new ideas implemented in the mother firm is the most significant source of innovations for the enterprises with foreign capital. The domestic firms, on the other hand, are relatively more active in conducting their own R&D activities and they more frequently make use of creativity of the personnel employed.

International corporations which invested in Poland also initiated (although on a limited scale) the establishment of scientific research centres. The following examples may be quoted : in Bydgoszcz, at telecommunications works belonging to Lucent Technologies (the former Telfa), a prestigious Laboratory Bella was set up ; in Cracow one of the eight in the world and the only one in Central Europe research centre of ABB was established ; Delphi Automotive Systems are setting up a scientific research centre in Cracow ; Philips Works in Pila are making significant investments in development and research on energy-saving bulbs, Ericsson is planning to build a research centre, the so-called software house.

Studies conducted by Marketing Research Centre INDICATOR at the request of the State Agency for Foreign Investments show that the level of modernisation of production in the companies with foreign capital is rising. Most of the companies with foreign capital apply technologies not older than one year (63.4%). In 1997 the newest technologies were applied by 55.6% of the reviewed companies. At the same time the number of companies using technologies older than ten years fell down from 20.3% in 1997 to 11.2% in the year 2000. The companies with foreign capital are also making use of more and more modern machinery and equipment. Although in the years 1997 and 2000 the same number of these companies used one-year old machinery and equipment (62.0% and 63.6% respectively), at present a smaller number of them are making use of equipment older than 5 years (in 1997 - 64.2%, in 2000 - 57.6%) and older than 10 years (22.9% and 13.0% respectively). One third (32.3%) of the companies with foreign capital use normalisation standards and quality procedures. ISO 9001 (22.1% of this group of companies) and ISO 9002 (17.1%) are most frequently used.

The situation in Poland shows a third kind of problem with a low level of technical achievement and a limited interest in innovation from domestic firms. In comparison, firms with foreign capital figure the most dynamic part of the economy but meet difficulties in improving rapidly the situation of the Polish economy because of its size. Competitiveness is still low and trade deficit is growing.

Concluding remarks

We have reviewed three different kinds of situations that can be considered as proper illustrations of the problems met by European transition economies. Of course, it is not exhaustive and many other problems may arise.

In none of these three cases, the situation regarding the efficiency of technology transfers, its appropriation by the transferee, its future contribution to the building of technological capacities can be seen as satisfactory.

This raises the question of the advantage of a prior existing potential, scientific and technological capacities, skilled manpower etc...in a framework of rapid and important transformations. In this respect, the situation of transition economies does not seem much better than the situation of dynamic LDCs.

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