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Jaroslav Gamzikov

Growth and External Sources of Technology

The linkage between new knowledge, productivity improvements and economic growth of nations was addressed a long time ago. Schumpeter's 'carrying out of new combinations' embraced new methods of production that were founded on scientifically new discoveries (Schumpeter 1934). In the 1950s Solow-Swan growth theory supplied a solid theoretical base. According to Solow, growth occurs when exogenous technological progress compensates for the diminishing of the returns on the expansion of capital and labour are. The factor of progress has been much inserted to give an explanation of the long-term development of advanced nations whose rates of growth had not declined. The next generation of researches pointed out that an initially supportive element of technology was too crucial for the standard two-factor model. In the new models, which emerged in the late 1960s, ideas were unintended by-products of production and investment. New knowledge was a non-rival good in contrast with land, capital and labour with discoveries' spilling across the economy by 'learning-by-doing' practices.

The revival of interest in growth theory at the end of the 1980s resulted in the so-called endogenous-growth theory. Romer and Barro and Sala-i-Martin, who were its major contributors, paid attention to the empirical applicability and their theory embraced the new set of models addressing increasing returns, the role of government activities, human capital and technology. Within endogenous-growth theory, easier dispersion of knowledge between the producers via learning-by-doing compensates for diminishing returns to capital in the short run. Incorporation of technical progress to the model ensures avoidance of diminishing returns in the long run.

Modern economic thought establishes direct linkage between capital and technology as springs of progress. Abramowitz (1989: 23) stresses 'The growth sources feed from one another. The most important interactions are those between technological progress and the accumulation of tangible capital and between technological progress and build-up of human capital through education and training'. More recently, van Marrewijk (1999) proves econometrically that innovation and capital accumulation are complementary in the long run and that neither of these processes would take place without each other.

Foreign direct investment (FDI) seems to be a universal package for economic development

because it may bring internationally accumulated capital resources and inject modern technologies into local production. According to OECDb (2000: 108) 'countries with a large net inflow of FDI... are likely to obtain important net benefits from technology and knowledge flows.' FDI brings new knowledge in the process of mobilising local assets and combining them with their ownership-specific advantages. In contrast with licensing FDI disseminates stricter time and quality standards in utilisation of the knowledge delivered[1]. Today even autarkic-minded nations have to let technology enter via FDI. Many governments subsidise sectors and projects receiving FDI, and the acknowledged criterion for doing this is that of a project's technology content.

Foreign investment plays a considerable role not only in the relocation of resources vital for economic growth but also in the qualitative improvement of their utilisation. Because a multinational enterprise (MNE) is an agent of at least two markets, it has advantages in the adaptation of hardware or knowledge regardless of their place of origin. Potentially, affiliates deliver the technology, which moves host to the technological frontier. At this point, the host can stimulate technical progress in general and FDI in particular if it protects intellectual property and if foreign researchers consider compensation for adaptation of their products abroad as part of their rate of return. Ideally, foreign investments spur technology diffusion, contributing to 1) the closure of the technology gap between countries, 2) the improvement of the adaptive ability of the host, 3) the fostering of innovations internationally.

The new knowledge is crucial for international economic success. Archibugi and Iammarino (1999) register that the growth of high-tech products in the share of world trade in manufacturing from 9.5% in 1970 to 21.5% in 1995. The amount of patent extensions grew 13% annually between 1985-1995. The MNEs are the engines in the exchange of technologically intensive inputs and goods. They are the most prominent actors in the processes of both generation and utilisation of innovation. Moreover they collaborate and the growth of strategic alliances and the other forms of scientific co-operation brings volatility and complexity to these activities. The rise in research and development (R&D) alliances comes from the fact that while there are still strong location differences in the availability of resources it becomes extremely costly for a given MNE to rely on its own subsidiaries in the efficient exploiting of knowledge-based assets in each location (Narula and Hagedoorn 1999). According to the CATI database the number of alliances involved in innovative activity grew 10.8% per year on average in 1980-1994.

Technological advances speed up the process of 'globalisation'. Narula and Dunning (1998), investigating motives for the strategic alliances in R&D, say that globalisation increases interdependence and convergence of consumption patterns and technologies; internalisation of production through the MNE networks, overlapping and merging of industrial sectors; capital and knowledge intensity, and shortening of technologies' life cycles. The modern knowledge must be sophisticated but also volatile in terms of adaptation, application and scrapping. Standard,

mass-production techniques and expensive custom-made knowledge have become more international, more tradable, and more transferable.

Hosts are aware that FDI may positively contribute to the host's innovation potential and that stimulation of innovation-related activities is beneficiary. Romer (1990) assumes that the invention of a new product costs a societyless if it has invented more before. Current research activities have a positive spillover effect on future activities. Hence it is reasonable for a government of a non-advanced country to stretch these spillovers across the border by promoting technology transfer (TT). It is also reasonable because cross-border technology diffusion will: 1) open comparatively better prospects for the utilisation of up-to-date knowledge since the costs of invention exceed the costs of imitation (Hirschman 1958; Barro and Sala-i-Martin 1995), and 2) compensate for the lack of an indigenous research base and simultaneously assist its foundation at least for imitation and adaptation[2]. According to OECDa (2000), firstly, R&D notably contributes to output and total factor productivity growth. It is assumed that a 1% increase in the stock of R&D leads to a rise in output of 0.05-0.15%. Secondly, there are high private (often 10-20%) and very high social rates of return to investment in R&D. The social rate of return is especially high because of uncountable externalities from product/process on the way down to the garbage can. Thirdly, the productivity on a firm-level definitely increases with additional investment in technology. However, to derive gains firms must learn how to use the new technology initiating organisational change, training and the upgrading of skills.

The TT occurs unevenly across the countries. As their high value added activities are concerned, the host characteristics become more crucial. Considering a fragile and risky nature of technology we expect that a salesman will trade it first with more reliable and dedicated consumers. Globalisation of the TT might be defined as a process of 'technology's triadisation'. Amongst all alliances established in 1980-1994 and listed in the CATI database 94.6% were formed with the participation of at least one of the Triad firm. However, the East Asian and Central and Eastern European economies have already developed a number of fully functional alliances. While Hagedoorn and Sedaitis (1998) observe that these alliances do not differ much from the ones previously studied, we think that many of them are based on unilateral technology transfer and that the benefits for the weaker party are questionable (Box 1). Let us look in detail at the controversial aspects of the technology transfer process.

Hosts and Technology Transfer

The degree of contribution of technology flow to the rise in efficiency and rates of economic growth varies. The results of the process will be shaped by the sets of factors, including the strategies of the technology suppliers; the adaptive ability of the host and the nature of the

Box 1. Venture Enterprises as a Mode of Technological Co-operation with the MNE After Socialism.

Sectors with high R&D content are the fields for inter-company co-operation because of the high start-up and operational cost and fast pace of technological change. World-scale MNEs and minor producers either outsource their innovation, design and engineering functions to specialised firms or multiply their resources by co-operating with rival firms. Trends of specialisation and co-operation resulted in the growing amount of non-equity technology alliances particularly in the pharmaceutical, biotechnology and electronics sectors.

Though varying across Central and Eastern Europe, there are nations where technological competencies are strong in selected areas and active scientists are high in number (even accounting for hidden unemployment) (Table 1). Scientific joint ventures and projects teams have been an effective form of inter-firm co-operation in transition economies (TEs), combining Eastern scientific and engineering competencies[3)] and Western managerial and financial expertise. The distinctive features of these projects are operational flexibility, high learning propensity and diversity of workers' skills. Flexibility is stressed with the fact that in the vast majority of cases contractual agreements are preferred over JVs, as observed in Russia by Hagedoorn and Sedaitis (1998). They associate the contractual relationship with R&D-based alliances, newer firms and multilateral technology transfer.

Table 1. Innovation in TEs of Central and Eastern Europe.

	Information and Communication Technology Expenditures, % of GDP, 1999	*Scientists, Engineers and Technicians in R&D, per million people, 1987-1997*	*Patent application fled by residents, 1998*
Albania	na	na	0
Belarus	na	2 514	919
Bulgaria	1.76	2 714	281
Croatia	na	2 630	273
Czech Rep.	8.49	1 915	641
Estonia	na	2 408	22
Hungary	6.42	1 609	751
Latvia	na	1 400	195
Lithuania	na	2 659	135
Macedonia	na	1 881	84
Moldova	na	1 971	257
Poland	4.90	2 735	2 410
Romania	1.78	1 968	1 308
Russia	1.55	4 187	16 630
Slovak Rep.	5.98	2 658	224
Slovenia	4.31	3 278	296
Ukraine	na	2 746	5 327
EMU States	-	3 637	111 399

Note: EMU stands for the European Monetary Union countries combined.
Source: Compiled from WB (2001).

For the leading scientific centres of the former Soviet Union technological partnering has been crucial in the improvement of the technological base and sustaining research potential. There are 20 operating venture funds in Russia, almost all of which are financial institutions involving foreign capital. While some MNEs established their own R&D affiliates locally (*Samsung*) others gained access to know-how developed on the other scientific paradigm by outsourcing R&D to low-cost partners in Russia:

- *AT&T* – Joffe Laboratory;
- *Corning* – the Institute of Silicate Chemistry, the Vavilov State Optical Institute, the General Physics Institute;
- *Deputon Manufacturing* – the Kaluga Institute of Radiotechnics
- *Waterman International* – the Central Institute of Shipbuilding Technology
- *Rockwell* – the State Institute of Aviation Systems;
- *FMC* – the Karpov Institute of Physical Chemistry;
- *Sun Microsystems* – the Moscow Centre for SPARC Technology, in co-operation with the Institute of

High-performance Cybernetic Systems.

■ *Boeing*—the Central Aerohydrodynamic Research Institute.

However, the role of technological alliances in the technology transfer process did not become central because spheres where transition nations hold complex ownership-specific scientific competencies are few. Also, there are well known drawbacks in this form of co-operation. An MNE will either utilise transferable tacit knowledge in international R&D networks (the export of locally trained researchers) or directly exploit non-transferable facilities and equipment, minimising collaboration with locals (like networks for the testing of agrochemical or nuclear accelerators and piles).

Free market forces shaped two principal modes of the co-operation. In the EU accession front-runners (Hungary, the Czech Repuhlic, Slovenia, Poland) hard budget constraints fostered academia-industry linkages. There, R&D projects are sourced within the same channels as production subsidiaries have been for the last decade. In the former Soviet Union there is investment aiming at institutes and individuals possessing unique technology or skills. The first mode witnesses the deepening of MNEs' involvement in local economy and the building of its own capacities for long-term international networking. The second mode is based instead on arm-length transactions, involves no capacity building and is oriented to a short- to mid-term perspective. A good example is the Soviet laser industry—in the beginning of the 1990s many venture firms possessed 'unique' technologies but could not properly procure and market them. After delegating technologies to Western counterparts most of them either went out of business or became retailers of foreign equipment.

Sources: Gamzikov (2001); USDC (2001); Bernstein (1999); various sources.

technology. On its way the technology must meet numerous demands to prove itself transferable and useful from the viewpoint of those engaged in its transfer (Figure 1).

Ultimately, society's gain from technology transfer should be no less than the gain derived from the alternative use of resources with technology previously employed. If the opportunity costs are equal, the TT is worth exercising anyway since it means a non-measurable increase in

Figure 1. Factors Affecting Technology Transfer Pattern.

Technology →

Strategy of the technology supplier	Characteristics of technology being transferred	Adaptive ability of the host
-Receipt of compensation: royalties and payments; -Forced move (environmental, obsolesce factors); -Securing indirect demand for equipment, services, personnel or other technology: package licensing, tying (tie-in), etc. -Scanning innovations in foreign markets (Kogut 1985).	-Access to market; -Efficiency and novelty; -Substitutability with other technologies; -Compatibility with existent equipment/technology/assets; -Serviceability; -Price; -Hazards (to environment, national security, etc.); -Imposed restrictions in use; -Predetermination of dependencies on other technologies; -Prospects for the technology development.	-Access to assets; -Available assets; -Infrastructure; -Qualification and dedication of the host; -Opposition of the structures tied with old technology; -National finance and management systems (Paoli and Guercini 1997) -Legal framework concerning the TT.

expertise and flexibility of institutions, organisations and individuals, who will deal with the new ideas.

The growing amount of modern challenges makes the role of government even greater and accentuates the significance of wide range public policies dealing with the globalisation of innovations (Archibugi and Iammarino 1999). Apart from the co-ordination of technology partnering public policy is being re-considered from the perspective of linkages to the local firms. Blomström, Globerman and Kokko (1999) accentuate that two of host characteristics are particularly decisive for the benefits of spillovers: the competitiveness of the local markets and the technical capability of the local firms. Blomström, Kokko and Zejan (2000: 228) found also that labour skills, e.g. the characteristic directly influenced by the host government, is statistically significant for the increase in technology imports by foreign affiliates.

Countries face a wide range of tasks if they want to obtain good technology. The decisions are hard to make since, firstly, the government's actions crucially affect the environment to which a technology is delivered. Secondly, the government must avoid the traps associated with technology reception. Public functions addressing the MNEs activities and national innovation capabilities are being re-shaped since the challenges have expanded. Increasing competitive pressure demands more from states with less to offer, i.e. non-advanced countries. Thus, benefits expected from the actions of technology transferors have to be carefully weighed against costs for the following reasons:

- ✓ FDI can bring technology which is inconsistent with resources, e.g. capital intensive technology in a labour abundant country. Sometimes, the host governments are responsible if they invite technologies associated with either self-reliant industrialisation or militarising.
- ✓ If a foreign firm raises capital on the host market it affects the availability of financial resources there. It strengthens the distortions common to many developing countries, and it also pre-empts investment by local firms. New investment by an MNE makes the local firm cancel its investments plans, so total investment does not increase (reverse-classical assumption of Hufbauer and Adler (Caves 1996)). The negative effects of raising funds locally are greater if capital flows away via the legal repatriation of profits or transfer pricing.
- ✓ FDI can bring technology that does not require linkages with local firms or technology which is so sophisticated that such linkages can be established only with foreigners. The worst scenario is if such a technology replaces one with deep linkages within the national economy[4].
- ✓ The introduction of superior technology that requires locally unavailable skills, inputs or other technologies results in foreign firm's monopoly position. Monopoly brings technological stubbornness.
- ✓ There is always a possibility that the results of new technology's implementation will be poor in the long run. The theory says that any technology transaction is a gambling activity

because the value of the good implies the benefits of its future use but they are not clear yet to either party. It is hard to predict results because it is hard to predict change in such factors as government policy, quality and cost of labour, exchange rates or prospects for technology upgrading under the influence of time and a changing environment.

Additionally, the intensity of international rivalry may misleadingly encourage government to acquire non-optimal technological assets. On the other hand this intensity might cause excessive attention to be paid to competing and bargaining instead of control over the projects' later implementation.

Technology Transfer in Transition Economies: Different Strategies and Different Outcomes

In TEs there was a strong bias against any kind of barriers, protection and subsidies to national producers among governments and the public at the start of the reform. Many believed that the very fact of the national enterprises exposure to the global economy would automatically make them become competitive in terms of efficiency. There was strong belief that a rise in efficiency would rest on the competitiveness of the indigenous research system and skilled labour. As a consequence, the state withdrew itself from the spheres of knowledge generation, transfer and utilisation, and formerly controlled enterprises had to act on their own. However, free rides for technological upgrading had a low rate of success. The obvious idea is that without a national strategy local producers got less included in international innovation networks than their capabilities had suggested.

Trade liberalisation opened the markets of TEs for goods from countries with a higher allocate efficiency and countries with better comparative advantages. Flows of imports had the strongest negative effect towards the sectors relying on deteriorating location advantages. There, even if a factory improves productivity and management's flexibility, it cannot compensate for the negative effects of the decline on industry level. The impulses of weakness reach survivors through the backward linkages. Thus when a firm rationalises faster than the whole sector, it must find a cost-restructuring technology, which is compatible with the fabric of the traditional network.

Administrative methods of management and resources' allocation had been the source of change in the planned era. Market forces shift the responsibilities to a firm's white and blue collars, demanding flexibility and initiatives. Nevertheless, being pre-occupied with survival agenda managers lack strategic vision and skilled workers lack innovative energy.

Also, the qualitative standards for necessary capital and technology in TEs of Central and Eastern Europe are higher than in a developing country. Hence, the more TEs should strive to

Table 2. FDI Penetration in TEs.

	Inward FDI Stock as a Percentage of Gross Fixed Capital Formation, 1999	*Number of Foreign Affiliates*
Albania	na	2 422
Belarus	9.9	393
Bulgaria	41.4	918
Croatia	31.3	353
Czech Republic	44.5	71 385
Estonia	23.6	3 066
Hungary	18.8	28 772
Latvia	21.3	107
Lithuania	20.3	1 893
Macedonia	5.2	na
Moldova	17.8	na
Poland	17.8	35 840
Romania	16.6	71 318
Russia	11.0	7 793
Slovak Republic	5.9	5 560
Slovenia	2.0	1 195
Ukraine	8.1	7 362
EU States	27.7	-

Note: Data for a number of affiliates are for the latest available year, which is 1994 for Belarus, Bulgaria, Russia, 1995 for Albania, 1997 for Croatia, the Slovak Republic, Slovenia, 1998 for Hungary, Poland, Romania, 1999 for the Czech Republic, Estonia, Latvia, Lithuania, the Ukraine.
Source: Compiled from UNCTAD (2001).

gain foreign investment and the higher are standards for infrastructure development, education and innovation systems. In a situation where the taxation base contracts and the population's propensity to save is low the task of TEs in attracting FDI and foreign technology seems to be immensely large.

The distribution of FDI among post-Socialist countries is not even (Table 2). Accumulated foreign investment is heavily embedded in the national economies of the Czech Republic, Bulgaria and Croatia, which have larger inward FDI stock relative to gross fixed capital than the countries of the European Union (on average). The Czech Republic and Romania host more than 70 000 foreign subsidiaries each, and are followed by Poland and Hungary with 35 840 and 28 772 consecutively.

The roles of FDI as the contributor to the technological upgrading and growth of the economy also varies across the region. It is basically explained by the fact that the MNEs pursued different goals in different locations in Central and Eastern Europe, which were determined by different configurations of location-specific advantages. Particularly, market- and resource-seeking investment concentrated in the east of the region, where indigenous factors make inward-oriented manufacturing production or natural resources procurement reasonable. In the

closely proximate EU-bordering nations the MNEs found fast-paced reforming, a stable and legally regulated economic environment, political consensus, a decent infrastructure, weakly organised low-cost but productive labour and realised efficiency-seeking investment. Not surprisingly, the factors attractive for the MNEs were also good foundations for the economic recovery, which, in turn, was associated with improvement in the operating environment and a rise in demand. Thus, in these group of TEs FDI grew relatively more in volume and influence. Hungary, the Czech Republic, Poland (and to some extent the Slovak Republic and Slovenia) became part of the EU international division of labour scheme re-orientating and later intensifying their manufacturing exports to advanced countries. The Ukraine, Romania and Russia are weakly globally integrated self-sufficient markets where multinationals' presence is less pronounced.

This resulted in the fact that knowledge and technological goods disperse intensively in the advanced group of TEs. Technology transfer from FDI is **externalities**-driven there and proceeds in **inter-firm** fashion with industrial leaders clustering around subsidiaries of the MNEs. The clustering causes linkages to be established across borders, and so additional channels for getting technological impulses are established with international markets. There is diversification of the MNEs' activities and emergence of FDI made by the small and medium MNEs, as it happened in Poland and the Czech Republic (Table 2). In the rest of the TEs technology transfer is **project**-driven and largely occurs within the limits of an **intra-firm** system of inputs, skills and techniques transfers. The subsidiaries act independently from the host firms and institutions. It also results, psychologically, in management having a fortress mentality and oppressing further expansion on the market.

Though much is pre-determined with the locations' configurations of advantages and the consecutive orientation of the subsidiaries' activities, the government policy factor is hard to over-estimate. For us it is interesting that the fact that some slower-reforming countries have significant indigenous innovation potential distracted the attention of their policy-makers from the promotion of technologically significant FDI and left the R&D complex intact. Examples of business-to-business technological exchange and R&D co-operation with foreign companies are few there. However, in Poland, Hungary, and the Czech Republic the governments were more decisive. They concentrated efforts on the creation of a favourable climate for *all* firms but withdrew non-market forces from the economy. As a result hard budget constraints forced old R&D institutions to vanish or re-structure completely and enterprises to re-orientate their production faster. The speed of getting rid of the old technologies increased dramatically as did the intensity of technological co-operation with foreigners. FDI is technologically intensive. In the Czech Republic a national FDI survey in 1998 revealed that 22% of all FDI manufacturers do 'significant R&D' inside their Czech subsidiaries and 53% perform product development work on

Box 2. Externalities of FDI in Car Production.

The automotive sector is a major source of employment and has significant side effects on the economy through backward linkages and after-sale service. Because of the increasing competition and diversification of products technological changes occur faster here. At the same time big investment is necessary to rip profits from mass car production. While modern governments compete fiercely for the right to produce for auto industry controlled by the major MNEs, a number of Central and Eastern European countries attracted significant FDI in the field.

During the 1990s indigenous producers of cars and trucks were either literally wiped out (Wartburg of the DDR, LIAZ of the USSR), bought out (FSM in Poland by Fiat, Škoda in the Czech Republic and BAZ in the Slovak Republic by Volkswagen) or had to decrease and re-structure production (Dacia in Romania, FSO in Poland, Ikarus in Hungary, Avia SA in the Czech Republic). With the exception of a number of economies of scale or niche producers (VAZ and GAZ in Russia, Aro in Romania), survival meant collaboration with Western firms, especially in the area of engine procurement. Gradually, raising living standards stimulated imports and local manufacturing, which was backed up with foreign investment. As a result, a large part of the Central and Eastern European market matured as a production base for intra-industry networking with the EU countries, and as a stock of demanding low and mid-income consumers.

Large multinational corporations mainly from the Triad countries became the dominant forces in the Central and Eastern European automotive sector. The major examples of their involvement are:

- *Daewoo* (JVs with Avia SA, FSL, FSO, Oltcit, ZAZ)[5];
- *GM* (GM Poland, Opel Hungary Vehicle Manufacturing Ltd. (GM Hungary till 1994), JV with ELZAZ),
- *Suzuki* (Magyar Suzuki, in co-operation with Fuji Heavy Industries and General Motors);
- *Fiat* (Fiat Auto Poland, JVs with GAZ, KRAZ);
- *Ford* (Ford Hungária, Ford Vsevolozhsk);
- *Renault* (JVs with AZLK, Dacia, IMV);
- *Volkswagen* (Audi Motor Hungary, VW Bratislava Spol. SRO, VW-Škoda).

Additionally, PSA Peugeot Citroën and Toyota Motors consider investing US$ 1.33 billion into a joint venture in the Czech Republic with production to start in 2005 and maximum capacity set at 300 000 units.

The primary motive for the majority of the automotive projects is cost-reducing investment of souring type (e.g. Audi Motor Hungary), while the supplying of local and regional markets was particularly important for early comers (Fiat Auto Poland). Within the region the Czech Republic, Hungary and Poland are the primary destinations for auto-related FDI. The MNEs have seen these countries as stable locations rich in inexpensive skilled labour and weak unions in a natural proximity to the EU market. In a sense, it was the pioneering investments by major automakers that moved Hungary and the Czech Republic closer to the Western European countries and sped up their participation in the OECD, EU and NATO.

Local suppliers are the joint ventures or the post-socialist enterprises which re-oriented their production facilities away from the former Council of Mutual Economic Assistance countries. Due to the high level of competitiveness amongst the automotive sector firms from the Czech Republic or Hungary quickly gained access to international technology and know-how markets. Auto-related industrial clusters are the main channels of new equipment and skills upgrading in the manufacturing of these TEs.

At the same time there were no massive investments in the automotive sector in such largely populated and industrially advanced markets as the Ukraine, Romania and Russia. Interestingly, these countries received moderate imports penetration and sustain independent national car manufacturers while foreign investors bought almost all of the factories in the West. Excess production capacity in the world automotive sector resulted in the fact that the MNEs localised automotive production in 'winners', i.e. economically successful transition countries, lying near the EU borders. In the 'losers' group there is mainly retail-oriented raise-the-flag production with financial, managerial, R&D and productive inputs sourced from abroad.

Magyar Suzuki

Magyar Suzuki was set up in April, 1990 with founding capital of JPY 10 billion and shareholders including

Suzuki Motor Corp. (40%), Itochu Trading House (11%), the International Finance Corporation (9%), and Autókonszern Rt (40%) (Later Suzuki Motor Corp. raised its share to 88.87%). The venture was of a greenfield type with first production starting in October, 1992 (Suzuki Swift 1.0 and 1.3 litre models). In the two years preceding production Hungarian workers undertook thorough training programmes both in Hungary and in Japan. Continuous training helped reach quality standards high enough to source all Swift models sold in Europe from the Hungarian factory in 1995. In that year the output reached 35 000 units of which 63% was exported. In 1999 Magyar Suzuki introduced the Wagon R+ model and produced 68 105 automobiles of which 35 546 were exported. The plant rolled out 85 000 units, including models developed in co-operation with GM (Opel) and FHI (Subaru) in 2001 and 100 000 units is a projected aim for 2002.

By January of 1995 local content share exceeded 50% with batteries, seats, glass, paint, wiring harnesses, some small metal parts, etc. being produced by local suppliers. Suzuki has been interested in the high share of local inputs because it lets the cars be considered Hungarian and be exported to the EU preferentially. The strong motivation of the MNE towards the development of networking with locals is the main reason why the plant in Esztergom became the centre of the automotive cluster with 55 primary and 208 secondary suppliers, employing in total up to 33 000 people. In 2000 Magyar Suzuki also presented a cluster-focused subcontracting promotion plan, the Mid-Hungarian Automotive Cluster. Suzuki encourages Hungarian suppliers to introduce new products and processes by stimulating its Japanese partners to provide know-how and licenses free of charge. It also imposes high quality standards for the suppliers and gives financial assistance for meeting these standards. As a result of these efforts it became possible for Hungarian firms supplying Magyar Suzuki to start exporting to Japan already in late 1994.

Avtoframos (AZLK and Renault)

AZLK was the third largest car manufacturer in the former Soviet Union, producing up to 100 000 units in 1991, but its output dropped to 5 000 in 1996. The Moscow government (owner of AZLK) and Renault formed JV Avtoframos in 1997 to produce Renault engines and bodies at Moscow plant. In 2000 capital of the JV was enlarged from US$ 4 million to US$ 120 million. In 1999 Avtoframos assembled 535 Renault Meganes and Renault 19 cars and 900 units were made in the first half of 2000. There are plans to start assembling 3 000 of Renault Clio Symbol models annually. Currently JV installs the body painting facility and expands and develops the local dealer network. Being accompanied by an aggressive marketing campaign in the local media, Renault strategy is aimed at sales promotion rather than scale manufacturing.

The current production is complete-knock-down and semi-knock-down assembly lines with limited capacity. Almost 100% of components are imported. Very few of the local component manufacturers can compete with imported parts due to over-sizing, ineffective management, outdated technology and lack of financing for modernisation. In contrast with the situation in Hungary, the emergence of JV with a Western carmaker did not lead to clustering and networking while low production volumes cut off potential domestic suppliers (Russian JVs with Delphi Packard Electric, Bosch, Mannesman), which are oriented towards national producers (VAZ, GAZ). Only Autoliv make seat belts for AZLK in Dubna.

Renault has little incentives to make the AZLK plant its production base:

-exporting is not justified because there is no preferential treatment on the third markets as there is for Hungarian cars. Because local component suppliers are few and inadequate in product quality, Renault has to rely heavily on component imports.

-supplying local market does not justify production expansion either because the Russian market is small, fragmented and regionalised. There is also upward competitive pressure from subsidised indigenous producers with cost advantages (VAZ).

Sources: Havas (1997); UNCTAD (2001); Zweig (1999); AutoAsia Online; Autoreview; Hungarian Trade Office in Tokyo; various sources.

exported goods (Czechinvest).

The analysis of the post-Soviet automobile industry in Box 2 shows that modern production of internationally competitive goods is possible in Central and Eastern Europe if country-specific factors are enhanced by the appropriate government policies. However, we cannot help but say that the OECD membering TEs ripped the benefits of the TT from multinationals for the following costs:

-simplification of the national firms' production processes;
-narrowing of the orientation of indigenous R&D and education and training systems;
-extermination of the institutional potential for independent innovation.

While the benefits of the opposite group of countries are:

-variability of idea centres, which secure flexibility in macro-economic policies;
-distancing from the European institutions means the continuance of military innovation, including dual-use technologies.

Here we see the key point. The main factor that influences the interaction of governments and foreign firms in delivering technology suitable to the configuration of location-specific advantages is the initial incompatibility of the economic paradigm based on the host's independent innovation system with the development strategies of the foreign direct investors. In countries, where innovative self-sufficiency is high the state tends to impose soft budget constraints on science and R&D and economic agents reluctantly turn to the technological sourcing from the MNEs. Finally, the TT becomes troublesome for all parties involved or affected—the subsidiary, local firms, elements of national innovation system and governing bodies.

In sum, one has to destroy autarky-bred innovation systems to construct socially and economically acceptable channels for the TT from multinationals. Because FDI coming to TEs is not of a strategic-asset seeking type, it precepts local innovation facilities as a resource to drain dry. Since the existence of indigenous innovating potential creates new opportunity costs, the host is biased against the MNE activities.

Conclusion

Our study analysed one of the aspects of the TT—the delivery of knowledge with FDI and its effects on the host country. The overview of the literature on economic growth gives a strong impression that technological inputs and innovation are becoming more central and more crucial among the progress' explanatory factors. Coupled with practical evidences, these theoretical developments resulted in the current reality - that the nurturing of innovation-related activities occupies policy makers' agendas everywhere. FDI is an integrative part of this agenda. TT initialised via FDI advances a nation to the technology frontier; deepens the level of development

of technologies; increases the sophistication of the use of innovation results and, generally, internationalises new knowledge. At the same moment the technology transfer has potential drawbacks, which were particularly interesting for us to investigate.

After constructing the graphical framework for the process of the TT we looked at the specific case of the TEs of Central and Eastern Europe, which is an interesting example of buoyant change in the patterns of capital and technology flows. Our supplementary finding is that:

❑Technology transfer initiate welfare-reducing asset restructuring if the interests of the MNEs and the host are not balanced. Governments must plan strategically and co-ordinate their policies with those of foreign investors.

Our primary findings are that:

❑The majority of transition economies are under pressure because their international competitiveness is not strong but they demand capital and technology of quality to curb inherited distortions and reverse economic slump of the 1990s. There is clear stratification between them, although, across the line of positioning of the MNEs subsidiaries within the host economy and their innovation activities. The distinction lies between externalities-driven technology transfer occuring via the clustering of local subcontractors around the subsidiaries of the efficiency-seeking foreign investors and project-driven technology transfer, which takes place within a market-seeking MNE and has little spillover effects on the host.

❑Also, the general differences in country-specific configurations of advantages should not hide the importance of the specific factors. The specifications of indigenous innovation potential influence the technological and production opportunities opened and exploited by the MNEs and affect the government's choices. In some cases, if there is no FDI of a strategic asset seeking type matching the strong innovation potential of the host, there will be institutional and political resistance to the modes of technological co-operation offered by other investors.

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Note

1) There is still no consensus amongst scholars about the dependence between the levels of the main modes of TT, i.e. FDI and licensing (Knell and Radoševič 2000). Licensed technology is better because it allows the choosing of necessary ready-to-use knowledge at a reasonable price. However, internal expertise is absent in the technology package and the buyer has yet to develop such expertise, which is costly and time-consuming. Additionally there are strong suggestions that technologies transferred via FDI are newer than licensed ones. It has also been speculated in the literature that the choosing of particular channels is of secondary importance and more attention should be granted to the quality of their usage (Knell and Radoševič 2000).

2) If the means to obtain the results of innovation is foreign investment then the less developed hosts orient toward R&D sourcing from foreign country. The elimination of the technological gap is possible and determined by the factors affecting the rate of return to imitation. When all previously non-adapted products are adapted at the host country and the rate of return to innovation exceeds that to adaptation the host's researchers will innovate.

3) Post-socialist national innovation systems are far from being flawless; still there are a number of strongholds.

The Russian space launch providers sector is highly competitive with many firms (usually partnering with foreign investors) marketing their products and technologies in all mass lift ranges. Russia markets *Proton, Soyuz, Cosmos, Rockot, START, Dnepr* and *Shtil* vehicles and 8 out of 27 worldwide commercial launches were supported by Russian providers in 2000. Another 3 launches used Russian and Ukrainian technologies on the sea surface platform (*Zenit* 3SL). *Proton*, which is owned by the International Launch Services in partnership with Lockheed Martin, deployed 14% of the standard geosynchronous orbit launches in 1996-2000.

Another example shows the potential of the education system. Daimler-Chrysler runs a design centre in Prague where locally educated Czech specialists design special parts, undertake component development, work and adaptations of parts in collaboration with its German headquarters. Dr R. Fink, director of Mercedes-Benz Bohemia s.r.o said in 1998 that 'We have had no problem to find young designers with the high level of skills required to do detailed design work for Mercedes-Benz. Our R&D operation in the Czech Republic was an experiment in collaboration as Daimler began to act as a global company but it has proved very successful' (Chechinvest Agensy web-site)

4) Dunning (1993) in a precise manner describes a typical situation of this kind: 'Assume that this industry (in the host country) is moderately competitive in international markets, has reasonable support facilities, is subsidized by the government and is protected from foreign competition. Assume, next, that the purpose of the acquisition by the foreign company is to gain access to local or adjacent markets for its products. And finally, assume that the foreign company transfers the R&D facilities of the acquired firm back to the parent company and undertakes only local assembling operations on imported intermediate products. Assuming all these things... it may be that the net result of foreign investment is to reduce the international competitiveness of the industry and to accelerate a vicious circle of asset decumulation and a restructuring of assets away from that sector to others in the host country' (Dunning 1993: 279)

5) Daewoo has been acquired by General Motors.