Dual Economy and Impacts of Foreign Investment on Private R&D in Slovakia

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Abstract

This paper analyses development of the private R&D system in Slovakia after 1989. In 1990s, Slovakia experienced a painful economic transition, privatization and influx of the foreign direct investment. These developments were major factors behind sharp fall in R&D spending and levels of innovativeness. Moreover, Slovakia became a dual economy. Branch-plants of multinational companies benefited from technology diffusion and accounted for high productivity levels. Domestic companies generated low demand on innovative solutions and competed with low costs of production. There, however, were some 'islands of excellence'. This was a case of the Zentiva pharmaceutical firm, which accounted for a distinctive system of R&D and innovation patterns. The Zentiva case study is analysed via patters of corporate governance, entry of a smart foreign investor and firm's international expansion. Concluding chapter summarises findings on role of FDI in fostering innovations and private R&D.

Keywords: *dual economy; private R&D, innovation policy*

JEL Classification: O31, O32, O33

Introduction

It is widely accepted that a change of technology coupled with organizational changes at various levels of economy and society, are the main driving factors behind the continuous increase in output and living standards. Development and introduction of new technologies in associated with R&D inputs. There are a lot of studies supporting assumption about positive impacts of R&D and innovations on economic growth (e.g. Barro and Sala-I-Martin, 1995; Driouchi et al., 2006). European countries and regions account for very diverse levels of R&D

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and innovativeness. Minority of regions engage in highly sophisticated knowledge-based productions. They have rich networks of R&D facilities, large stocks of human capital, high shares of employment in knowledge-intensive services. These countries and regions are able to commercialise outputs of R&D investments and enjoy benefits of growth based on knowledge inputs.

Many studies indicate a significant correlation between per capita GDP on one hand and R&D inputs on the other hand (e.g., Griliches, 1992). Slovakia, however, seems to provide for an interesting exception from this correlation. After 1989 rapid rise in per capita GDP happened alongside deep fall in R&D expenditure, employment and infrastructure. That time Slovak gross expenditure on R&D (GERD) accounted for some 3.9 per cent of GDP, and the GDP grew by 1.9 per cent. By 2005 Slovak GERD accounted for some 0.53 per cent of GDP, but GDP grew by some 6.1 per cent. It followed the lower investments in R&D, the higher economic growth. Was Slovakia's growth pattern an aberration from standard assumptions on drivers of economic growth, or had this development its own logic?

High economic growth – accomplished in a competitive environment of the EU markets – implies significant improvements in productivity levels. If direct R&D inputs were low, increases in productivity and competitiveness had to originate either in low costs of productions or transfers of technology from abroad, or in combination of both these factors. The latter possibility indicates operation of a dual economy. Dual economy is the existence of two separate economic systems within one country or region. It is common in the less developed countries, where one system is geared to local needs and another to the global export market (Ranis and Fei, 1961). Examples of a dual economy include agriculture and (export-oriented) manufacturing sectors, modern production units operating midst of traditional production systems or foreign-owned industries developing alongside domestic ones. Existence of a dual economy usually is manifested in gap in the marginal product between sectors. Large part of the cross-sectoral productivity difference can be explained by different rates of absorption high technology (Temple, 2005). Economic theory relates emergence of a dual economy to industrialisation and/or arrival of high-tech investors to agriculture-based societies in less developed countries (Jorgenson, 1961). None of that was case of Slovakia, which had high shares of manufacturing and R&D spending already by late 1980s. Dual economy emerged by late 1990s and originated in organisational change and thorough transformation of economic and social system in Slovakia.

Patterns of industrial organisation and system of industry R&D in 1980s and 1990s are explored in Part 1 of this paper. This part also examines impacts of

macroeconomic and framework-supportive policies developed by Slovak Government on R&D system in 1998 – 2006 and provides a short review of Slovak R&D and innovation policies in this period.

Part 2 analyses emergence of dual economy in Slovakia and importance of technology transfer for productivity levels in domestic and foreign-owned sectors. Branch-plants of multinational companies benefited from technology diffusion and accounted for high productivity levels. Domestic companies generated low demand on innovative solutions and competed with low costs of production. Dual economy did not generate a fertile environment for R&D activities. There, however, were some 'islands of excellence'. Selected domestic companies were able to find new forms of engagement in international R&D cooperation.

Part 3 discusses case of the Zentiva pharmaceutical firm, which accounted for a distinctive system of R&D and innovation patterns. Success of Zentiva is analysed via patters of corporate governance, entry of a smart foreign investor and firm's international expansion.

Concluding part summarises findings on role of FDI in fostering innovations and private R&D. It provides for comparisons with R&D and innovation policies in other transition economies and suggests some policy recommendations. Notwithstanding sharp fall in domestic R&D spending, Slovakia has preserved some of its former rich research infrastructure. Increases in public support to R&D may boost private spending in this area and promote convergence between domestic and foreign-owned sectors.

1. Transition and Business R&D in Slovakia

Since 1970s, industrial structure in the country started to change towards dominance of monopolies and oligopolies both within the state and the regional economies, so called VHJ (*Výrobno-hospodárska jednotka*, the *Production--Economic Units)*. Some 100 VHJ in the 1980s in Czechoslovakia accounted for by far the largest part of the total industrial output. Average size of a VHJ was about 3 000 employees, but there were some real giants with over 50 thousands workers. The ZŤS Martin VHJ, for example, had labour force of 70 thousands and was responsible for most of armament production in Czechoslovakia. Giant VHJs dominated both the sectoral and regional economics. The VHJ's operated within limits of a centrally planned economy and showed lack of competition on domestic and Council of Mutual Economic Assistance (CMEA) markets transferred to low competitiveness on EEC (Eastern European Countries) markets; artificial price environment was reflected in non-transparent pricing and efficiency off production, etc. Centralisation of sectoral productions, however, also enabled

to enjoy benefits of economies of scale, including division of labour, market specialisation and concentration of R&D efforts. The VHJs had their own R&D units, which accounted for the overwhelming part of the enterprises R&D in the country. By 1989 Slovak Gross Expenditure on R&D (GERD) accounted for some 3.88 per cent of GDP and matched levels of R&D activity in most developed EU members. Most of GERD was channelled to enterprise sector. Several factors were behind this unusually high level of R&D expenditure in the communist economy:

- The former Czechoslovakia was technologically lagging behind the developed OECD members. There was a strong interest by communist planners to close the gap.
- Czechoslovakia, on the other hand, ranked to most developed members of the former CMEA. Its VHJs and enterprise research facilities had to serve the whole CMEA market (some 400 million customers) with the best-possible technologies (including armament production).
- There were severe barriers (including embargos) to transfer of know-how between the East and West. These barriers were further made stronger via lack of hard currency in communist economies. Many technologies already available in the West had to be developed separately in the East. Ideological and economic constraints, therefore, considerably boosted R&D expenditure in the former Czechoslovakia.

The VHJs deepened processes of enterprise specialisation and cooperation. These developments had ambiguous consequences for the sectoral and firm economies. On one hand, sectors and companies were able to profit from increasing benefits resulting from the integration of VHJ into the CMEA markets. On the other hand, they became rather over-specialised, inflexible and vulnerable to external shocks.

Collapse of communist regimes lifted ideological and strategic constraints on knowledge diffusion between East and West. Mutual exchange of knowledge should benefit both trading partners. In practice, most of this flow has been one-way, as the knowledge generation almost collapsed in Central and Eastern Europe, and in Slovakia in particular.

Introduction of a market economy included, among other reforms, significant decrease in state intervention, price deregulation and privatisation of business units. As for the sectoral economies, privatisation policies firstly were aimed at transformation of the state-owned enterprises to joint-stock companies and disbanding VHJs. Instead of dozens strong VHJ, several thousands large and medium-sized were established. Small units were much easier to transform and privatise than giant company groups. Dissolution of the VHJs, however, had also

some negative consequences. The complex supplier-customer networks were damaged and long-term planning disappeared. Business R&D became one of the first victims of enterprise restructuring.

The 'shock therapy' model of economic and social transition encouraged short--term economism in company planning, whereas R&D requires long-term perspectives. The demand for traditional company-level research has declined in favour of technology. The inflow of FDI (foreign direct investment), linked to privatisation has often been followed by substitution of imported management and technology for in-house R&D, as part of wider corporate division of labour. Even where relatively high levels of company R&D activity have been maintained, this has increasingly focused on implementation of foreign technologies, and related process innovations, rather than on development of new products and technologies. On the positive side, imported technology does raise the technological operating levels of firms, quickly as the technology gap is closed and is responsive to new forms of demand for product development (design, quality control, etc.) aimed at concrete markets.

Reduced public expenditure was related to the neo-liberal stabilisation programme, and led to a direct decline in R&D. The re-internalisation of trade has also had a negative impact on the R&D. Collapse of the CMEA has meant reduced opportunities for exporting more technologically sophisticated goods, including military products. Many research institutes have been closed or severely emasculated and the financial squeeze imposed on the privatised enterprises has reduced R&D capacity. Falling public spending was also linked to brain-drain and exodus of scientists from public sector and Slovakia because of wage differentials. There were dramatic declines in capital and current expenditures (materials for laboratories, books, journals, communications, etc.). Because of the sharp decrease of industrial R&D, there has been a structural shift between sectors that has not always been effective or well-planned (Zajac, 2004; Nemcová, 2005a). Indirect impacts were reflected in difficulties in finding complementary sources of R&D finance by private firms, as the business sector itself was undergoing a period of privatisation and thorough corporate restructuring. Both in case of the universities, academies and business sectors, the quest for alternative sources of finance was complicated by (a) a lack of an appropriate financial market environment; (b) changes in business innovation cycles and (c) changes in corporate governance systems.

In developed OECD economies, innovation activities shifted from traditional industries with long product cycles (manufacture of basic metals, chemicals and power supply) to industries with shorter product cycles (ICT – information and communication technologies, biotechnologies). Shorter innovation cycles enabled

a diversification of finance sources. While only large institutional investors could afford massive long-term investments, smaller projects with shorter time horizons were interesting for larger numbers of business angels and venture capitalists. These changes benefited countries with developed venture capital markets. Most Anglo-Saxon economies (UK, USA, Canada, Australia) had well-operating stock markets designed for smaller companies (NASDAQ, AIM) and abundance of private capital supplied by venture capitalists and private persons. Firms in "bank economies" (e.g. Germany, Austria, Portugal, Finland) had to rely primarily on bank loans and internal finance. The post-communist countries had to cope with the problems of establishing basic frameworks of capital markets. They ranked among the less developed bank economies with limited access to bank finance and high shares of internal finance used by small and medium-sized enterprises.

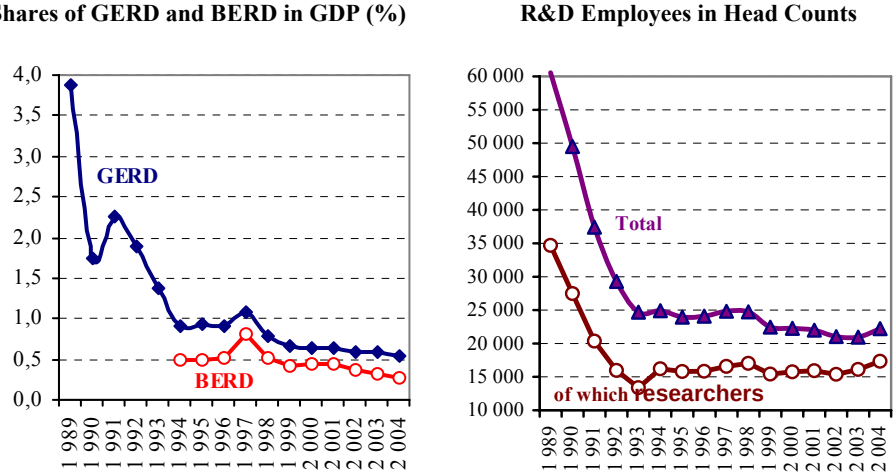
Difficulties related to economic and social transition and thorough re-organisation of business system were major factor behind sharp fall in R&D spending and levels of innovativeness. In 1992 – 1998 Slovakia experienced a period of macroeconomic mismanagement and instability, which negatively impacted social and economic stability of the country. By 2000 inflation rate increased to 12.2 per cent, unemployment rate to 18.8 per cent and the budget deficit surpassed 12.3 per cent of GDP. These problems, of course, were sensitive political issues and it was understandable that the Government concentrated on (i) policies of macroeconomic stabilisation and (ii) structural reforms. Macroeconomic polices implemented after 1998 targeted lowering budget deficits, cutting inflation and interest rates and preparation for the Euro adoption by 2009. There were severe cuts in public spending in many areas, including R&D system. Structural reforms were aimed at privatisation, pension reform (creating strong funded pillar), tax reform (introducing flat tax rate of 19 per cent), business environment reform (simplifying conditions for entry of and activities undertaken by enterprises) and reform of social and health care services (aiming financial sustainability of these systems).

The reforms were very successful in their own terms. Since 2001 Slovak economy has enjoyed economic boom. Inflation rates, interest spreads and fiscal imbalances moderated and there was some progress in cutting unemployment rates. Slovak Government reform agenda was highly acclaimed by foreign economic experts and media. Flat tax and business-friendly environment helped to attract large volume of FDI to the country and the carmakers in particular (Nemcová, 2004, 2005b). FDI, in turn, became a major driver of technology change and economy growth.

A more detailed analysis of the reforms' results provided for a rather mixed assessment, as these reforms had their 'dark sides', in particular persistent high unemployment rates (Šarmír, 2006), low average wages and great regional

disparities. The reform agenda also came rather costly and impacted public expenditure on education, social and health care, and R&D system. Data by the 2005 European Innovation Scoreboard (EIS) indicated that, with some notable exceptions, Slovakia ranked to the poorest innovation performers in the EU-25 area. Support to R&D decreased to 0.53 per cent of GDP in 2005 (Figure 1). Sharp downturn in R&D spending happened both in public and business R&D. Slovakia's expenditure on R&D was one of the lowest in the EU-25 area. Slovakia spent some 38 per cent per cent of the EU-25 average in business R&D, 25 per cent in public R&D, 5 per cent in University R&D financed by business sector and 6 per cent in early stage venture capital. Poor financial base of R&D system was reflected in very low commercial output. Slovakia, for example, accounted for very low numbers of scientific publications and patent applications to the EPO (European Patent Office) and USPTO (United States Patent and Trademark Office). Rates of patent activity were only 3 per cent of those in the EU-25 area.

F i g u r e 1
Development of Basic Indicators in Slovak R&D System in 1989 – 2004



Sources: SO SR (2005); author's own computations.

There was very limited direct intervention by the Slovak government in field of R&D and innovation (Šarmír, 2004). Slovakia had neither national innovation plan nor national innovation council by 2006. Development of innovations has not been considered a priority in Slovakia until 2005, when some policy documents were passed (e.g. Strategy of Competitiveness, the Law on Research and Development Agency, the Higher Education Law and the Law on Organisation of State Support to Research and Development).

T a b l e 1
Comparable Indicators of Economic and R&D Performance in 2005

	Slovakia	EU-25
GDP per capita in PPS (EU-25 = 100)	54.2	100
Real GDP growth rate (per cent change previous year)	6.1	1.6
Labour productivity per person employed (EU-25 = 100)	61.0	100
Inflation rate (average annual), per cent	2.8	2.2
Public balance (net borrowing/lending) as a per cent of GDP	–3.1	–2.6
General government debt as a per cent of GDP	42.5	63.4
Unemployment rate (as per cent of active population)	16.4	8.7
GERD as per cent of GDP	0.53	1.99
Percentage of GERD financed by industry [a)]	38.3	54.3
Innovation expenditure by businesses, in per cent of the EU-25 average	160	100
Venture capital investments – early stage, per cent of GDP	0.009	0.0223
Total public expenditure on education as a percentage of GDP [b)]	4.38	5.21
Tertiary graduates in science and technology per 1 000 of population aged 20 – 29 years [a)]	9.2	12.7
Share of employment in high- and medium-high-technology (manufacturing sectors) in total employment	25.59	33.29
Share of employment in knowledge-intensive service sectors in total employment (per cent)	7.65	5.55
Exports of high technology products as a share of total exports [a)]	4.6	18.2
Number of patent applications to the EPO per million inhabitants [b)]	3.42	134.51

Notes: [a)] 2004, [b)] 2003.

Sources: Eurostat and EIS, 2005.

The National Innovation System (NIS) was fragmented and consisted of a number of government, private and non-profit organisations. Major responsibilities within the NIS were assigned to the Ministry of Education of SR and Ministry of Economy of SR. In general, most of the basic and applied research was undertaken in the Slovak Academy of Sciences and 30 Universities, while Ministry of Economy of SR and its agencies backed majority of innovation initiatives. Most of the NIS organisations (including private ones) were controlled and/or supported by the government and its agencies and initiatives. When many Slovak enterprises shed off their R&D departments, Slovak government tried to preserve at least remnants of R&D infrastructure built by the former VHJs. By 2006 some 37 industry research institutes have preserved (half of the 1989 level) and were nursed by their former parent Ministries via grants and State Research Orders. The research institutes, on the other, had to re-orientate on activities bringing immediate profits, like metrology, certification, etc. As most of these institutes do not publish data on their business, it is difficult to assess, how research activities share in total income. There was little co-operation between industry and academia sectors.

The few innovation policy measures implemented by Slovak Government in 2000s were aimed at SMEs (small and medium enterprises). They lacked adequate financial resources and brought no improvements in levels of innovativeness

by businesses in period 2000 – 2005. There has been a modest support to innovation activities compared to very generous assistance to major foreign low- and medium-tech investors in car sector.

2. Dual Economy and Private R&D and Innovations

By early 2000s Slovak economy already was completely revamped. Liberal and export-oriented, but with a dual structure. Two economies evolved alongside in Slovakia. One was represented in highly efficient, export-oriented and technologically advanced branches of MNCs (multinational corporations) and international banks. The second one consisted of few large enterprises owned by domestic capital and a great number of domestically owned SMEs, which accounted for limited financial, human and technological resources. Foreign investors owned some 6 400 LTD and PLC-type companies, some 10 per cent of total companies registered in Slovakia. Table 2 presents performance indicators for 200 largest Slovak enterprises. Half of these were foreign owned. The foreign owned companies (mostly branches of MNCs) generated major share in total turnover (77.3 per cent) and also over 3.8 times higher sales per employee than domestic firms in 2005.

Disparities in marginal productivity between domestic and foreign-owned sectors originated in different rates of absorption high technology. Slovakia enjoyed very high innovation expenditure by companies (160 per cent of the EU-25 average) and ICT expenditure (95 per cent of the EU-25 average). Most of the technology diffusion was related to branches of the MNCs. Slovakia hosted branches of top World companies (Samsung, Volkswagen, Siemens, etc.), which favoured Slovakia for its combination of cheap, but educated labour, friendly business environment and generous investment incentives. Slovakia, for example, maintained reasonable rates of the S&T graduates (68 per cent of the EU-25 average) and shares of population with tertiary education (58 per cent of the EU-25 average). Increasing rates of youth education (119 per cent of the EU-25 average) indicated that the human resources gap between Slovakia and EU-25 may narrow in the future. Foreign direct investment was behind high levels of employment in mid/high-tech manufacturing (121 per cent of the EU-25 average) and new to market product sales (239 per cent of the EU-25 average). Multinationals active in Slovakia had high rates of R&D spending and introduced top-notch technologies. This was a highly positive trend, as growth and innovation capacity of an economy depends not only on the supply of R&D, but also on the capability to absorb and diffuse technology and demand for its generation and utilization (Radosevic, 2004).

Slovak branches of MNCs contributed to parent companies' turnovers and R&D spending and, in turn, profited from technology diffusion. In 2000s, Slovak economy accounted for significant increases in labour productivity. Data on productivity in domestic and foreign sectors (Table 2), however, indicate that MNCs were by far more productive than domestic firms, because they profited from R&D spillovers (via technology transfer) much more than Slovak SMEs. Hence, positive relation between R&D and innovation spending on one hand and productivity on the other hand is valid also for Slovakia.

T a b l e 2

Performance of Domestic and Foreign Sector in Slovakia in 2005

Firms	No. of firms	Total sales, EUR million	Sales per employee, EUR thousands
Foreign	108	26 684.346	229 011
Domestic	92	8 269.377	59 940
Total	200	34 953.723	137 353

Notes: Includes consolidated business groups. Foreign/domestic ownership is defined via majority of voting rights.

Source: Trend (2006); author's own computations.

While branches of MNCs benefited from R&D spillovers, R&D and innovation by domestic companies very quite limited. The CIS 2 (Community Innovation Survey) surveys, for example, established that only some 16,9 per cent of Slovak companies introduced a completely new product within period 1997 – 1999. The CIS 3 survey found innovation rate only slightly increased to 19.0 per cent in period 2001 – 2003. Both rates ranked to the lowest in Europe. The Matador tyre company was the largest Slovak firm owned by domestic investors. In 2005 it spent some EUR 9.6 million on R&D or 2.4 per cent of its sales (Matador 2006). This was quite exceptional, because average business spending on R&D (BERD) was only 0.44 per cent of sales in the manufacturing industry in 2001 – 2003 (SO SR, 2004). Innovation was not seen a development priority by most Slovak firms. The 2004 survey on innovation capacities of Slovak SMEs (NADSME, 2005), for example, found that Slovak SMEs identified correct fulfilment of contracts (61 per cent), high quality of products (60 per cent), flexibility toward needs of customers (48 per cent) and low prices (45 per cent) their main competitive strengths. Only some 13 per cent of SMEs saw innovation as their major competitive strength. This was reflected in low levels of innovation activity, as only 13 per cent of SMEs introduced a completely new product, while some 32 per cent innovated current products in period 2002 – 2004. SMEs relied mainly on knowledge of local markets and low costs of production. Low wage costs (average wage was some EUR 448 in 2005) enabled competing in field of labour-intensive industries on European markets.

Research and Development and innovations were considered risky and costly steps to uncertain and unfamiliar environment. Domestic SMEs preferred low--cost, low-value added productions.

Dual economy became an unfriendly place for private investments to R&D and innovations. As domestic SMEs lacked financial and intellectual resources for introduction of substantial innovations, R&D-intensive productions could develop only in large companies. Most large companies in the Czech and Slovak Republics were privatised either via direct sales to foreign investors, or sold their managers in early 1990s (Williams and Baláž, 1999). Foreign direct investors usually targeted branch plant investments and looked for acquisition of new sale markets and/or low costs of production. None of multinational companies placed their headquarters or other strategic units to the Czech and Slovak Republics, although some MNC started to shift their support service centred and selected R&D units by early 2000s.

International financial investors were relatively scarce and accounted for more diverse development strategies than FDI. Some of them were able to exercise full range of venture capital services and instead of promoting branch-plant investment they concentrated on fledgling independent companies. This type of investment proved friendlier towards private R&D and growth based on knowledge inputs.

3. Case of Zentiva

Many R&D and innovation firms are funded with venture capital (VC). Role of the venture capitalists usually is associated with ready supply of capital to high-risk projects. Venture capitalists, however, can provide R&D intensive firms with services surpassing mere financing needs. Venture capitalists invest considerable amount of their time to developing and reinforcing their social networks (know-who). Social networks enable for monitoring the activity of other venture capitalists, firms and markets. Venture capitalists acquire a great deal of tacit knowledge on non-financial issues, such as management advice, contacts and networking. In some cases this knowledge capital could be of more importance and interest for recipient firms, than input of financial capital. Timmons and Bygrave (1986), for example, surveyed some 464 VC-funded entrepreneurs from 1967 to 1982 and found that ‘capital’ was consistently the least important variable in an entrepreneur's decision. The firms were principally interested in developing networks with venture capitalists who were able to assist them with improving business vision and management, opening gates to key stakeholders in the business sector. These findings were supported by the Zook’s

(2004) survey on 91 venture capitalists and VC-funded firms. Strategy building, setting metrics and accountability, networking within business and financial communities and managerial assistance were most demanded activities by the recipient firms.

Case of Zentiva corroborates importance of a smart financial investor for local R&D intensive companies, which have potential for going global, but lack relevant capital resources and global market experience. The US-based investment fund Warburg Pincus LLC was able to transform two local firms to largest generic pharmaceutical companies in Central and Eastern Europe within a relatively short time period of five years.

Zentiva's origin dates back to 1930s and 1940s. The Czech firm Léčiva started mass production of pharmaceuticals in 1930. The Slovak pharmaceutical company Slovakofarma Hlohovec was founded in 1941. In 1952 – 1954 Slovakofarma and Léčiva were incorporated in the organisational structure of the Czechoslovak Association of Companies for Pharmaceutical Production (SPOFA). This VHJ was managed by the Ministry of Health of Czechoslovakia and responsible for all pharmaceutical production in the former Czechoslovakia.

After 1989 the SPOFA members underwent thorough organisational transformation. Particular member firms were firstly converted to joint stock companies and later privatised. The Léčiva's shares were bought by the Warburg Pincus investment fond in 1998. The Slovakofarma was privatised by the Pharma Holding GmbH Vienna in 1997. In 2003 the Warburg Pincus acquired majority stake in Slovakofarma Hlohovec and merged it with the Léčiva under the joint brand of 'Zentiva'. The Zentiva group essentially acquired the largest and most prosperous pharmaceutical companies in the Czech and Slovak Republics, left from the former SPOFA. Both firms accounted for similar culture, which simplified communications during and immediately post the transaction and the increased efficiency of sale teams in two countries. After the merger Zentiva became one of the largest volume manufacturers of pharmaceuticals in Europe. Business combination provided the firm with significant economies of scale. The firm established much greater purchasing power and was able to negotiate low prices from its raw material suppliers. During August 2003 the trading companies Zentiva CZ, Zentiva SK, Zentiva PL and the Russian company Zentiva Farma were founded. In 2004 Zentiva launched an integrated distribution system and started corporate manufacture planning for both production units – in Prague and Hlohovec.

Zentiva's original business strategy was developed in the former Léčiva firm in late 1990s. Léčiva's local managers and Warburg Pincus agreed that the company has to firstly ensure its leading position in the Czech Republic and than to

expand internationally. The Léčiva firm had some problems with profitability, but accounted for strong development potential. The Czech drug market traditionally has been open to competition. Combination of competition with lower purchasing power of end customers favoured low-cost suppliers. The company put stakes on development, manufacturing, marketing and selling of branded prescription generics and consumer health care (CHC) products. Tacit knowledge of Czech market was essential for success of initial phase of the Zentiva's strategy. Domestic managers (some of them working with the Léčiva since 1970s) owned some 13.8 per cent of total Zentiva's shares, but were appointed Chief Executive and Financial Officers. Warburg's representatives were appointed non-executive directors and made responsible for business strategy, marketing and R&D development.

Development of the firm's own R&D function has played a key role in completely changing Zentiva's overall product portfolio. Both the former Léčiva and Slovakofarma had their own company R&D departments, which were crucial for development of new products. The firms also had long-term cooperation with the key Universities in the Czech and Slovak Republics, but, this co-operation had limited impacts on development of product portfolio so far. Léčiva and Slovakofarma also developed several initiatives to attract talented young people, such as trainee programmes for graduates, scientific seminars for industrial pharmacies, scientific excursions, cooperation on students' thesis and support in the students' professional development. The merger enabled Zentiva to both increase its investment and streamline its Pharma R&D activities. The nominal R&D expenditure increased 2.5 times in period 2002 – 2005. By 2005 the company spent some EUR 16.5 million (about 4.2 per cent of its sales) in R&D and employed some 240 people in its corporate Pharma R&D department. The department focused on the development of new products for its branded generics portfolio. These new brands have not only driven Zentiva's sales growth but have also increased its profits by 2.5 times in period 2002 – 2005 (Table 3). New brands had much higher margins versus the in-licensed products, which generated significant part of Zentiva's product portfolio in the past. These products can be sold across all of Europe and beyond. In total, the Zentiva wants to introduce some 10 new products per year.

The Zentiva also focused on development and improvement of the quality and efficiencies of active pharmaceutical ingredients (API) production. Zentiva invested in first class formulation and pilot production facilities, state of the art analytical laboratories and a highly motivated regulatory department. The latter department developed strong relationships with the regulatory authorities in the Zentiva's core markets.

T a b l e 3

Basic Data on the Zentiva

	2002	2003	2004	2005
Sales, EUR million	192.782	237.753	334.566	397.495
Employees, persons	1 399	1 927	2 885	3 416
Sales per employee, EUR million	0.138	0.123	0.116	0.116
Gross profits, EUR million	109.282	142.130	202.388	244.930
R&D personnel, head counts	n.a.	n.a.	146	240
BERD: EUR million	6.668	10.738	13.723	16.534
BERD as per cent of sales	3.46	4.52	4.10	4.16
Exchange rate CZK/Euro	30.812	31.844	31.904	29.784

Note: n.a. – not available.

Sources: Zentiva (2006); authors' own computations.

T a b l e 4

Fostering and Hampering Factors Influencing the Level of R&D Activity of the Zentiva

	Impact
Internal factors fostering/hampering R&D activity	
Organisation	
ownership structure	3
organisational structure	3
management methods	3
Resources and capacities	
firm size	3
financing of R&D	3
human resources available for R&D activities	3
information on consumer needs	3
R&D management	3
Cooperation with…	
Universities	0
research organizations	0
competitors	3
suppliers	3
customers	3
External factors fostering/hampering R&D activity	
External framework conditions	
national markets	3
international competition	3
human resources potential in the region	0
national/regional research capacities	0
infrastructure (Science parks, ICT-infrastructure…)	0
Policy measures	
direct financial measure (state, EU…)	0
indirect financial measures (taxation)	0
supporting science industry relations (Centres of excellence, competence centres)	0
laws, norms and other regulations influencing production and/or markets	–1
approvability conditions (IPR or other forms of securing profitability of R&D results)	3

Notes: Scale: –3 = strongly hampering, –2 = hampering; –1 = slightly hampering; 0 = no influence, 1 = slightly fostering; 2 = fostering; 3 = strongly fostering.

Source: Interview with Zentiva's managers. This table is derived from the standard questionnaire prepared by the Network for European Techno-Economic Policy Support (ETEPS).

The Zentiva developed new products its own capacity and did not seek any help from the State. There was no interplay between the State economic and/or R&D policies and Zentiva's R&D activities. The company managers were quite sceptical about role of the public sector in fostering private R&D and innovation activities.[1] The managers considered ownership structure, organisation and management methods on firm's own human and R&D resources essential for company's success (Table 4). The firm also learned a lot from co-operation with its customers, suppliers and competitors. As one could expect in Slovakia, the co--operation with universities and research organisations, but also existing national/regional research infrastructure had no influence on Zentiva's R&D activities. The company also was indifferent towards direct and/or indirect R&D and innovation policies. These were few, poorly designed and aimed mostly at large--scale foreign investors in low- and medium-tech manufacturing industries. If the State did not help, it also did not hamper Zentiva's activities and, basically, the only hampering factors were related to existing legal environment in Slovakia (law enforcement in particular).

After establishment of a strong foothold in the Czech and Slovak Republics, Zentiva looked for expansion into new markets. The firm capitalised on strong economic performance in the former CMEA area in 2000s and increasing demand for improved healthcare from the citizens of these countries. Pharmaceutical consumption was rising rapidly from a relatively low base in this area. It was not just new Member States, but also Russia, Ukraine, Romania and Bulgaria generating increasing demand on generic drugs. The firm also exploited some structural changes in the health care markets in the former CMEA. In the past, most healthcare was provided in hospitals. This pattern of health care provision changed. More care is provided by the primary care market and large part of the health care spending is generated by the drug prescription now. Zentiva focused on producing drugs for key therapeutic areas in the primary care market including cardiovascular, central nervous system, pain management, alimentary tract, gynaecology, urology, and consumer healthcare. Since 2005 the Zentiva has used the EU's Mutual Recognition Procedure (MRP) in order to gain market registration for the company's key products. By end of 2005 the company had had 295 marketing authorization applications, including 107 MRP applications for the sale of pharmaceutical products, which includes the registration of new products, the registration of existing products in new territories, and line extensions on existing

[1] This section is based on authors' interview with manager of the Zentiva's R&D Department in May 2006. The semi-structured interview was based on the project 'Private Sector R&D in the New Member States'. The project covered several sectors of economic activity in each of the ten new Member States and was prepared and implemented by the Network for European Techno-Economic Policy Support (ETEPS).

products. These marketing authorisations targeted core markets with some 220 million inhabitants and potential for generic drug market of USD 10.9 billion.

Warburg Pincus's involvement in Zentiva enabled company to benefit from advanced financial instruments. Zentiva's listing on the Prague and London Stock Exchanges in June 2004 was a historic event both for the Company and for the Prague Stock Exchange. It targeted several issues related to future activities of the company. Share issue should provide firm with funds needed for more aggressive approach to future acquisitions and growth strategy. It also aimed to raise Zentiva's profile both domestically and internationally. The improved image was considered important given the firm's growth ambitions in the international markets. The investors met Zentiva's growth plans with great enthusiasm and the IPO was more than five times over-subscribed at the issue price of CZK 485 per share. The IPO was also a significant event for the Czech financial markets as it was the first IPO in Prague since the Czech Republic joined the European Union. The Czech and Slovak Republics were typical bank economies. Companies obtained finance either via bank loans, or, especially in case of MNCs, via inter-company loans. A share issue was quite exceptional method of financing, as it enabled to tap global financial markets and establish the company in international investor community.

The Warburg Pincus was a financial investor. It looked for companies with low levels of market valuation, but strong development potential. Warburg's active involvement in Zentiva's restructuring and expansion helped to increase company's value. Since their listing in June 2004 the share price had risen 134 per cent by the end of 2005. With Zentiva's transformation completed, Warburg Pincus opted for exit of its investment. In March 2006 the Sanofi-Aventis acquired a 24.9 per cent stake in Zentiva via the purchase of a 19.6 per cent stake from Warburg Pincus, a 5.2 per cent stake from the Zentiva's management and employees. The Sanofi-Aventis's entry into the Zentiva was beneficial for both parties. The Sanoti-Aventis got opportunity to use Zentiva's skills and marketing presence in the former CMEA area. The Zeniiva, on the other hand, can use the Sanofi-Aventis's pharmaceutical expertise and its much broader European presence. It enables for development of Zentiva's business in new markets in Western Europe.

The Sanofi-Aventis has become Zentiva's largest shareholder, but held just about a quarter of total shares. Company managers owned some 6.5 per cent of shares and various institutional and private investors some 68.6 per cent. This shareholder structure allowed Zentiva's managers to create a long term relationship with Sanofi-Aventis, but in the same time preserve reasonable degree of independence, when making strategic decision on Zentiva's future business.

Discussion and Conclusions

Since 1989, Slovakia has followed a specific path of economic development. Difficulties generated via long and painful transition generated spectacular fall in R&D intensity in terms of employment, expenditure and commercial output. Extensive R&D base – related to the former communist sectoral monopolies and oligopolies – largely disappeared. Instead of intra- and extra-mural R&D, Slovak business and branches of MNCs re-oriented on imports of modern technologies. Offsetting knowledge and technology creation via diffusion should not be viewed entirely negatively. High R&D intensity before 1989 was rather artificial and generated via ideological considerations and economic constraints. From business point of view import of high-tech equipment can be more efficient than in-house development of the second-best technology. The same is true for branches of multinationals.

There are two contrasting views about impacts of FDI on productivity growth and the development potential of a local economy. One, 'catching-up' view asserts that large productivity gaps between foreign investors and domestic firms generate large potential for technology transfer (Cappellin, 2004). Productivity gaps also can result from differences in corporate governance. FDI often is accompanied by change in firm ownership and results in increased international engagement and competitiveness. Research by Estrin and Carlin (2000) on manufacturing firms in Poland, Romania and Spain, for example, exemplified that foreign ownership brings access to finance for investment as well as management expertise and to new export markets. Transfer of this 'soft knowledge' can be as much important for boosting productivity levels in foreign-owned firms as transfer of technologies or spillovers of R&D results. The other view is that firms with low productivity levels account also for low capacity to absorb high technologies.

The latter view implies that the lower the productivity gap, the higher chance for technology transfer. These views, however, may be rather complementary for Slovakia's dual economy. As a matter of fact, foreign-owned sector was far more productive than domestic one, and increases in productivity were related to direct and large-scale transfers of technology, whether via green-field or brown-field investments. There however, was little evidence for transfer of technology and R&D spillovers between domestic and foreign sectors. Damijan et al. (2001) found similar patterns for technology transfers and R&D spillovers in eight transition economies. Spillovers through arms length trade were only exceptionally present, while the spillovers from foreign to domestic firms were negative or insignificant.

The technology transfer also is impacted by prevailing technology paradigm. If a technology importing country accounts for lower technology paradigm, technology transfer from a country with higher technology paradigm is difficult. The technology gap reinforces in this case, as importing country has look for lower technologies. This is a problem encountered by majority of small and medium enterprises in less developed countries.

The Zentiva's success story, however, was based on incumbent relatively high levels of productivity, which enabled for absorption of foreign knowledge and modernisation of the product portfolio. Relatively low technology gap enabled for rapid catch-up and significant increases in total output and productivity. Zentiva's success could be attributed to several factors:

- The firm has been created and managed by a smart financial investor, unlike most factories in Slovakia, which were privatised by managers and employees and/or sold to foreign investors. Warburg Pincus activities focused on long-term, growth-oriented investment approach, and facilitating sustainable value creation. The key investor assisted Zentiva with tacit knowledge on operation of global financial and pharmaceutical markets. It was able to provide the Zentiva capital, but also with know-how, know-who and know-why. The Warburg managers also recognised that Zentiva's success would not be possible without involvement of talented local management team and allowed for considerable freedom of operations by this team. Different kind of ownership provided for different approaches to corporate financing, marketing and R&D. In these fields, the Zentiva has been years ahead of most Slovak firms.
- Zentiva's expansion to new markets was based on its incumbent R&D base and realistic business strategy. The company did not posses enough financial and/or intellectual resources for developing breakthrough drugs and competing with World leaders in the field. Company's core markets were in the former CMEA area. Potential customers had relatively low incomes and could not afford new and expensive drugs. Instead of top-notch products, Zentiva opted for brand generic products aiming broad masses of population. This strategy proved successful and enabled expanding to market niches, which were not target by firm's competitors.
- As a matter of fact, company's success happened in a 'policy vacuum'. The company was not able to benefit from the State Aid, unlike branches of MNCs in car industry. The firm, on the other hand, enjoyed liberal business environment flexible labour markets, simplified conditions for business operations and flat tax. The State, for example, did not object merger of the former Léčiva and Slovakofarma and/or downsizing the Slovakofarma's staff by 300 people after the merger. Supportive business environment proved major advantage of developing business by Zentiva.

Slovak government was liberal-minded and concentrated on enforcing macroeconomic stability, structural reforms and improvements in business environment in period 1998 – 2006. Slovak Government opted for a framework-support approach and tried to attract foreign investors via low taxes, flexible labour markets and an excellent relation between cost and quality of labour force. The only, but notable exception from this liberal pursuit was an over-generous support to foreign investors, in car industry in particular. Investment stimuli were designed for large-scale, long-term investors with significant potential for generating jobs and decreasing regional disparities. This approach helped to cut unemployment rates and develop lagging behind regions, but also had some negative consequences. The MNCs turned Slovakia to a branch-plant economy, favoured for low costs of production, and performed most of sophisticated activities (including R&D) in their headquarters. Low- and medium-tech investments in car industry has until now attracted far more Government support than high-tech investments. High-tech investors in the IT, biotechnology and pharmaceutical sectors used to launch medium-sized and flexible business projects. They did not qualify for the State Aid aimed at large projects with long-time horizons and significant amount of administrative procedures. Slovak innovation policy measures, on the other hand, were aimed at SMEs. They concentrated on the technology transfer and building technology parks and business incubators. Because of their small size, considerable amount of administrative procedures and target groups, they were of no interest by R&D-intensive firms.

Current innovation and R&D policies do not appear to generate much effect and country is lagging behind in meeting Lisbon objectives in the field of R&D and innovations (for similar problems with low efficiency of innovation policies in Poland and Bulgaria see Jasinski, 2003, and Simeonova, 2006). There is a considerable room for government intervention in these policies. Experience from some transition economies suggests that public funds for R&D need not result in substituting for firms' own resources. Comparison of R&D efforts by firms in Eastern and Western Germany, for example, showed that both R&D intensity and innovation intensity were considerably higher if firms received public R&D grants (Czarnitzki and Licht, 2004). In the absence of public assistance fewer firms would have been able to implement new products and processes in national and international markets.

Differences in productivity levels suggest existence of a dual economy in Slovakia by mid 2000s. This dual economy was different from those in developing countries. In 'classical' dual economies different vintages of technology coexisted, because the domestic sector started out far enough behind the technology frontier. In Slovakia low productivity of domestic sector at least partly resulted

from sharp fall in R&D spending. The country, however, preserved some research infrastructure, if ageing and poorly maintained. This is important, because catch--up or convergence depends on the balance of innovation and imitation, how challenging these activities are, and the extent to which countries are equipped with the necessary capabilities (Fagerberg and Verspagen, 2002). Historical lessons provided by successful catching-up countries (e.g. South Korea, Taiwan, Singapore, Ireland) was assisted by extensive investments in higher education, particularly in engineering and natural sciences, and significant increases in funding devoted to R&D and innovation. Policies aimed at modernisation and extension of domestic R&D base are essential for re-starting knowledge-intensive pattern of economic growth in Slovakia.

Slovakia faced a challenge of transition from short-term, low cost-based competitiveness to long term, technology-based competitiveness. Low demand on innovative solutions by domestic SMEs has been a major obstacle for increasing private sector investments in R&D. Slovak firms may become more interested in company research activities, when R&D and innovation become competitive advantages. Average wage in Slovakia are still low, but rising. Slovak producers cannot rely in cheap labour for long time. There also is a pool of highly skilled professionals, who seek adequate employment and remuneration. There already are some positive examples of (large) domestic companies considering R&D an important factor of their economic performance (Zentiva, Istrochem, Duslo, Matador). Medium-sized companies are likely to come in next round.

Less clear is strategy of the MNCs. The MNCs develop and diffuse technologies across national borders via a number of ways. These include technology transfer to branch-plants in destination countries, international movements of expert personnel, trade, patenting and international technological and R&D collaboration. Acquisition of assets via FDI, purchase of technology and movement of personnel clearly were most important channels for technology transfer in transition period in Slovakia. Most MNCs were interested in low production costs and acquisition of new sale markets. Domestic R&D base accounted for limited human and financial resources and had little to offer to foreign investors. MNCs may increase range of their activities, when Slovak Universities and R&D centres improve quality of their research and develop denser networks of cooperation with industry. Some foreign investors (e.g. Samsung, Johnson Controls) have already started to tap the pool of educated labour and established research and service centres in Slovakia. Similar process of transferring R&D centres to the new Member States was found for Hungary (Inzelt, 2004). This process is likely to be phased. Reallocation of some development and pre-competitive

activities will be most important in first phase of international R&D cooperation, and Zentiva's case provides for a nice example of this process. Cooperation in basic and applied research may follow later, after supply of high-quality researchers and R&D infrastructure improves.

References

[1] BARRO, R. – SALA-I-MARTIN, X. (1995): Economic Growth. New York: McGraw-Hill.

[2] CARLIN, W. – ESTRIN, S. – SCHAFFER, M. (2000): Measuring Progress in Transition and Towards EU Accession: A Comparison of Manufacturing Firms in Poland, Romania and Spain. Journal of Common Market Studies, *38*, No. 5, pp. 699 – 728.

[3] CAPPELLIN, R. (2004): International Knowledge and Innovation Networks for European Integration, Cohesion, and Enlargement. International Social Science Journal, *56*, No. 180, pp. 207 – 225.

[4] CZARNITZKI, D. – LICHT, G. (2006): Additionality of Public R&D Grants in a Transition Economy: The Case of Eastern Germany. Economics of Transition, *14*, No. 1, pp. 101 – 131.

[5] DAMIJAN, J. P. – KNELL, M. – MAJCEN, B. – ROJEC, M. (2003): The Role of FDI, R&D Accumulation and Trade in Transferring Technology to Transition Countries: Evidence from Firm Panel Data for Eight Transition Countries. Economic Systems, *27*, No. 2, pp. 189 – 204.

[6] DRIOUCHI, A. – AZELMAD, M. – ANDERS, G. C. (2006): An Econometric Analysis of the Role of Knowledge in Economic Performance. Journal of Technology Transfer, *31*, No. 2, p. 241 – 255.

[7] EC (2005): European Innovation Scoreboard 2005. Brussels: European Commission.

[8] FAGERBERG, J. – VERSPAGEN, B. (2002): Technology-Gaps, Innovation-Diffusion and Transformation: An Evolutionary Interpretation. Research Policy, *31*, No. 8, pp. 1291 – 1304.

[9] GRILICHES, Z. (1992): The Search for R&D Spillovers. Scandinavian Journal of Economics, *94* (supplement), pp. 29 – 47.

[10] INZELT, A. (2000): Foreign Direct Investment in R&D: Skin-deep and Soul-deep Cooperation. Science and Public Policy, *27*, No. 4, pp. 241 – 251.

[11] JASINSKI, A. H. (2003): Has Innovation Policy an Influence on Innovation? The Case of a Country in Transition. Science and Public Policy, *30*, No. 6, pp. 431 – 440.

[12] JORGENSON, D. W. (1961): The Development of a Dual Economy, Economic Journal, *71*, No. 282, pp. 309 – 334.

[13] Matador (2006): The 2005 Annual Report. Available at <http://www.matador.sk/downloads/ACFF2.pdf>.

[14] NEMCOVÁ, E. (2004): Klastre a ich úloha v rozvoji regiónu. Ekonomický časopis/Journal of Economics, *52*, No. 6, pp. 739 – 754.

[15] NEMCOVÁ, E. (2005a): Priemysel Slovenskej republiky a vybraných malých ekonomík Európskej únie – komparácia z aspektu prechodu do informačnej spoločnosti. Ekonomický časopis/Journal of Economics, *53*, No. 5, pp. 527 – 541.

[16] NEMCOVÁ, E. (2005b): Analýza vývoja automobilového priemyslu na Slovensku. Ekonomický časopis/Journal of Economics, *53*, No. 10, pp. 1009 – 1022.

[17] RADOSEVIC, S. (2004): A Two-Tier or Multi-Tier Europe? Assessing the Innovation Capacities of Central and East European Countries in the Enlarged EU. Journal of Common Market Studies, *42*, No. 3, pp. 641 – 666.

[18] RANIS, G. – FEI J. C. H. (1961): A Theory of Economic Development. American Economic Review, *51*, No. 4, pp. 533 – 565.

[19] SIMEONOVA, K. (2006): Research and Innovation in Bulgaria. Science and Public Policy, *33*, No. 5, pp. 351 – 363.

[20] SO SR (2005): The 2005 R&D Yearbook. Bratislava: Statistical Office of the Slovak Republic.
[21] ŠARMÍR, E. (2004): K problematike vednej politiky u nás a v zahraničí. Ekonomický časopis/Journal of Economics, *52*, No. 10, pp. 1202 – 1214.
[22] ŠARMÍR, E. (2006): Nezamestnanosť – pretrvávajúca výzva súčasného sociálno-ekonomického rozvoja. Ekonomický časopis/Journal of Economics, *54*, No. 10, pp. 1024 – 1036.
[23] TEMPLE, J. (2005): Dual Economy Models: A Primer for Growth Economies. The Manchester School, *73*, No. 4, pp. 435 – 478.
[24] TIMMONS, J. A. – BYGRAVE, W. D. (1986): Venture Capital's Role in Financing Innovation for Economic Growth. Journal of Business Venturing, *1*, No. 2, pp. 161 – 176.
[25] TREND (2006): Trend Top 200 – The Biggest Non-financial Companies in Slovakia in 2005. Trend Weekly (supplement), 3rd July 2006.
[26] WILLIAMS, A. M. – BALÁŽ, V. (1999): Privatisation in Central Europe: Different Legacies, Methods, and Outcomes. Environment and Planning C: Government and Policy, 17, No. 6, pp. 731 – 751.
[27] ZOOK, M. (2004): The Knowledge Brokers: Venture Capitalists, Tacit Knowledge and Regional Development. International Journal of Urban and Regional Research, *28*, No. 3, pp. 621 – 641.
[28] ZAJAC, Š. (2004): Slovakia: S&T Transformation without a Strategy. In: W. MESKE (ed.): From System Transformation to European Integration. Science and Technology in Central and Eastern Europe at the beginning of the 21st Century. Münster: LIT Verlag, pp. 218 – 234.
[29] ZENTIVA (2006): Zentiva's 2004 and 2005 Annual Reports. Available at <http://www.zentiva.sk>.