CHALLENGES FOR THE CZECH REPUBLIC'S COMPETITIVE PERFORMANCE IN THE ENLARGED EU[*]

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Abstract:

The new EU-entrants face double challenge on the Lisbon road to knowledge-based competitiveness. On the one hand, higher expenditure is required to improve the quality of research and education input and infrastructure, on the other hand, the innovation system changes are necessary to increase efficiency of expenditures. The example of the Czech Republic within EU-25, as to the export performance, productivity and R&D intensity of the so-called hi-tech activities, presents a more detailed analysis of competitive advantage sources and challenges in the less developed EU members. The analysis emphasizes the criterion of (in)completeness of the multinational value chain, which continues to consist mainly of segments with lower quality intensity (assembly operations) in these countries. This aspect plays a crucial role in international comparison of competitiveness within EU-25, and in assessment of success and political support of transition to knowledge-based economy.

Keywords: competitiveness, transition countries, technology catch-up

JEL Classification: O33, O57

1. Introduction

The fundamental condition for growing living standards lies in the long-run sustainable country competitiveness, which is based on technology and skill intensive activities, i.e. those with high innovation and human capital content. Such a competitive advantage is referred to as quality-based in contrast to the cost-based advantage relying on comparatively lower production cost (mostly due to undervalued exchange rates). Achieving quality-based competitiveness is, understandably, much more difficult for less developed countries, including the new EU entrants. Therefore, the cross-country differences in innovation and human resource performance (within EU-25) may even increase in time.

The new EU members thus face double challenge – both of economic and technology catch-ups. Moreover, most of new EU entrants are confronted with the two-fold transition. Still coping with the ongoing deep system transformation into efficient and effective market economy, the countries find themselves on a crossroad to diverse sources of competitive advantage, either to the cost-based path relying on cheap labour and other inputs, or to the quality-based, in-house innovation-intensive advantage enhancing the transition to knowledge-based economy.

There is not much maneuvering space, however, left for autonomous decision-making. The desirable economic catch-up causes the cost advantage to disappear gradually and the loss must be compensated by higher quality output. Such a compensation requires a long way to go and hard work to do - both sufficient investment into the development of innovation and education capacity and in-depth changes making the innovation and education systems more effective and expenditure more efficient. Given the diverse sources of competitive advantage, the related question is about the new EU entrants' position at the crossroad between the cost and quality based competitiveness.

In the paper, after an introductory overall assessment of the Czech Republic's competitive performance, the above-mentioned characteristics of the competitiveness are presented in terms of competitive advantage matrix distinguishing between the qualitative and cost factors, and between internal and external sources of technology knowledge. The following section presents the export performance of hi-tech activities, which demonstrates a relatively favourable position of the new entrants within the enlarged EU. More detailed specification of this position follows in terms of productivity, export, R&D and patent intensities. This specification points to the importance of the country positions in the multinational value chain according to which their competitiveness is to be assessed and the related political support formulated and realized.

2. Technology and Skill Catch-Up

Within selected analytical aspects and policy implications of the sources of competitive advantage of new entrants to the European Union, attention is given to the specifities in assessing their quality (i.e. technology and skill) catch-up. According to trade statistics and related analyses (see e.g. OECD 2004, Kaderabkova et al., 2005), the structure of exports of these countries to the EU has been improving markedly since the second half of the 1990s. The shares of the so-called technology and skill more intensive products are steadily increasing, particularly due to the activities of foreign investment enterprises (FIEs).

These favourable "statistical" outcomes, however, must be interpreted with careful analytical scrutiny basically from two aspects. The first one is the actual (revealed) quality content of the industries marked as technology and skill intensive, as the industry classifications are based on the presumption of complete value added chain. In transition countries, however, rather the less quality intensive segments (like assembly operations) prevail and, consequently, their technology and skill intensities remain low, which reflects the overall low level of in-house innovative capacities. Another analytical aspect considers the overall low productivity contributions of technology and skill more intensive activities, which do not particularly differ from the contributions of the quality less intensive activities.

The mentioned analytical outcomes bring a number of implications for the formulation and implementation of the supportive, pro-competitive policy. So far, the recommendations and measures have mostly copied the experience and development priorities of the more developed countries. They do not reflect the achieved (i.e.

low) level of innovative capacities and nature of competitive (i.e. cost-based) advantage with low quality intensity of economic activities, which results in weak demand for quality intensive inputs (R&D, skilled workforce, etc.).

Therefore, the particularly urgent challenges in the support of competitiveness lie in an appropriate policy design adjusted to the level of revealed quality intensity of economic activities, including the problem of supply and demand interactions; in the reorientation of FDI inflow support (incentive structure) towards more quality intensive services (instead of the still dominantly favoured manufacturing); in linking the public expenditure increases to performance criteria of the recipient institutions (particularly in R&D activities, tertiary education), and in increasing efficiency of national innovation system, particularly through the effective performance feedback and the development of closer inter-sectoral interfaces.

More specifically, the innovation and human capital ingredients of quality-based competitiveness must be viewed as mutually interlinked and dependent concerning both their supply/demand characteristics and effectiveness. Industries with low technology intensity, weak innovative capacities, producing lower-quality products (more standardized, simpler, price-sensitive) require labour force with the lower level of human capital. Low demand debilitates stimuli to invest in education and skills improvement because higher skills will not be sufficiently used and appreciated. The deficiency of high-quality human capital prevents the expansion of technology more intensive production and development of innovative potential.

Consequently, the industries might be locked in vicious circles of low productivity, insufficient improvement of skills and bad jobs, and the countries where such industries prevail are trapped in the equilibrium with low skills, low technology intensity of production and weak innovative potential. In other words, higher investments in R&D and education do not themselves guarantee a change in the quality intensity of economic activities; it is conditioned by the interconnection of high-quality human capital with higher technology intensity of production and innovative capacities.

3. Competitive Performance of the Czech Republic

The evaluation of the Czech Republic's position on the transition towards the knowledge-based economy points to a number of weaknesses in the economic performance and quality-based competitiveness including the skill intensity (EC, 2004a; EC, 2004b; EPC, 2003). Within priorities defined by the Lisbon strategy, the attention is paid mainly to lagging in the quality of human capital and research and development. This lagging partly reflects the achieved economic level and insufficient change of political priorities in the Czech Republic towards building the basis to long-term sustainable, knowledge-based development path.[1]

As to economic performance, the Czech Republic lags behind other new entrants in the rate of long-term economic growth (see Figure 1). The reported improving economic performance since 2000 has been accompanied by increasing external and internal imbalances. The Czech Republic shows unfavourable tendencies of the demographic development with significant impacts on the size (and share) of population in the productive age. The related economic and social impacts are demonstrated in the pressure on social expenses. The need of public finance reform limits

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[1] Underlying analysis of the key performance indicators is presented in detail in Kadeřábková et al. (2005), all the data are available mostly in related EUROSTAT databases.

available resources for investment into quality improvement of domestic knowledge base and factor endowments. In the developed countries, the sources of productivity increase, as a basic assumption for the long-term sustainable economic performance, consist in the creation and use of new knowledge and education and increase in the labour force skills. The share of knowledge-intensive activities in the value added in the Czech Republic is relatively high; however, their productivity remains low (Havlik et al., 2001; Kaderabkova et al., 2005).

Production in the Czech Republic is, on average, low R&D intensive (in % of value added) and high industry concentrated (more than 60 % of business R&D is realized in just two industries of car and machinery manufacturing), the shares of other industries are, consequently, very low. Besides insufficient R&D funds, there is a very low supply of venture capital (0.033 % of GDP in 2003 as compared to 0.088 % in the EU-15) available for start-up and expansion of high-risky, innovation and new technology based (particularly) small companies (OECD, 2003, 2004). For the country with a less developed local knowledge base (Knell, 2002), it is even more important to readily absorb new technology expertise. The share of research and development activities of FIEs (as a potential source of technology transfer) in the Czech Republic has already been approaching their shares in sales (43.5 % in 2002). This is reflected in increasing R&D intensity of foreign firms against domestic ones. The country position in the supranational value chain, however, still remains to rest on the qualitatively less demanding segments like assembly operations with overall low R&D intensity and a high share of blue-collar workers (hence the like term blue-collar economies).[2]

Figure 1
Economic Growth (average annual rates in %)
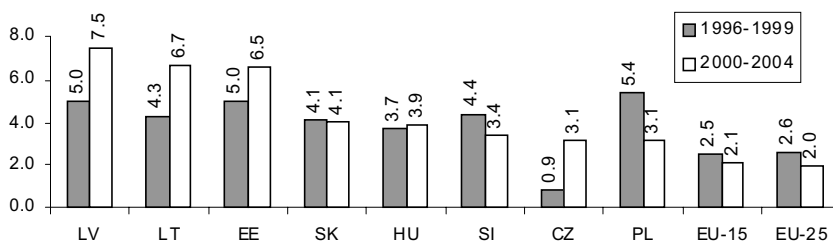
Source: EUROSTAT – New Cronos Database, data extraction to 1. 6. 2005, own calculations.

Public policy support to human resource development remains insufficient. The share of public expenses on education as a percentage of GDP dropped compared to 1995 (from 4.6 % to 4.4 % in 2002 compared to 5.2 % in the EU-25) and this share belongs to the lowest in the EU. The participation in the lifelong learning in the Czech Republic is on the under-average level within EU-25 which indicates low expenses on education in business sector (6.3 % in the Czech Republic as compared to 9.4 % in the EU-25 in 2004). The employment structure in the Czech Republic is very unfavorable as to the share of employees with tertiary educational attainment (13 % in 2004) as compared to the share of quality-intensive high-skilled occupations

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2) For a more detailed evaluation of the role of the transition countries in supranational valued chain see e.g. Kadeřábková (2003, 2005a, 2005b), Kadeřábková, Srholec (2001), UNCTAD (2004), UNIDO (2002).

(31 %).[3] Consequently, employees with only secondary educational attainment perform a major part of occupations with high qualification requirements.

Within the new EU entrants, the share of research and development expenditures in GDP is relatively high in the Czech Republic (1.35 % as compared to 1.95 % in the EU-25 in 2003). The national innovation system structure, however, shows some unfavourable trends in recent years. R&D expenses are skewed in favour of government sector (as compared to higher education institutions) and the share of business sector in financing and realizing R&D has been decreasing (from 63 % in 1995 to 51 % in 2003, and from 65 % to 61 %, respectively). The current participation of the business sector in funding of R&D realized in higher education institutions (0.7 % in 2003) is one of the lowest in the EU-25, which points to a limited demand for university expertise from Czech companies. In such an environment, the triple-helix model (with intense science-industry linkages) is quite difficult to develop, which is detrimental (particularly) to the quality of university education supply in science and technology fields.

The characteristics of research and development and innovation activities in the Czech Republic point to the still underdeveloped role of the interactions between individual stakeholders of the national innovation system (OECD, 2003, 2004). Research and development activities are not sufficiently financially supported but they also show problematic structure and limited openness to international cooperation. Innovation activities in enterprises are generally on a very low level as to intensity and economic efficiency, with limited interfaces to external sources of knowledge (reflecting uncooperative innovation culture), and, last but no least, less skill demanding (with negligible share of training in the overall innovation expenditures).

The position of the Czech Republic (and other new EU entrants) in terms of R&D innovation output is notoriously very weak both in respect to the number of patents per million of inhabitants (10.2 as compared to 133.6 in the EU-25 in 2002) and the share of innovating companies (28.5 % as compared to 36.2 % in the EU-25 in 2000). As a result of low share of population with tertiary education the position of the Czech Republic is very unfavourable even in respect of share of university graduates in science and technology fields. It must be appreciated that, within the new entrants, the Czech Republic ranks rather favourably as to ICT readiness and usage, especially in business sector. Much less intense, however, is the ICT usage in households, and the application of e-learning methods in education and training both by companies and individuals remains quite limited.

4. Competitive Advantage Matrix

A cross-sectional assessment of competitive advantage is presented in terms of its sources and the level of innovation capacity (source of technology knowledge). This assessment is based on the concept of the global competitiveness index presented by Sala-i-Martin and Artadi (2004) with a reference to Porter (2003). This concept identifies qualitatively different sources of competitiveness (of countries and firms) prevailing in three development stages. Economic success based on lower development stages of competitiveness ultimately leads to its loss due to growing input costs, in particular wages. Long-term sustainable growth performance there-

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3) The group of quality-intensive occupations includes the codes 1-3 in ISCO-88 (legislators, senior officials and managers, professionals, technicians and associate professionals, the so-called high-skilled white collars).

fore requires gradual transition to qualitatively higher sources of competitive advantage, *i.e.* more intensive in internal (or in-house) innovation capacity.

In the initial *factor-driven development stage*, firms compete mainly in price, i.e. with the advantage of cheap inputs using technology invented elsewhere. In the *efficiency-driven stage*, the productivity is determined mainly by the product quality (no longer solely by the price) and efficient production practices. The technology capacity, i.e. access to the best available technology even adopted from abroad, makes for the key qualitative characteristic of competitiveness in this stage. In the *innovation-driven stage*, *i.e.* the qualitatively highest, the innovation capacity (the ability to produce new products and processes using the most advanced methods of production and organization) becomes the key characteristic for a competitive advantage.

4. 1 *Sources of Competitive Advantage*

The starting assessment of country positions within EU-25 is based on an indicator delineating two extreme *sources of a competitive advantage* – on the one hand, low costs or local natural resources (sensitive to the price competitiveness or price changes), on the other hand, unique products and processes that are difficult to imitate. Movement between the two extreme positions can also be described as transition from a cost/price-based competitive advantage to a quality-based advan-

Figure 2
Sources of Competitive Advantage, 2004
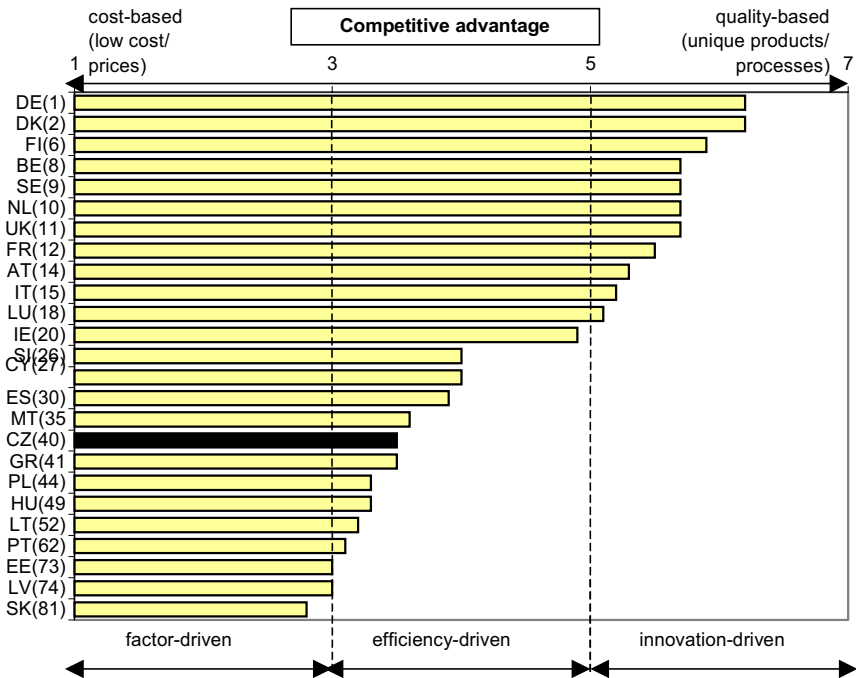
Note: Ranking within 104 countries; 7 – the best result, 1 – the worst result.
Source: WEF (2004), own modifications.

tage. A scale from 1 (the worst result) to 7 (the best result) can be used to identify the three development stages of competitiveness (or its qualitative segments, see Figure 2).[4]

The EU country positions (within 104 countries in total) are identified using the results of expert survey undertaken by the World Economic Forum (WEF, 2004). EU members are assigned either to the efficiency-driven stage, or to the innovation-driven stage. Application of this criterion to EU-25 makes for relatively clear identification of two country groups. The first twelve countries (including the borderline Ireland)[5] can be described as countries with an innovation-driven competitive advantage, while the remaining thirteen countries (including the borderline Slovakia) can be described as countries with an efficiency-driven competitive advantage. The competitive advantage in the first country group can be assessed as predominantly quality-based, while the competitive advantage in the second group as mainly cost-based. Differences between individual EU countries are considerable not only in the very assessment, but also in the final ranking within the group of 104 countries.

New EU members (together with Spain, Portugal and Greece) form a group (EU-13) with a competitive advantage that can be assigned to the efficiency-driven development stage, nonetheless still based mainly on relatively lower costs (prices). The transition to an efficiency-driven and rather quality-based competitive advantage therefore presents a great challenge. In these countries, at the same time, considerable differences in the economic performance between domestic and foreign business sectors show up. The question remains whether the differences in the economic performance are also reflected in the qualitative levels of their competitive advantage.

4. 2 *Sources of Technology Knowledge and Level of Innovation Capacity*

A closely related aspect of competitive advantage assessment is that of sources of technology knowledge or the level of (internal) innovation capacity. Two opposite positions are identified also in this case – on the one hand, knowledge acquired mainly through licenses and imitation of foreign technology, and, on the other hand, through internal research activities leading to the creation and introduction of new products and processes. Understandably, certain intermediate stages, reflecting the development of local knowledge base, can be identified between the two extremes (see Figure 3).

Although this comparison shows that both the new and less developed EU members continue to depend mainly on external sources of technology knowledge, they are able to adapt it to the local needs, though in environments still characterized by mainly cost-based competitive advantage. The question is how to encourage the technology transfer effectiveness on this qualitative level and gradual development of internal innovation capacity. Innovation strategies of FIEs play crucial role in this regard.

The fundamental precondition for successful technology transfer lies in the very technology openness of the local economic agents, *i.e.* knowledge of new technolo-

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4) The concept used in Sala-i-Martin and Artadi (2004) distinguishes individual qualitative stages of competitiveness in terms of GDP *per capita*. In addition, the stages of transition are identified to the efficiency-driven and to the innovation-driven competitiveness.

5) Irish position is borderline between the efficiency-driven and the innovation-driven stages. However, within EU-25, Ireland is closer to the group of countries in the innovation-driven stage. A borderline position may reflect a dual character of an economy with persisting dependency on external technology knowledge in the economically highly efficient segment of FIEs.

Figure 3
Sources of Technology Knowledge and Level of Innovation Capacity, 2004
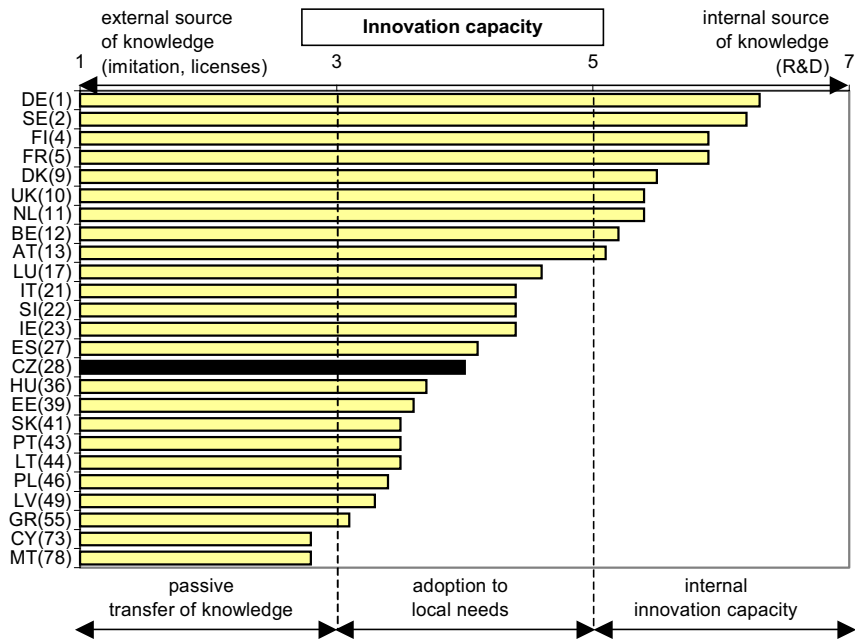
Note: Ranking within 104 countries; 7 – the best result, 1 – the worst result.
Source: WEF (2004), own modifications.

gy and intense interest in its acquisition. The effectiveness of technology transfer decisively depends on the development of the local knowledge base. Its level understandably gains increasing importance with growing role of internal innovation capacity. However, even passive adoption of foreign technology requires adequate (minimum) level of knowledge. The importance and level of these prerequisites increases in the next development stage, allowing adoption of imported technology to the local needs.

The most important sources of external technology knowledge (technology transfer) include import (especially import of technology intensive machinery – capital assets), foreign direct investment (developing technology intensive production activities in the host country) and export (through the competitive pressure of other exporters and sophisticated demand on challenging markets). The technology transfer intensity through foreign direct investment depends on the position of affiliates in the multinational value chain and this position is in turn influenced by the development of the local knowledge base referred to above. However, the position in the multinational chain also influences the technology transfer intensity through import and export activities.[6]

6) A quality more intensive position also means higher technology intensity of imported machinery and exported products, and a broader range of undertaken activities (including international distribution and marketing), which allows closer contact with challenging demand and competition in technology more developed product segments.

4.3 *Competitive Advantage Matrix*

Country positions within EU-25 can be identified in the *competitive advantage matrix* (see Figure 4) based on a combination of indicators of competitive advantage sources and technology knowledge sources (level of innovation capacity). This matrix relatively clearly identifies the lagging behind of the group of new and less developed EU members (EU-13) as compared to the more advanced members (EU-12).

Figure 4
Competitive Advantage Matrix
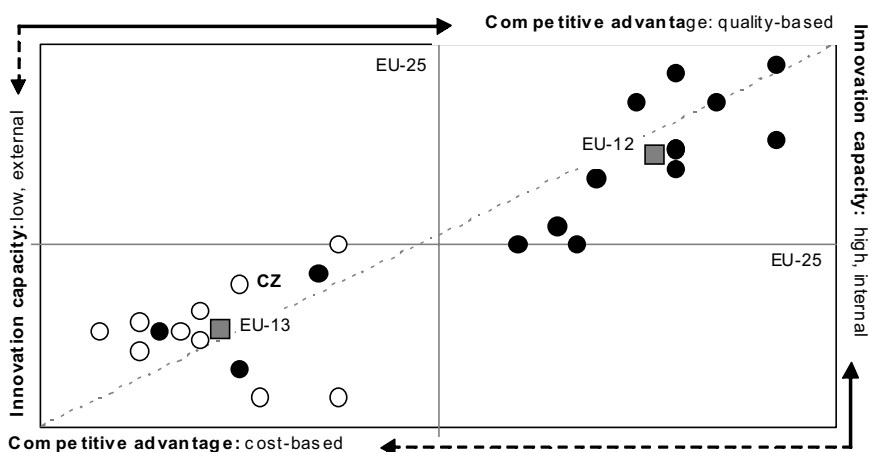
Source: WEF (2004), own modifications.

The lagging behind is demonstrated by the predominantly cost-based competitive advantage, *i.e.* by low importance of unique products and processes, while the competitiveness is mainly driven by efficiency. The lagging behind can also be clearly observed in the persisting dependency on external sources of technology knowledge, *i.e.* by low importance of internal knowledge sources (research and development activities). Although internal innovation capacity of these countries is still insufficiently developed, they are able to adopt external technology knowledge. Quite remarkable differences in individual country positions in the competitiveness matrix indicate the necessity of specifying policy tools for support of competitiveness at country levels.[7]

5. Hi-Tech Export Performance

The share of hi-tech export is a closely observed and prestigious indicator of a competitive advantage in the so-called knowledge-based economy. According to the European Commission's definition, this indicator reflects the ability to exploit commercially the results of R&D and technology innovation on international markets (EC,

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7) Similar matrices can also be constructed at industry or regional levels. The different positions of constituent units can be (or should be) also used for the specification of political support.

2004a). Therefore, the hi-tech export or its growth in time can also demonstrate effective functioning of national innovation system, which supports the transformation of innovation inputs into innovation outputs with measurable economic benefit.

The interest of companies and governments in hi-tech activities is motivated by a number of positive effects, which include especially the creation of high skill intensive jobs and their continuous development, high wages, fast growth in trade and productivity, high profits, high intensity of research and development activities and innovation, and high incidence of related positive externalities (OECD, 2005). Technology intensity of production attracts related quality intensive inputs and supports their further development. Business demand for research and development and high skills stimulates the creation of their corresponding supply and the interest of private sector in its support.

Hi-tech products compete in quality at relatively high prices. Hence their quality-based competitive advantage as opposed to an advantage based mainly on low costs and prices. Higher prices of products mean higher income for the expended production factors, *i.e.* high evaluation of inputs. What's more, life cycles of products in these industries tend to be short and this results in enormous pressure on the speed of their replacement with new, technologically comparable or preferably superior varieties. This pressure drives further investment into research and development, and training. This virtuous circle drives development of knowledge intensive activities in a knowledge-based economy.

According to the statistical data (see Figure 5), new EU members with the highest share of hi-tech products in the total export are (disregarding the specific case of Malta) Hungary, and, with a remarkable distance, the Czech Republic (with an increase by 4.5 p.p. in hi-tech export share compared to 1999). Hungary holds the third position within the EU. Although the share achieved in the Czech Republic remains lower than the (weighted) average for EU-25, it is only slightly below the levels achieved by Sweden or Denmark.

Can the increasing shares of hi-tech exports in new EU members be evaluated as demonstration of their successful transition to the knowledge-based economy? Can it be seen as increasing importance and economic effect of a quality-based competitive advantage? Could this development even justify, for example, more intensive public support for development of the hi-tech industry, including industry-specific investment incentives? Answering these questions is complicated due to the limited explanatory value of the exploited indicators as they fail to take into account positions of the exporting countries in the global value chain. Multinational corporations are the most important exporters of hi-tech products in new EU members at

Figure 5
Share of Hi-Tech Export in Total Export of EU Members, 2003 (in %)
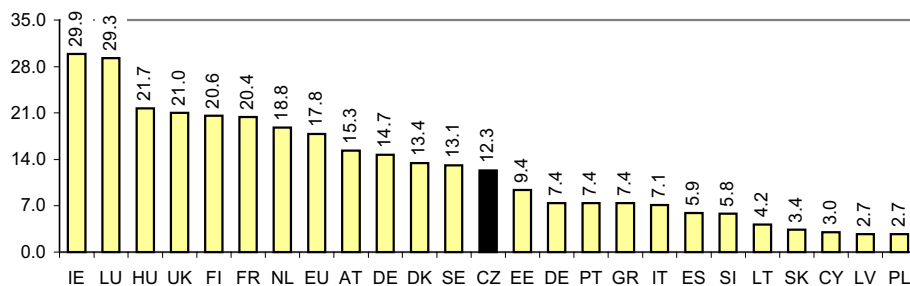
Source: EUROSTAT (2005).

the corporate level. However, their affiliates in less developed countries with low production costs mostly only assemble imported parts and components.

6. Quality Intensity of Position in Multinational Value Chain

Classification of products with the relevant SITC code produced in FIEs as hi-tech is justified. However, this classification is based on the criteria of a complete value chain, which contains not only production itself, but also research and development segments and other, knowledge-intensive activities. However, these quality intensive segments remain located mainly in home countries of foreign investors with adequately developed local knowledge base. On the other hand, the quality more intensive segments are not represented in the host economy (with less developed knowledge base) or their occurrence is very limited (Kadeřábková, 2005a, 2005b).

6. 1 *R&D Intensity and Productivity*

A more detailed analysis of hi-tech activities in new EU members does not reveal any significant differences compared to other industries regarding the intensity in qualitative inputs (research and development and high skills), or regarding the level of productivity or unit values. On the other hand, the group of hi-tech industries in developed countries is (mostly) much more productive and more intensive in research and development and skills compared to other, technology less intensive industry groups.

The above given diverse characteristics of hi-tech activities as to their productivity and quality intensity can be illustrated on the example of the Czech Republic (CZSO, 2004). The share of hi-tech industries in research and development expenditure in this country is low and even lower as compared to 1995 (with the drop from 18.2 % to 17.2 % in 2002). The labour productivity in hi-tech industries does not differ significantly from the manufacturing average or from groups with lower technology intensity. In 2002, the hi-tech productivity reached mere 112 % of the average for the Czech manufacturing. In general, in broader international comparison, the labour productivity in hi-tech industries in less developed EU countries is very low (see Figure 6) and without any significant differences compared to the productivity in the manufacturing (EUROSTAT, 2005).

Figure 6
Labour Productivity in Hi-Tech Industries in the EU, 2001 – 2002 (in thousand EUR)
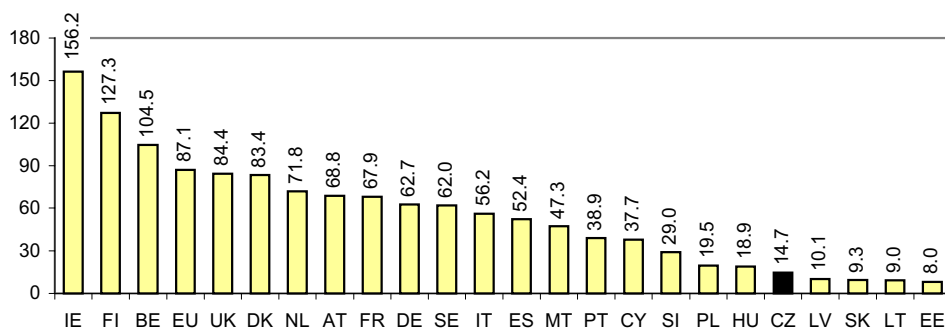
Source: EUROSTAT (2005) and own calculations.

The actual technology intensity of the Czech hi-tech industries (the share of R&D expenditure in value added) has been low and even decreases in time (from 7 % in 1995 to 5 % in 2002). The R&D intensity in hi-tech industries with the most important export activities is even lower, less than 4 % in electronics and only 0.14 % in computers. The R&D intensity in hi-tech industries in developed EU countries usually exceeds 20-25 %. In addition, the share of professions with high skill intensity in hi-tech industries in the Czech Republic is also low, as it is reflected in the share of R&D employees in total employment (2.6 %). Other less developed EU countries also achieve low levels of R&D intensity of hi-tech industries.

6. 2 *Hi-Tech Assembly in FIEs*

The prevalence of the quality less intensive segments, such as assembly operations, in hi-tech activities in the knowledge less intensive countries is reflected also in the high import intensity of the so called hi-tech exports (the trade balance of hi-tech products has been significantly passive on a long-term basis) and their high geographical concentration and product specialization. This means that intermediate products (components and parts) are imported for inward processing and a very limited product range is exported to a very small number of countries (often one or two only). The low level of internal innovation capacity is also documented by the low level of patent activities in international comparison (see below).

The given characteristics are well illustrated by the following data for the Czech Republic. According to the CZSO data (2004), the share of FDI affiliates in the total export of hi-tech products from the Czech Republic in 2002 reached 91 % and their share in import 88 % (with a share in value added of 49 % and a share in research and development expenditure only 33.1 %). The Czech trade with hi-tech products is therefore considerably dominated by foreign companies. The most significant share of this trade is achieved on a long-term basis in two closely connected product groups, specifically in computers and electronics (these groups accounted for 70 % of hi-tech import and 78 % of export in 2003).

The assembly character of activities in the above mentioned product groups is also documented by the very high share of processing trade regime (export after inward processing accounted for 94 % of the total export in computers and 73 % in electronics). Closer examination of the range of foreign markets and the type of traded products is also revealing. Mainly components and parts are imported from Asian countries and final products are exported to the Western Europe.

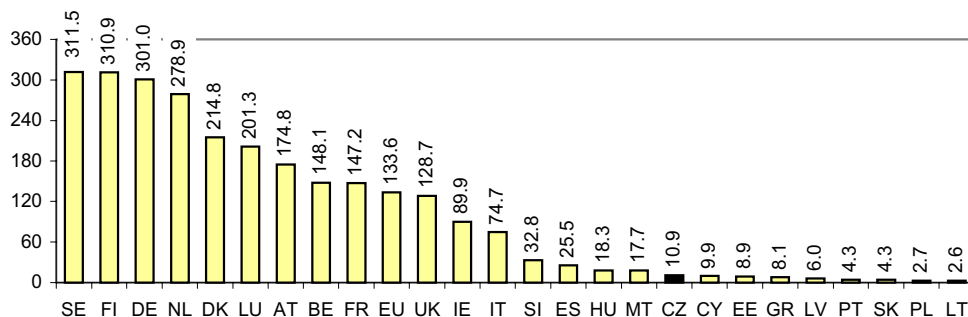### 6. 3 *Low Patent Activity*

New EU members lag far behind the more developed ones in the number of patent applications at the European Patent Office (EPO), see Figure 7, the Czech Republic ranks even lower than Slovenia and Hungary. The extent of the lagging in numbers of patent applications compared to the top EU countries in relation to the share of hi-tech export can be illustrated *vis-à-vis* Sweden. Although the difference in the position of the Czech Republic in hi-tech export is negligible, the number of patent applications per million inhabitants in 2002 reached only 11 in the Czech Republic compared to 312 in Sweden.[8] Completely outside the game are EU mem-

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8) Moreover, it is necessary to point out that more than 55 % of these applications in the CR are based on inventions of foreign residents, while in Sweden only 27 %.

bers with less developed knowledge base in the so-called hi-tech patents. The number of applications at the EPO for the CR (per million inhabitants) remains lower than one.

Figure 7
Number of Patent Applications at EPO, 2002 (per million inhabitants)

Source: EUROSTAT (2005).

However, significant differences in patent activities can also be observed among EU members with similar levels of economic development. Comparison of shares of hi-tech export and numbers of patent applications at the EPO (calculated per million inhabitants) is very revealing. For example, Ireland records a share of hi-tech export of almost 30 % with only 90 patent applications (of which 41 % is owned by foreign inventors). Finland reaches 21 % of hi-tech export and 311 patent applications (of which only 9 % is owned by foreign inventors).

7. Conclusions

The level of internal innovation inputs and outputs in new EU members remains low, with prevailing dependence on external technology knowledge. This is mainly due to the persisting underdevelopment of domestic knowledge (technology) base. The change in the above characteristics requires a long-term orientation of economic policy to an improving quality of factor endowments by increasing the related inputs (expenditure on education and R&D activities) and particularly their efficiency. The question is what tools are to be used (given the limited availability of the quantity and quality of financial, technology and human resources) to encourage positive changes as effectively as possible or what agents may play the most important role in these changes.

Understandably, the low level of internal innovation capacity in less developed EU countries is closely associated with their quality non-intensive position in the multinational value chain. Low production costs remain the key factor for foreign investment localization decisions. However, this advantage grows weaker with the increasing economic level and the question is how to encourage technology development toward increasing supply of unique products and processes and the increasing importance of localization factors which are more quality intensive. Ideally, both of these supporting approaches should be combined. The benefit of the technology transfer of FDI activities will thus be maximized to ensure that they become an important and integral part of the national innovation system. In addition, the development of local knowledge base must be encouraged by measures that take into ac-

count specific needs of individual agents within the system as much as possible (business sector, higher education institutions, and government).

In most new members, the data on hi-tech activities only include a small segment of domestic economy and as the detailed analysis shows, only a very small part of this segment is based on internal national innovation capacity or at least creative use of technology transfer. This is why supporting a quality-based competitive advantage based on "picking up winners" may be precarious. The increase of the role and quality intensity of hi-tech activities is a long-term process and its success (regarding export performance and the extent of positive knowledge spillovers) depends to a great extent on the development and the size of the local knowledge base across industries and groups of economic agents. Any support of innovation activities should therefore focus on eliminating or at least reducing the impact of factors causing the most companies in new EU members not to engage in any innovation activity (as indicated by CIS3 results in EUROSTAT, 2005); in the Czech Republic this applies to 74 % of Czech and 60 % of foreign investment enterprises (CZSO, 2005).

The question of the possibility of qualitative change of innovation performance in the Czech Republic is one of stronger use of technology transfer of foreign direct investment in the host economy, and of increased effectiveness of expenditure on innovative inputs (*i.e.* effectiveness of national innovation systems) particularly based on increasing economic benefits of R&D activities and the consequential development of the research and technology base (including adequate supply of high and specific skills).

At the same time, the domestic structural specifics must be taken into account and the adaptation of transferred technology to local needs supported and made possible. Given the specific problems and needs of increasing the innovation performance effects in the Czech Republic (and generally in the less-developed EU countries) it is important that they are projected into the nationally-specific instruments of innovation policy, in particular the policy concerned with support of competitiveness and long-term sustainable growth performance. The political proclamations of such a support became an integral part of every new government program. The actual system changes increasing the technology and skill performance, however, are still on their way to the priority political agenda.

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