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## **Industry-university interactions to enhance the matching of demand and supply of human capital in Hungary**

### **Introduction**

The Hungarian labour market has been afflicted with several severe problems and distortions ever since the change of the regime. Persisting low employment or rather high inactivity<sup>1</sup>; low labour mobility, excessive heterogeneity (regional and skill-related differences) of workers, lagging productivity increase, and the high number of unregistered employees<sup>2</sup> are among the most frequently tackled difficulties.<sup>3</sup>

“The Hungarian labour market has been stuck in a steady unfavourable state for long years, while the level of employment is extremely low...employment difficulties are concentrated in certain layers of the society and certain regions of Hungary ...The polarization of the Hungarian labour market<sup>4</sup> and the extreme and permanent territorial differences result from the low territorial mobility of the labour force...” (Fazekas [2006] pp. 199-202)

Despite a rapid growth in the supply of graduates, the Hungarian education system has been unable to give an adequate response to the challenges triggered by economic transformation and skill-biased technical change. Instead of demand led adjustment and skill upgrading, educational expansion has rather produced a supply shock,<sup>5</sup> and has led to the devaluation of the value of certain diplomas and to some

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<sup>1</sup> The total number of employed was 3.654 million in 2005 (in the population of males (15-59) and females (15-54) while the total number of inactives was 2.0594 million in the same age group. Furthermore the number of pensioners and other inactives above 55 (female) and 60 (male) was 2.2583 million. Activity rate in 2005 was 54.5 %. Source: (Fazekas–Kezdi [2007])

<sup>2</sup> Surveys of the widespread practice of unregistered employment have been published mainly related to the situation in the agricultural sector as well as to the perspectives of rural manufacturing employment (Kun [2004.a and b]; [2005]). In his sociological surveys Kun details the hopeless efforts of manufacturing firms in the Eastern, unemployment-ridden part of Hungary, to find, hire and retain blue collar employees.

<sup>3</sup> The annual joint publication of the Institute of Economics and the Hungarian Employment Foundation: “The Hungarian Labour Market” provides regularly updated, thorough analyses about the evolution of the labour market situation and the prevailing problems. See also Fazekas [2006]; Kőrösi [2005]; Laki [2007]; Balla et al. [2008]

<sup>4</sup> According to a 1998 CSO survey, 27 % (!) of working age population is unskilled (with no more than primary school completed). (Quoted by Z. Karvalics–Kollanyi [2006]) According to David et al.’s [2005] calculations this share was 20.4 % in 2001.

<sup>5</sup> The sharp increase in the supply of graduates is demonstrated by the following numbers: The total number of graduates was 640,000 in 1993 and 850,000 in 2003. The ratio of new graduates as a percentage of the total number of graduates was as high as 30.1 % in the 2001-2005 period. (Source: Kertesi–Köllő [2007] p. 80). In the early 2000s the annual number of new graduates was 2.5 times higher (!) than labour market’s demand (David et al. [2005]).

decrease in the return to education (decrease of the wage premium to university degree) the extent of which is still debated among the analysts.<sup>6</sup>

International comparisons suggest that the composition of fields of education in Hungary does not contribute to the purpose of catching-up and remaining competitive in a knowledge-based global economy. As opposed to countries like Finland or Ireland both with 34 % of total graduates in the field of science and engineering, the respective Hungarian figure was 25 % in 2004 (OECD Education at a Glance, 2007<sup>7</sup>) As for the survival rates in tertiary education the Hungarian rate (62 % in 2004) is lower than that of advanced economies.<sup>8</sup>

Public Employment Service, an organisation created by the amended Employment Act in 2001 commissioned a Hungarian consulting firm (3K Consens Bureau) to prepare a comprehensive survey on the state and evolution of labour demand and supply relations (David et al. [2005]; [2007]) According to the main findings of the referred studies, the traditional relations between the key players of the system (employers, educational institutions, students) has been split after the change of the regime, and has not recovered ever since. *Parents, students and educational institutions, disregard the messages of the labour market.* ([2005] p. 5) Educational institutions are financed according to the number of students admitted, thus they are not forced to establish “business-oriented” relations with firms and take employers’ needs into consideration when determining their curriculum. Decision-makers are too cautious to intervene, since educational institutions insist on their autonomy. This has led to the emergence of *extreme imbalances which situation keeps worsening: shortages of specific skills keep accumulating on the one hand and the stock of holders of superfluous degrees for which no demand exists also keeps accumulating on the other hand* ([2007] p. 14-15, 25, 37).

International comparisons (the OECD Programme for International Student Assessment) have documented Hungarian students’ worsening performance over years, and persisting and deteriorating inequalities within the Hungarian schooling

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<sup>6</sup> As for the years before 2002, Galasi [2004] discovered no evidence that university graduates increasingly fulfil jobs that require only secondary education. According to Galasi, although the proportion of overqualified workers increased in the second half of the 1990s, the market rewarded the extra years, so return to education did not diminish. Later investigations however, have already found convincing evidence for the strengthening of this negative trend (i.e. increasing number of overqualified workers; worsening employment prospects of job seekers with tertiary education attainment; declining wage premium and returns to education.) (Kertesi-Köllő [2007]) Nevertheless, it should be taken into account that the Hungarian wage premium used to be among the highest ones, thus even with its modest decrease it is still higher than the OECD average (OECD Education at a Glance, 2007) According to David et al.’s [2005] calculations, in 2001 8 % of employees with tertiary educational attainment were employed in occupations that did not require a diploma. On the other hand, there were 72,500 employees without diploma in occupations that require tertiary educational attainment. This number is approximately 10 % of the total number of diploma holders. (p. 8)

<sup>7</sup> In its country briefing OECD formulated this statement even more harshly: “Relative to population, Hungary produces the lowest number of science graduates (695 per 100,000 of the employed population aged 25-34 years) than any other OECD country and less than half the rate for the OECD on average. Social sciences, business, law and services are the most common subjects of graduates, with these subjects representing more than 50% of the annual university level graduate output” (OECD Education at a Glance, 2007)

<sup>8</sup> Finland: 71 %; France: 79 %; Germany: 75 %; Ireland: 78 %; Netherlands: 76 %; UK: 71 % (OECD Education at a Glance, 2007)

system.<sup>9</sup> The system fails to enhance social mobility and catching-up: student performance is strongly linked to their social background.

This paper tackles a special competitiveness-related issue: it examines the relation between tertiary education and the highest segment of the labour market (the one of knowledge workers) from the point of view of job matching.

Job matching has been a preferred topic in mainstream labour economics, with papers surveying trends in (i) job requirements-related qualification levels (ii) wage premium; (iii) mobility and educated labour force reallocation issues.<sup>10</sup> Alongside to the analysis of empirical data including

- returns to schooling at various levels;
- evolution of the number of jobs at various education levels;
- tendencies in the gap between observed and required education;
- the proportion of workers with higher education diploma working in higher education occupations etc.

the common research methodology is interviewing larger or smaller samples of job holders about their perceptions concerning their qualification levels (overqualified, properly qualified, underqualified related to the requirements of their current occupations). Another common research question of the interviews is the relation between individual qualification levels and the frequency of participation in job-related trainings.

Another, similar method is to interview a sample of recently graduated students about the process and the outcomes of their labour market entrance. Student are asked to assess the usefulness of their studies, the skills they were most missing at their workplace, (as well as the most useful ones they had acquired at their tertiary educational institutions. They provide data about their wage level, the difficulties in finding a job, their companies' training efforts and their overall level of satisfaction, etc. (Hajdu et al. [2005]; Kabai et al. [2007])

The other analytical approach related to job matching, i.e. where the point of departure of the analysis is employers' expectations and their difficulties to find adequately qualified employees on the one hand, and the evolution of training costs and employers' efforts to help the newly hired meet job-related requirements on the other hand – has also been the focus of various sociological or interdisciplinary investigations.<sup>11</sup>

However, to our knowledge, in Hungary there has been no investigation focusing on the matching of supply and demand in a specific – nowadays, in the knowledge economy era highly important – segment of the labour market: that of

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<sup>9</sup> The social segregation index in educational institutions among 15-year-old students is the highest (!) among 30 OECD economies (as of 2003) (Source: Field et al. [2007] p. 59)

<sup>10</sup> See a comprehensive survey of the Hungarian situation and literature overview in Galasi-Varga [2005]

<sup>11</sup> One recent example is Polonyi [2007] who carried out a questionnaire-based survey at a sample of 146 companies, in one of Hungary's NUTS II regions about employers' expectations towards the individual levels of tertiary education; their relations to tertiary educational institutions and their views about ways to improve this relation. The author identified some mismatch between companies' skill expectations and the focus of tertiary educational institutions' curriculae (excessively theory-oriented education at all levels, graduates' inferior to expectations command of foreign languages). Another example is Laki's [2001] field interviews at a sample of 15 companies and 6 vocational training institutions about the human resource management practices and expectations and problems of the former group and performance, industry relations and problems of the latter group.

graduates with tertiary education attainment.<sup>12</sup> Our field investigations try to fill this gap, by exploring

- companies' perceptions of the difficulties to recruit adequate employees for occupations of high skill (educational attainment) requirement
- companies' training efforts and methods, as well as their success factors in this respect, and
- aspects of companies' relations to tertiary educational institutions.

We focus mainly, but not exclusively on job matching in IT-related occupations. Our analysis is based on data compiled from several sources: field investigations (knowledge based local SMEs and MNCs' local subsidiaries); interviews with representatives of tertiary educational institutions, survey of universities' and MNCs' homepages.

The aim of this paper is to provide a broad overview on job matching in the upper segment of the labour market, identify the main problems, draw competitiveness-related conclusions and formulate policy recommendations. The main focus of our investigations is ICT-related (software and programming) skills, which allows for selecting sample companies from a broad range of industries. Nevertheless, we shall also elaborate on some other fields (e.g. research and technical development skills; practical engineering skills) in the case of which our interviews provided interesting lessons. The paper deliberately details anecdotal corporate cases since our goal is to provide insights into the multifaceted process of job matching, i.e. to illustrate issues rather than mobilize quantitative evidence that can be generalized. Section one overviews companies' recruitment practices and problems, as well as the skills and abilities they consider indispensable. It also tries to identify differences between MNCs' and SMEs' practice. Section two is concerned with ex-post job matching in the light of companies' training efforts and methods. Section three surveys the state and the evolution of industry-university interactions, companies' involvement in determining university curriculae and the support they provide to universities in order to improve the match between graduates' supply and demand. Section four concludes.

## **Recruitment practices and problems**

Both the interviewed MNC subsidiaries and SMEs were unanimous in claiming that it is extremely difficult to find talented, interested, ambitious and hard-working new

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<sup>12</sup> To our knowledge the only exception is Selmeczy-Toth [2006]. The authors carried out field interviews about companies' demand for graduate job entrants and whether employers are satisfied with supply. According to their findings, electric and mechanical engineers and IT-specialists with adequate qualities and skills are the most difficult to find (poor command of languages and lack of practice were the most frequently mentioned problems). 40 % of the interviewed 121 firms provided some kind of training to the newly hired employees (the larger the firm, the more likely it is, that newly hired receive training). 52 % of the interviewed firms had some relations with tertiary educational institutions, but only 6 of them participated in the elaboration of the academic curriculum. The authors repeated this survey in 2007, and interviewed this time 1,000 firms. Results were basically similar to the previous survey. In the larger sample every fourth firm maintained some form of relations with at least one tertiary educational institution. ([www.gvi.hu](http://www.gvi.hu))

employees, which is one of the most significant obstacles of growth.<sup>13</sup> Problems with supply are manifest both in the sense of quantity and quality. Career advertisements are posted continuously (i.e. IT-specialists can submit applications on a continuous basis, not only up to a predetermined deadline) and all of the interviewed companies had vacancies (some of them as many as 15-20 positions) at the time of the interview.<sup>14</sup>

The recruitment strategy of both groups was to hire recently graduated persons (some practice was considered of course as an asset, but firms were not willing to pay much more for experienced professionals attracted from competitors, they rather opted for hiring relatively inexperienced new employees and training them internally.<sup>15</sup> One exception was the position of high level managers, in their case “attracting someone from the competitors” seemed the strategy, the two SMEs in question had adopted.

MNCs’ personnel policy and recruitment methods were determined by a formalized recruitment process, including various selection rounds during which various skills are tested. Many of the MNCs centralised the first step of recruitment: applicants had to send their CVs to the company’s global HR office, not to the Hungarian one. Selection process takes several months and includes language tests, job knowledge tests, cognitive tests, and personality tests (aptitude, intelligence trainability, interest, behaviour, capability to work in a team etc.), interviews, sample tasks etc.

It has to be noted, that MNCs consider applicants’ personal characteristics (values, motivations) equally (sometimes even more) important as their professional and vocational knowledge and skills. Capabilities including cooperation capability, communication capability, autonomy and decision-making capability, capability to work independently, responsibility, capability to bear stress and increasing workload, flexibility, learning competency etc. are among the most needed (and the most missed) personal qualities.

Audi prepared a list containing requirements of 15 occupations he intended to recruit manpower for. The HR manager sent these lists to secondary and tertiary educational institutions in the region. Interestingly, dominant part of the requirements consisted of the above-mentioned personal capabilities (alongside to command of languages, or software programming / using skills). Upon receipt of this list professors at Szechenyi University Győr organized a brainstorming session on how to include the “transfer” of these previously neglected skills into the curriculum – since – as they admitted – educational institutions can hardly pass these behavioural features to students in the course of professional and vocational education.<sup>16</sup>

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<sup>13</sup> The other side of the coin is that it is becoming increasingly difficult for graduates to find employment, even in occupations with substantial labour shortage. Personal acquaintances matter more and more. (Berde et al. [2006]; Szűcs [2005]) According to Berde et al.’s data [2006], the share of unemployed graduate job entrants within total job entrants has increased by 56 % (to 4.2 % as a yearly average) between 1999 and 2004. (p. 26)

<sup>14</sup> In 2005 3444 IT-specialist graduated, which on the one hand substantially exceeds demand, but at the same time there is a labour shortage in terms of specific IT-skills (Source: David et al. [2007]).

<sup>15</sup> On the other hand nearly all of the companies mentioned the slowly increasing turnover rate, the fact that their employees are increasingly being attracted by competitors, which shows that competition in the talent market increases.

<sup>16</sup> In fact, these competencies and values are rather to be acquired and assimilated in the course of elementary and secondary education.

After each round of the personnel selection process applicants are shortlisted and only a few of them participate in the final interviews. It also happens sometimes, that once the long selection process is over, no one is selected, and the company launches a new recruitment campaign. Companies also resort to the services of professional HR firms.

According to interviewed HR officials, applicants consider the selection process very strict and tiring: language skills for example were tested in an even more serious way, than the one they had experienced previously at the official language exam. The other side of the coin is that employers were highly dissatisfied with applicants' language skills. Especially in the case of software programmers serious deficiencies can be discovered in the command of languages. Even worse, it was not only in the case of job seekers specialized in science and engineering where the command of foreign languages was found to be inferior to expectations but also in the case of graduates in humanities and social sciences: "they possess a language exam already when they are admitted to the university, and they start forgetting the language right away. It seems university students are not required to read education related academic papers in foreign languages: they are absolutely incapable to do so." (interview excerpt)

Companies also complained about job entrants' inferior-to-expectation communication skills and low confidence as well as about the excessively theory-oriented education they receive at tertiary educational institutions. "When asked to define the term "cash flow" most of them can give an answer. However, if I ask them what they use the cash flow for, what a cash flow suggests at first sight – very few of them know." As for IT-specialists, according to one of the interviewed HR officials, "if they can demonstrate good practical skills it usually turns out they have acquired them during some previous work experience – practical skills are not acquired at the university."<sup>17</sup>

The interviewed SMEs were seemingly in a better situation, than MNCs. Implementing formal HRM practices is costly in terms of time and money for small firms, they felt they could get along without: they benefited from their informal relations with educational institutions or from the fact that in most cases SME CEOs

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<sup>17</sup> IBM Hungary commissioned a Hungarian research institute (GKI eNet) to prepare a survey about innovation trends in Hungary and factors influencing these trends. (Innovacios trendek [2007]) Researchers surveyed among others the quality of IT-related tertiary education. They interviewed 500 graduating students in seven Hungarian universities and colleges (90 % of them received IT-related education). Students were basically satisfied with the quality and quantity of theoretical education they had received, but they were highly dissatisfied with the quality and quantity of practical experience they could get access to during the years of their study.

One exemplary initiative that contributes to the improvement of this deficiency is PRACTING program launched by Széchenyi University Győr in 1996 with PHARE support, and maintained ever since. This program not only grants students the possibility of gaining practical experience but also contributes to job matching in the region both for SMEs and for large companies. For a minor amount of EUR 400 (paid to PRACTING Foundation) companies can employ an undergraduate student for half a year (the university included this sandwich course into its curriculum at its engineering faculties). Future engineers participate in companies' research efforts, and thereby they can demonstrate their innovativeness and other capabilities, which helps them find employment later at the given company. Companies (especially SMEs) are enthusiastic about this costless solution of getting acquainted with their future employees. Companies have to give a formal feedback to the university and assess not only the students' performance but also the lacking skills.

were university professor themselves. They could spot talented students and attract them, and hire them without any previous formal recruitment procedure. Nevertheless, they sometimes experienced the so called “liability of smallness” since MNCs are more successful in attracting the talented graduates. As the HR manager of Siemens underlined, the huge amount they spend for public relations and image building is also beneficial for the HR department, students all know very well that Siemens is one of the top blue chip companies; they are more or less acquainted with career development possibilities and this corporate image helps Siemens attract talent.

### **Companies’ training efforts and methods**

Our interviews revealed that MNCs apply their company-specific HR-management and –development models in Hungary. They have developed a standardized company-specific system of training newly recruited employees and providing regular training for their existing ones. This way, MNCs contribute to the general improvement of the bleak picture in OECD’s Education at a Glance (2007) study that “in Hungary, participation in job-related education and training is low compared with other OECD countries.”

GE has a portfolio of compulsory training programs for all newly recruited, including quality insurance and work security issues, and a so called “Integrity program” about corporate culture, values, rules etc. Employees receive task-specific trainings and participate in professional workshops, team-building etc. Many of them receive training in communication and negotiation techniques, conflict management, ergonomics, and language courses. During their initial training period most of the newly hired undergo a predetermined rotation process, which contributes to their integration as well as to their competence to carry out cross-functional tasks. Managers receive training in leadership skills, change management and various other coaching programs.

MNCs have a system of regular, formal performance review and elaborate programs for their employees’ career development. They encourage newly hired employees’ rotation between different functional areas, divisions and grant the possibility of transfers across locations and regional subsidiaries. Part of the training is online, with company-specific intranet courseware and exams. A good channel of knowledge acquisition is the purchase of MNCs’ services in terms of software systems and course content.

SAP sells its “Learning Solution” system which is employee-tailored and allows for flexible time management (employees can decide themselves how they share they time between working and learning). Software systems make virtual classroom training also available when employees at various locations participate in courses sitting in front of their computers. (They may ask questions using a web camera and a microphone.)

As opposed to MNCs’ formalized processes, Hungarian SMEs provide training to their employees in an ad hoc manner. Training is mostly in-house. SMEs’ training commitment is however greatly enhanced by government sponsored programs that support employees’ training. Grant schemes are announced in the frame of the National Development Plan’s Human Resource Development Operational Programme.

Megatrend won a sizeable amount for human resource development, and launched a comprehensive program including language courses, ECDL and project management courses, stress management and executive coaching as well as EU-specific courses (EU-institutions, decision-making in the EU, the consequences of accession etc.)

Software companies cannot survive without the continuous training of their employees. Many of the companies have established training centres themselves, partly for their own employees, partly for their customers and their partners, but increasingly also for outsiders (as additional income possibility).

Magyar Telekom offers a wide range of training services for outsiders (private persons, but in particular to firms), rents its training premises, conference halls, seminar rooms. Magyar Telekom's business unit, the Educational and Knowledge Management Directorate developed various (online) curriculae and makes them available for outsiders as well. Its executive coaching experts and internal organisational development experts offer consultancy services on a market basis.

## **Relations with tertiary educational institutions**

Our interviews revealed that the main difference between large MNCs' local subsidiaries and local SMEs, is the formal versus informal character of companies' relations with tertiary educational institutions. Local SMEs tend to rely on informal relations: they keep contact with their former professors (of the universities they attended)<sup>18</sup>. In contrast MNCs' local subsidiaries establish formal relations with universities<sup>19</sup> they intend to recruit workforce from. As a rule of thumb, in the course of their development SMEs' university-relations get more and more formalized: MNCs' practice has a non-negligible demonstration effect on how to manage these relations. The main obstacle for SMEs to formalize their relations with tertiary educational institutions is lack of finance, since establishing and maintaining a horizontal network that is of a strategic value for network members requires sizeable amount of money, which is beyond SMEs' means.

The first grade of formal relation-building is companies' engagement to grant summer practice possibilities to students. Furthermore, both MNCs and local SMEs attend annual job matching events organized by universities, where they distribute information about the company, announce vacancies, collect CVs etc. Some companies organize or participate in summer universities, managers make presentations about the company, its evolution, its technology and its expectations towards future employees.<sup>20</sup> Occasionally, MNCs announce and sponsor research competition for students (e.g. IBM regularly announces a software programming competition, Microsoft Hungary and Cisco Hungary sponsored an international IT competition "EuroSkills", the final round of which was in Debrecen, in 2008).

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<sup>18</sup> Some of the interviewed SME owners are university professors themselves and this way they can directly identify talented students. According to AAM Ltd.'s founder, at least 40 of its employees are his own students. His colleagues also teach at various universities, he even encourages them to provide free courses (if necessary also during working time) in order to be able to spot talent. Balabit Ltd's representatives also give seminars on security solutions, participate in and sponsor workshops organized by BUTE.

<sup>19</sup> In contrast to SMEs, MNCs establish relations with several in some case half a dozen educational institutions.

<sup>20</sup> Szechenyi University Győr has been announcing an Audi-course: "Audi: the modern company" for five years now. Local, regional (European) and global leaders of Audi make presentations about the company, about organizational and business issues. While this course targets business administration students, the planned Opel course and Suzuki course are rather about manufacturing technology issues, targeting students in Mechanical Engineer and Mechatronical Engineer faculties.

At a higher commitment level, companies – usually MNCs' local subsidiaries – provide the universities/colleges in-kind support in the form of instruments, computers, software,<sup>21</sup> machinery, testing equipment etc. The other side of the coin is that companies pay a fee to universities in return for using universities' high value research equipment (that had been acquired by universities as a result of their professors' / faculties' public research grants) for their own purposes. Companies sponsor university conferences related to their activity and research interests.

The next commitment level is characterized by industry-university research cooperation and regular research grants announced either for university professors and researchers or for students.<sup>22</sup> The interviewed MNC-subidiaries entrust university professors specific research tasks, to be carried out together with talented students. Furthermore, they announce research competitions for the students of the given university, as well as topics to be elaborated in dissertation work. In addition they grant scholarship to the given university's students.

General Electric regularly announces research topics for student of the University of Miskolc. The company nominates a contact person, who supervises the student's work. Announcements contain a description of the technological background, a list of the tasks to be performed by the student (e.g. literature survey, design, testing and measuring tasks, analysis etc. His/her work is monitored and supported also by a nominated university professor, in some cases a professor from another university, which in itself contributes to inter-university knowledge spillover. Students compete for the given topics, they hand in CVs, abstracts i.e. description of the planned work. Applications undergo a pre-selection mechanism. The next step is that, representatives of the company, together with university professors discuss the plans of shortlisted students. Final selection is made and the selected students are asked to hand in a more formalized, ad detailed work plan. They receive the grant, called Aschner Lipot<sup>23</sup> Grant for four semesters. The amount of the grant more or less corresponds to that of the minimum wage in Hungary. After the third semester students spend one month as summer practice at GE, where they continue elaborating their research topic. Following a successful graduation and completion of the research task, students may receive an award amounting to three months' scholarship. They are offered a position at GE which they may take or reject. The student may also opt for participating in GE-supported PhD program.

GE Hungary has also launched its Edison Engineering Development Program which offers work experience at four diverse positions (altogether 2 years) within GE's global network. Selected students receive theoretical and practical training. Another program bears the name of a famous Hungarian professor of physics, Jozsef Oveges (1895-1979), who popularized science for a generation of young Hungarians. This program launched by GE Healthcare involves students in individual development teams of GE's global development efforts. Participants get deep insight in a specific R&D work and work culture and methods of GE, and they can elaborate on their own dissertation work in this process. Program duration is two semesters, but GE also supports longer, PhD programs with the same name.

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<sup>21</sup> 2-3 % of Microsoft Hungary's sales is devoted each year to support education (subscription licensing program for educational institutions: Campus Agreement, scholarships, programming competitions etc.) Microsoft Hungary opened a teacher training laboratory at Eotvos Lorand University of Sciences.

<sup>22</sup> One example is the E.ON Scientific Awards for students and professors of BUTE that reward outstanding publication in the field of energetics. Siemens has also an award (Werner Siemens Excellence Award) to honour outstanding dissertation and PhD works at BUTE. Ericsson's HSN (High Speed Networks) Lab also provides scholarship for students of various technical universities for conducting research activities that are related to Ericsson's interests.

<sup>23</sup> Lipot Aschner (1872-1952) was the first CEO of the predecessor of Tungsram (the company privatized by GE).

GE Foundation Scholar-Leaders Program with a scholarship of € 1000 annually for three years is designated for students in the fields of economics, management, engineering and technology. It assists students in accumulating human capital.

In some cases universities/faculties/researchers benefit from MNCs' global (not Hungary- or CEE-specific) programs as it was the case of BUTE that benefited from IBM's Faculty Award, a competitive worldwide program intended to foster collaboration between researchers at leading universities worldwide and those in IBM research, development and services organizations.

MNCs' demonstration effect is manifest in a fast-growing Hungarian SMEs' decision to follow suit and also announce a support scheme: Balabit Ltd. a software company (with 30 employees) announced a yearly scholarship named after its main product. This scholarship is a useful channel of industry-university relations and it also provides good PR-possibility for the firm. According to the CEO, granting a scholarship is a much cheaper solution than hiring someone, who turns out to be an inadequate person after three months. Balabit can assess the student's performance when evaluating his work during the period of the scholarship. Thereby they gain better knowledge about the student's capabilities and can better decide whether to hire him or not. Balabit also offered a laboratory to BUTE, where students can learn about its security solutions (and security systems, firewalls in general).

At an even higher intensity level of industry-university relations, companies get involved in the formulation of the academic curriculae. They establish "faculties" at the universities, which either means that a representative of the company's management takes the post of the head of the faculty, or that the dean, and/or some academics or lecturers are provided monthly allowance by the company in return for the faculty's investment in developing company-specific human resources.

Audi established an "Audi-Faculty" at the Széchenyi University of Győr with an initial investment of € 40,000 (assuming at the same time also further contributions to the faculty's operational expenses as well as to the expenses of inviting foreign guest lecturers). Academic curriculum includes production technology, aspects of product development, mechatronics etc.

In 2000, Corvinus University Budapest (former Budapest University of Economics) signed an agreement with various companies to create positions of "corporate professors". Companies including Babilna Plc., Magyar Kulkereskedelmi Bank /Hungarian Foreign Trade Bank/, Magyar Villamos Művek, McKinsey & Co., Mol, Siemens, Alcoa Kofem Ltd, Antenna Hungaria, BAT Hungary, Gresco Plc. and System Consulting Plc. selected activity-specific research topics, and provided university professors (one professor by each company) who assumed carrying out / coordinating the given topic related research projects, an annual amount of € 28,000 for five years.

Robert Bosch Group (Bosch has 12 factories/facilities in Hungary, among others an Engineering Development Centre, and more than 7,000 employees) established a Bosch Faculty of Mechatronics at the University of Miskolc in 2006. The agreement included the establishment of a well-equipped laboratory (transfer of machinery, testing equipment etc.) and the training of university professors according to the Group's global training curriculum: to make them acquainted with Bosch's skill requirements. Professors will use Bosch's equipment in the course of their practical teaching of future engineers. Bosch supports other Hungarian universities as well, e.g. in 2008 it offered Budapest University of Technology and Economics (BUTE) an amount of € 300,000 of non-refundable grant for infrastructure development and scholarships. The university signed similar agreements with other multinational companies (E.ON: € 120,000; Continental Temic Telefunken; Siemens etc.)

Mentor Graphics (the local subsidiary of a US-based multinational corporation specialized in electronic design automation) invested USD 20 million (!) in 2006, to create a chip design laboratory (equipped with up-to-date software) at BUTE, and fund university scholarships.

Another company sponsored laboratory at the university is the HSN Lab (High Speed Networks Laboratory) which started its activity already in 1992 at the department of telecommunications and

telematics. Cooperation with Ericsson started right at the outset. Basic and applied research is performed in the lab in the field of network configuration and routing optimization, asynchronous transfer mode (ATM) networks etc.

In a 2006 agreement SAP Hungary assumed to support BUTE by providing free software licenses of a value of ~ 200,000. Furthermore, the company assumed to sponsor scholarships, commission applied research programs and grant the possibility to selected talented students to participate in the company's own trainings. BUTE assumed to include SAP-specific courses in the curriculum (specifics of various SAP business solution systems).

According to Siemens' data, the support (in various forms) they have so far given to BUTE amounts to ~ 800,000. They also support Corvinus University (corporate professorship and e-government faculty programs) and several other educational institutions.

The amounts enumerated in the above paragraphs make it clear that the provision of high-quality technical education that meets companies' current requirements and follows (is nearly in line with) technical development, requires huge investments<sup>24</sup> that is beyond the means of not only local universities but also of SMEs. Without these investments, university curriculae cannot adjust to corporate needs and potential employers' complaints about graduates' inferior to-expectations practical skills become more and more acute problems.

Some of the interviewed companies participated in special network initiatives, including cooperation research centres (CRCs) and Regional University Knowledge Centres (RUKCs)<sup>25</sup>: programs initiated by the National Office for Research and Technology. These programs comprise centres of excellence universities that establish a tight network with companies. Network members share high cost research infrastructure and initiate a range of joint research activities which facilitates technology transfer on the one hand and the increasing practical (business) orientation of university research. RUKC and CRC programs co-finance industry-university joint research and universities' investment into research related infrastructure.<sup>26</sup>

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<sup>24</sup> The other side of the coin is that according to one of the interviewed companies, representatives of some tertiary educational institutions consider MNCS as a "cash cow" from time to time ask for sponsorship without any commitment to establish formal partnership relations. One of the colleges even asked for money in return to publishing the company's internship offer, in spite of the fact that many of its graduating students find difficulties to get a proper job.

<sup>25</sup> One example (there are altogether 14 CRCs) is the Inter-University Cooperation Research Centre for Telecommunications and Informatics centered around Budapest University of Technology and Economics with corporate members including Ericsson Hungary, T-Com Hungary Sun Microsystems and others. Example for RUKC is the Regional University Knowledge Centre for the Vehicle Industry centered around the Széchenyi University of Győr, with partners including Rába Axle Manufacturing Ltd. and Shefenacker Automotive Parts Ungarn. Another example is the IT Innovation and Knowledge Centre at BUTE. The consortium includes multinational companies (T-Systems, Nuance-Recognita, Hewlett Packard – these MNCs all have substantial local R&D expenditures) as well as innovative SMEs (including Megatrend, DSS, e-Group etc.) Alongside to joint development projects the stated aim of the Centre is to involve PhD and MSc and BSc students into the Centre's work and grant them the possibility of acquiring practical experience.

<sup>26</sup> RUKC and CRC programs have similar objectives (promoting industry-university cooperation, creating centers of excellences, fostering tertiary educational institutions' innovation and commercialization activities) and they exist parallel to each other. Program announcement is not coordinated. Most of the tertiary educational institutions try to apply for each of these programs (Szechenyi University of Győr

## Conclusions

Our investigations revealed that problems with labour supply are manifest both in the sense of quantity and quality, which is an increasingly serious limitation to economic policy's modernization and competitiveness improvement efforts.

We found that MNC subsidiaries apply their standard, formal personnel policy (both in terms of selection, recruitment and training) in Hungary, which exerts a non-negligible demonstration effect on local SMEs. Competition in the talent market keeps increasing. MNCs' local subsidiaries can compensate for the lack of their informal relations with universities and for the lack of a network of local acquaintances by establishing tight formal relations with universities, and supporting tertiary educational institutions in various forms. This support is crucially important for universities not only because of financing reasons, but also from the point of view of keeping pace with technical progress and remaining up-to-date concerning new technological trends, technological problems and companies educational requirements.

Companies' internal training programs compensate for the deficiencies in tertiary educational institutions' curriculae. This is however insufficient: the quality improvement of production factors (in this case of human capital), a prerequisite of staying competitive in the knowledge economy era, requires conscious educational reform steps, that would alter the structure and the quality of supply and result in better job matching. Hungary ought to consider the experience of high-performing catching-up economies in this respect, e.g. the human-capital push that contributed to the emergence and rapid strengthening of the Indian software industry (Arora–Bagde [2006])

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participates in both RUKC and CRC programs and has also applied for receiving support from the City Growth Pole Development Program). Consortium members are often the same in each of the individual programs. Coherence of the individual support programs is ensured by the winners (grant recipients) and not by the individual NIS-actors, i.e. CRC and RUKC participants try to rationalize their activities financed by the individual programs, so that activities become complementary rather than overlapping.

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