Central European
Labour Studies
Institute

www.celsi.sk

CELSI Discussion Paper No. 38

LABOUR REGIME IN THE ‘NEW ECONOMY’: THE CASE OF SOFTWARE INDUSTRY IN CENTRAL EUROPE

April 2016

LUCIA MÝTNA KUREKOVÁ

MIROSLAV BEBLAVÝ

LABOUR REGIME IN THE 'NEW ECONOMY': THE CASE OF SOFTWARE INDUSTRY IN CENTRAL EUROPE

CELSI Discussion Paper No. 38
April 2016

Lucia Mýtna Kureková
Slovak Governance Institute, CELSI and IZA

Miroslav Beblavý
CEPS, Brussels

Central European Labour Studies Institute (CELSI)

Zvolenská 29
821 09 Bratislava
Slovak Republic

Tel/Fax: +421-2-207 357 67
E-mail: info@celsi.sk
Web: www.celsi.sk

CELSI Discussion Paper No. 38
April 2016

ABSTRACT

Labour regime in the 'new economy': The case of software industry in Central European

The software industry in Central Europe has seen a fast growth in exports and in employment over the past decade. Given the core importance of human capital, this paper studies how the institutional framework in the organisation of skill provision and labour market regulation, developed with the specific aim of sustaining the growth of traditional manufacturing sectors, provides (or not) adequate conditions for the growth of innovative industries where organisation of the workforce has specific demands. We propose a model of skill hierarchy which helps us to better understand particular employee profiles, employment relations dynamics and recruitment practices in the sector. We show that various forms of labour market flexibility and labour pool flexibility have been important factors in explaining sectoral success and growth, not only in the automotive sector, but also in the IT industry, and have contributed to an improved position of Central Europe in the global division of tasks. The current model might be reaching its limits, however, particularly for more sophisticated and home-grown firms.

Keywords: Czech republic, employment, labour marker regulation, skills, Slovakia, software industry

Corresponding Author:
Lucia Mýtna Kureková
Slovak Governance Institute (SGI)
Štúrova 3, Bratislava 811 02
email: kurekova@governance.sk

* This research was funded by the European Commission (project name NEUJOBS) through the Seventh Framework Programme (FP7), grant Agreement No. 266833.

Introduction

There is probably no need for more scholarly work about the rising economic importance of the ICT (information, communications and technology) industry in general and the software industry in particular. By the same token, the vital importance of human capital for the sector is also taken for granted. Given these two truisms, there is a surprising lack of scholarly work on the character of national or regional labour regimes in the software industry and the influence it has on the sector's development. Moreover, the academic literature has focused on leading clusters of the software industry (Benner, 2002, 2003), or on rising stars such as Ireland or East Asian countries (Arora et al., 2001; Dayasindhu, 2002; Ó Riain, 2004; Saxenian, 2002). There is much less research about the software sector in Central Europe where it has grown massively since the early 2000s and has now become an important industry. In addition to being home to a set of foreign firms, there is also a strong home-grown security software segment that has achieved a position of global leadership, and a rising trend of domestic start-up companies (Beblavý and Mýtna Kureková, 2014). This lack of scholarly attention is puzzling not only due to the sector's size and growth and its innovation potential, but also because, unlike other industries, development has taken place without major government support (Hardy et al., 2011; Kureková, 2012; Sass and Fifekova, 2011).

Central Europe was, until the onset of the Great Recession, one of the most impressive growth and convergence stories of recent times (Bohle and Greskovits, 2012; Šćepanović, 2013). Based on a uniquely high level of foreign direct investment (FDI) penetration and wholesale restructuring of the economy following the demise of

communism, countries such as the Czech Republic and Slovakia became leading European and even global producers of sophisticated manufacturing products in the automobile and electronics (Myant and Drahokoupil, 2011; Pavlínek and Ženka, 2011). In several ways, the existing institutional framework with respect to employment, industrial relations and economic policy more generally has been adapted to sustain the comparative and competitive advantage of these countries in manufacturing, with less consideration given to other sectors in the economy, and – as most would argue – negative implications for the sustainability of the model (Duman and Kureková, 2012; Nölke and Vliegenthart, 2009; Šćepanović, 2011).

Relatively skilled and cheap labour was a key factor attracting the initial entry of FDI in manufacturing (Jakubiak et al., 2008). This advantage was further sustained by a favourable institutional framework that has maintained wage levels below productivity levels, which is also due to a toleration of dual labour markets and a high-quality workforce, augmented at times with targeted immigration (Bernaciak and Ščepanovic, 2010; Hancké and Kureková, 2008; Šćepanović, 2011, 2013). Dual labour markets – characterised by a stable core and a less secure periphery – have been at the heart of flexibility arrangements that have helped the leading manufacturing firms to weather fluctuations in demand. This set-up has been made possible by generally cooperative labour relations in the respective countries, at least until the onset of the 2008-2009 economic crisis (Drahokoupil et al., 2012; Kahancová, 2007; Myant, 2013; Šćepanović, 2011).

The implications of this institutional design for other industries have not been analysed and should be better understood. Benner (2002) points out that “traditional approaches

to labour market policy remain constrained by a set of conceptual frameworks that are rooted in the industrial era of stable markets and mass-production industries" (p.238), and further continues that the "information economy is resulting in significant changes in the content of work and the coordination of economic activity" (p.239). Since the software industry is characterised by a very fast product life cycle and fast and perpetual product innovation, a prompt and flexible response to changing market dynamics is essential and this affects the organisation of work and employment (Benner, 2002; Grimes and White, 2005; Wickham and Bruff, 2008). The ability of firms to effectively adapt to changing market conditions and to react swiftly to new opportunities and challenges is a matter of their survival.

In this paper we therefore attempt to understand how sophisticated labour markets are organised in the 'new economy' in Central Europe. This addresses a particular gap in our knowledge of the dynamics of employment relations and firm strategies in hiring qualified employees in the ICT sector. We have gathered rich empirical evidence on employee profiles and recruitment practices in this growing sector in Central Europe, where so far relatively scarce knowledge and data have been collected. We develop a skills pyramid model within the software industry and show that it is internally and hierarchically differentiated with respect to the types of skills that individual layers require. This makes it similar to the car or electronics sectors where a clear hierarchy of tasks and processes is determined in the organisation of work and its global division. We link the skill and task hierarchy to employment relations dynamics in the sector and to recruitment and workforce upgrading practices at different ends of the skills pyramid

to demonstrate how flexibility is assured and contributes to growth and development of the sector in the region.

To build up the evidence, we combine secondary literature about software industry generally and its trajectory in Central Europe with a series of semi-structured interviews with various stakeholders and software practitioners in the Czech Republic and Slovakia, conducted in spring 2012 (see the Annex for the list of interviewees). We focus on two countries – the Czech Republic and Slovakia – where software is a fast-rising industry, strong home-grown companies exists and which have also achieved global success in the car manufacturing industry.

The rest of the paper is structured as follows. The following two sections introduce the necessary background by briefly describing the characteristics of the software sector in general, including the implications for work organisation, and then specifically in Central Europe. In the next section, we locate our research in a broader model of skill hierarchy in the knowledge-intensive ICT industry. In the fifth, sixth and seventh sections, we provide the key empirical findings of the paper on employee profiles, labour market regulation as well as on recruitment and HR practices. A final concluding section summarises the findings.

Sector characteristics and implications for work organisation

The ICT sector is a skill-intensive and innovation-intensive sector characterised by a very fast product life cycle. Relative to skilled and capital-intensive industries, such as the automotive sector, large capital investments are of lesser importance, at least in the initial stages of establishing the firm or a new product. Networking, proximity and

clustering to facilitate the exchange of knowledge and ideas have been noted as important accompanying features of a vibrant software sector (Agrawal et al., 2008; Enright, 2003). Boschma (2005) and Boschma and Frenken (2010) elaborate different types of proximity – social, cognitive, organisational, and institutional – which can contribute to effective coordination among firms and to interactive learning and innovation. Beblavý and Mýtna Kureková (2014) argue that for the case of Central Europe social proximity rather than geographical concentration has contributed to the success of the anti-virus industry in the Czech Republic and Slovakia.

The product characteristics require a rapid and flexible response to changing market dynamics and influence the organisation of work and employment (Benner, 2002; Grimes and White, 2005; Wickham and Bruff, 2008). Work is typically structured in projects where project teams have a short and fluctuating membership. Skill sets have a short life-span and skill requirements are fluid; both generic and specific skills are typically needed. Formal professional qualifications are relatively unimportant, and occupational licensing is not yet widespread (but it is growing).

Firms in the IT sector are dependent on internal as well external flexibility in employment, which leads to a relatively high labour turnover. Internal flexibility aims to enable easy reallocation of personnel within the firm and is reflected in the utilisation of teamwork, broad job categories and redeployability. External flexibility is ensured by practices such as the high use of subcontracting or working from one's home, temporary or part-time employment and labour-leasing, which enables access to specialised skills and adjustment to fluctuating labour demand (Benner, 2002). Such practices are further echoed in the fact that the software industry often utilises migrant labour (Millar and

Salt, 2007; Wickham and Bruff, 2008). This so far has not been extensively done in Central and Eastern Europe, the reasons for which we will discuss in the section on recruitment practices in the industry. Furthermore, a general shortage of skilled IT professionals in the US and western Europe has triggered an internationalisation and 'delocalisation' of the IT sector in these countries (Guzik and Micek, 2008), including to Central Europe.

The ICT industry deviates from our typical understanding of a service sector. Prior to the spread of the Internet, software was delivered as a physical product, whereas now it is offered electronically, and may be delivered as part of an overall package that includes a range of other services (Grimes, 2006). This is in stark contrast to the original definition of service activity defined as intangible, non-storable and non-transportable output consumed and bought at the moment of its production and thus requiring a physical proximity of producer and consumer (Sass and Fifekova, 2011). This de-linked and re-shaped nature of 'proximity' in the computer services industry, defined by availability and appropriate competence rather than a physical presence, has important implications for a more diffused localisation of employment in certain segments of the industry, including the higher-value added activities, such as software development and R&D generally. Along these lines, Beblavý and Mýtna Kureková (2014) show that branches of innovative firms (e.g. anti-virus firms) are typically organised in a 'parallel' (horizontal) rather than 'hierarchical' (vertical) headquarters-branch model of work and R&D localisation (Aranya, 2008; Coe, 1997). Such horizontal organisation of highly sophisticated activities in multiple locations is driven by the fact that fast-growing IT or knowledge-based activities are highly dependent on the availability of a sufficient

quantity of highly qualified workers. Fast-growing companies quickly reach the limits within local economies (especially small ones) and turn to the establishment of R&D centres globally (I-8, I-9, I-10) (Arora et al., 2001; Ó Riain, 2004).

The software sector in Central Europe: moving upwards and diversifying

The expansion of the software industry in Central Europe took off massively in the early 2000s on the back of global changes in the sector: internalisation and diversification. With improved access to the Internet, ICT companies turned away from serving traditionally limited national markets to providing services more effectively in an open and global market space (Coe, 1997). The key factor that spurred the expansion of ICT services globally as well as in Central Europe was the internationalisation of major manufacturing firms which have followed their clients to new destinations (Capik and Drahokoupil, 2011; Coe, 1997; Grimes and White, 2005; Guzik and Micek, 2008). The main features of diversification took the form of hardware producers extending their business offering to software and services. This has been further advanced in the provision of integrated services, such as 'security suites' or 'cloud computing' (Bell, 1995; Coe, 1997). Such 'service encapsulation' indicates the embedding of services in products and their interlocked nature (Grimes, 2006).

The importance of the ICT sector in the Czech and Slovak economies has grown since the mid-2000s. ICT exports as a share of total exports in services rose sharply in the Czech Republic from 2005 and in 2010 totalled nearly $21 billion (about 6% of total exports). According to the Czech ICT Union, in 2010 the total ICT exports (services and commodities together) were higher than the export of cars (380 billion CZK versus

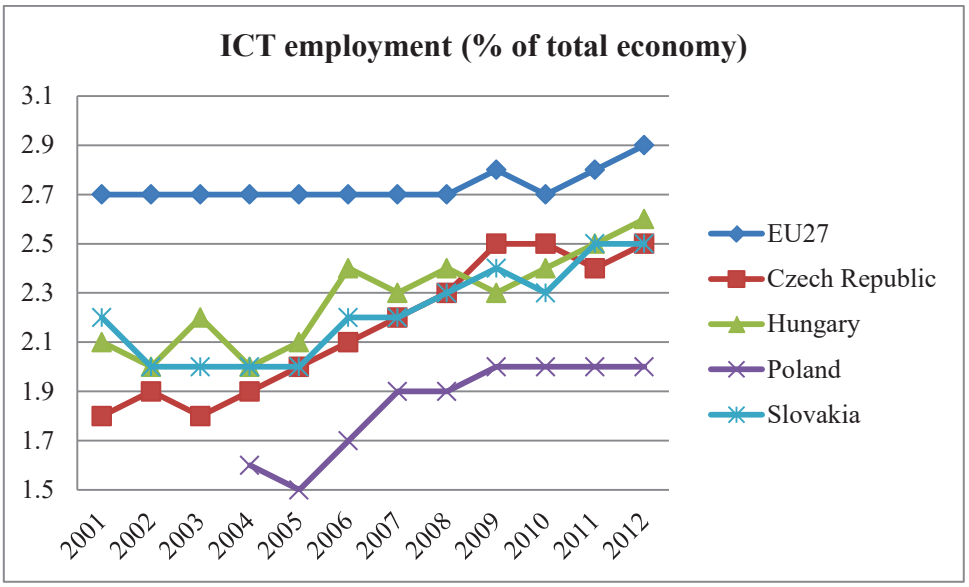
239 billion CZK) (Čapek, 2012). Slovak ICT exports represented about 6% of total service exports in the country in 2010 and equalled nearly $6 billion, a drop from $8.5 billion in the peak year of 2008. Gross valued added in the sector has grown steadily since the accession of the countries to the EU: value added grew by 45% in Slovakia and by 21% in the Czech Republic between 2005 and 2012 (all data: Eurostat). The growth of employment in the software industry has also been steep (Figure 1). The trend has been present in all Central European countries, but has been the most evident in the Czech Republic and Slovakia. Generally, the importance of the sector within national economies is catching up with the level of the EU-27 average. In 2012, the total number of employees in the ICT sector in Czech Republic and Slovakia stood at 127,000 and 55,000, respectively (Eurostat). [1]

The sector is now composed of large internationalised firms, which typically offer a range of products and a variety of services, but also a myriad of small- and medium-sized firms of domestic origin (Beblavý and Mýtna Kureková, 2014). A few home-grown firms have globalised (in the anti-virus segment in particular), but most seem to specialise in offering tailor-made services to national governments or local firms. Their knowledge of the national legal and regulatory environment and the local language

[1] The software industry alone is typically defined in the statistics by NACE 72 group (Rev. 1) or NACE JC (62 + 63) (Rev. 2) – computer and related activities. This includes hardware consultancy, publishing of software, other software consultancy and supply, data processing, database activities, maintenance and repair of office, accounting and computing machinery, and other computer related activities (Guzik and Micek, 2008). Defined in this way, the IT sector is only a subpart of the broader ICT sector, which includes both manufacturing (electronics, office equipment, telecommunications equipment) and ICT services (IT, telecommunications, postal services, radio and TV broadcasting) (Guzik and Micek, 2008). A broader ICT definition is often used in international comparative statistics, including the data in Figures 1 and 2.

gives them a competitive advantage in a regional perspective. On the other hand, it appears to pose a limit on a fully-fledged globalisation and expansion.[2]

Figure 1. Employment trends in ICT sector



Source: Eurostat, national accounts, NACE 2, Code J.

Incoming ICT companies initially entered with the aim of off-shoring services with lower value added, such as back-office, corporate functions and customer care (Capik and Drahokoupil, 2011; Hardy et al., 2011; Piech and Radosevic, 2006). Similarly to the automotive sector, the realisation of the availability of a skilled, talented and motivated labour force gradually led to the localisation of more sophisticated activities, such as shared service functions (accounting and finance), IT support and IT problem-solving centres (Hardy et al., 2011) as well several R&D centres. Examples of these high-end activities in the Czech Republic include R&D investments of Sun Microsystems/Oracle, Red Hat, Solar Winds and NetSuite; and in Slovakia of Alcatel Lucent and NESS

[2] An example of an important regional player, now listed on the Warsaw stock exchange, is ASSECCO (see http://asseco.com/ce/company/company-profile/).

Košice Development Centre (I-7, I-13). Recently, the software sector has been increasingly characterised by the emergence of start-ups, especially in the Czech Republic (Kočí, 2012; Lauder, 2010) (I-8, I-7, I-6). Several software R&D centres established in the Czech Republic or in Slovakia emerged when a foreign investor acquired an existing successful domestic company, e.g. Sun Microsystems' acquisition of NetBeans (Němeček, 1999) and Microsoft Slovakia of Caligari (I-3). This phenomenon has been dubbed 'offshore R&D' (I-8). This highlights the multiple positive effects that domestic start-ups in the sector can have on the further advancement of the industry in these countries generally.

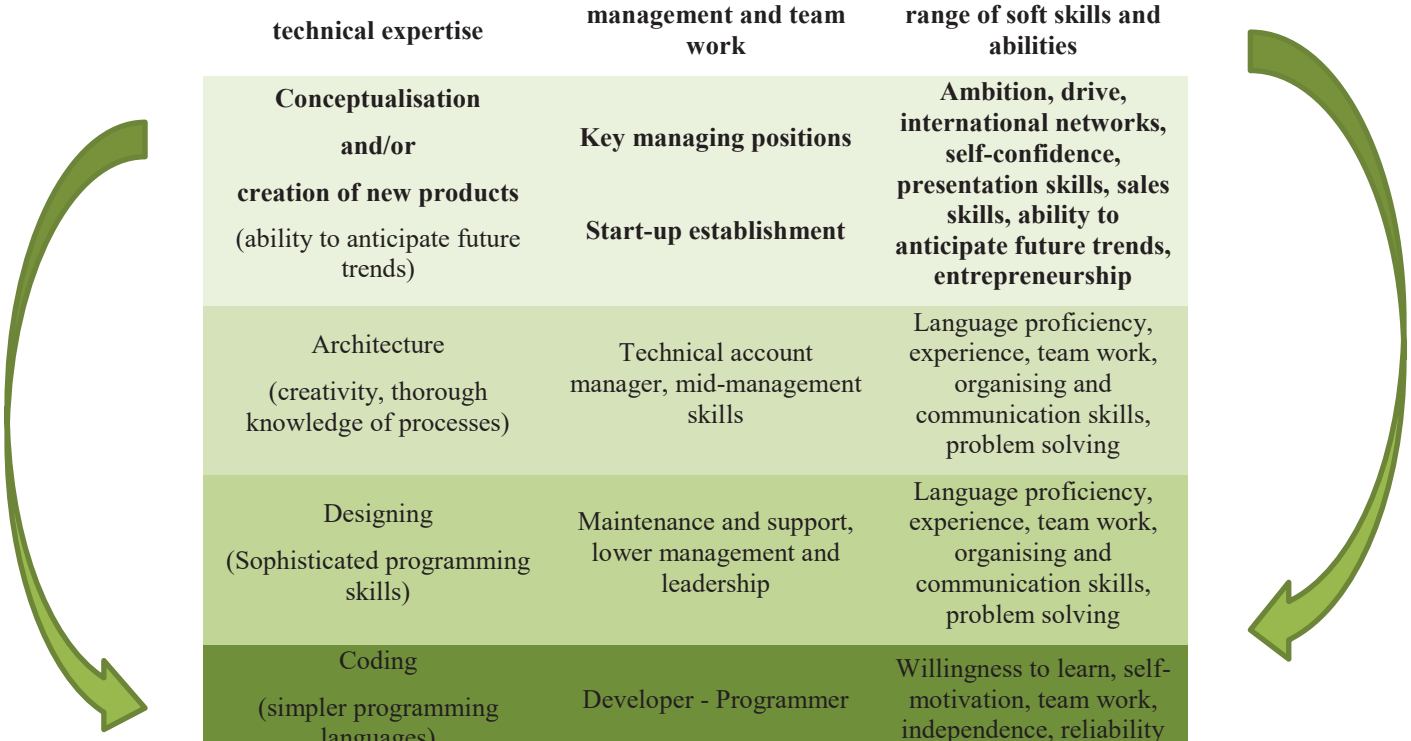
A model of skill hierarchy in the software industry: not all knowledge workers are created equal

Other technology and skill-intensive sectors, such as automotive, electronics or aviation, are typically divided into activities of progressively increasing sophistication, at the pinnacle of which is R&D of new products (Capik and Drahokoupil, 2011; Gereffi, 1994; Henderson et al., 2002). Termed as 'global commodity chains', they consist of institutionalised relations between actors in a production framework where the distribution of resources and rewards is organised through a more or less hierarchical structure. This has implications for the organisation and status of the workforce. For example, automotive sector workers who are the closest to the most sophisticated and skill-intensive tasks at the heart of production, product or process development compose the core staff, whereas the workforce in less skill-intensive tasks fulfil the flexibility function. Šćepanović (2011) shows that in Central Europe the core workers are typically

unionised, well-paid and trained, while periphery workers are unprotected, leased rather than employed, and often recruited from abroad. With the exception of brief on-the-job-training, little skill development takes place and no employment security is granted.

The software industry is typically viewed as a technically sophisticated and innovation-intensive sector, while few studies seem to acknowledge its internal diversity to the extent that is often acknowledged in other globally organised sectors. However, our interviews indicate that there is a 'fractal' effect at work also in the software sector, whereby research and development activities are themselves divided into a hierarchy with very different skills requirements and different implications for the labour market. In Figure 2 we graph a model of the skill and task hierarchy within the research and development activities of the software sector to highlight its internal variance. The model was developed based on information and insights gleaned from the interviews and organises a hierarchy of skills along technical expertise, management functions and soft skills, as all of these were highlighted as important elements of a successful ICT firm in the region. In fact, in some respects, this internal skill and task organisation might be compared to the hierarchy present in the automotive sector, where this arrangement is a key element for the existence of duality of labour markets with different set of contracts, working conditions and salaries.

Figure 2. Model of hierarchy of technical expertise and soft skills in the software industry



R&D hierarchy (hard skill based)	Complexity of management and processes	Soft skill hierarchy
Key element: **technical expertise**	Key element: **management and team work**	Key element: **range of soft skills and abilities**
Conceptualisation and/or creation of new products (ability to anticipate future trends)	**Key managing positions** **Start-up establishment**	**Ambition, drive, international networks, self-confidence, presentation skills, sales skills, ability to anticipate future trends, entrepreneurship**
Architecture (creativity, thorough knowledge of processes)	Technical account manager, mid-management skills	Language proficiency, experience, team work, organising and communication skills, problem solving
Designing (Sophisticated programming skills)	Maintenance and support, lower management and leadership	Language proficiency, experience, team work, organising and communication skills, problem solving
Coding (simpler programming languages)	Developer - Programmer	Willingness to learn, self-motivation, team work, independence, reliability
Testing	Software tester	Willingness to learn, self-motivation, independence

Source: Authors.

A key message of the skill pyramid is that while all levels of the hierarchy reach high knowledge content, they do not necessarily entail knowledge creation. Higher levels of hierarchy require more diverse and demanding skills and abilities, whereas education requirements might also rise. Within technical skills, different levels of expertise and sophistication exist. This can be exemplified by different degrees of difficulty and prestige in programming languages in the programming segment as well as by varied

technical levels of sophistication between software testers and software architects (cf. Micek, 2008: 176). The model of skill hierarchy combines different skill and competence types – technical, managerial and soft skills. Due to the nature of the work – team work, fast changes, the need for continuous learning, the global character of the sector – soft skills such as independence, self-initiative, problem-solving, communication skills, sales skills and foreign language proficiency are needed in addition to a set of technical skills. Different skill types reinforce each other at rising levels of product and process sophistication, and a combination of expertise is needed at all times.

Our interviewees asserted that there is a large share of employment in tasks of lower complexity (which are, in themselves, fairly complex and skill-demanding), but there is an emerging group of companies (both foreign-owned and domestic) present in the higher layers. Furthermore, Central Europe is very competitive in hard skills (technical expertise) but lacks the soft skills on most levels, especially with respect to key management positions where networks, access to sources of finance and entrepreneurship become crucial (I-5, I-11, I-8). We found that the internationalisation of management is often performed with the aim of attaining global recognition and trust and gaining access to international networks, know-how (including entrepreneurship and soft skills) and capital (I-8, I-6, I-4).

Acknowledging the hierarchy helps to understand several related issues. The first is the varied sophistication of R&D within the software sector, which is very often considered a high-tech sector without fully understanding the differences in the complexity of the tasks carried out. This insight is foremost relevant in evaluating the value added of

foreign investors in Central Europe, where some scholars have attained a rather sceptical view (Capik and Drahokoupil, 2011). Treating all software employment equally can be misleading from an analytical and policy perspective. As one of our interviewees emphasised: "Policy discourse often distinguishes between 'assembly manufacturing' and 'sophisticated R&D activities'. This is, to some extent, a fiction as production of a complex manufacture with a short innovation cycle is more sophisticated than some simple 'software R&D' like coding." (I-10) Second, this hierarchy transfers into recruitment practices, types of demanded skills, and forms of labour contracts offered to employees, amplifying diverse flexibility arrangements. In the next sections we discuss these elements in greater detail.

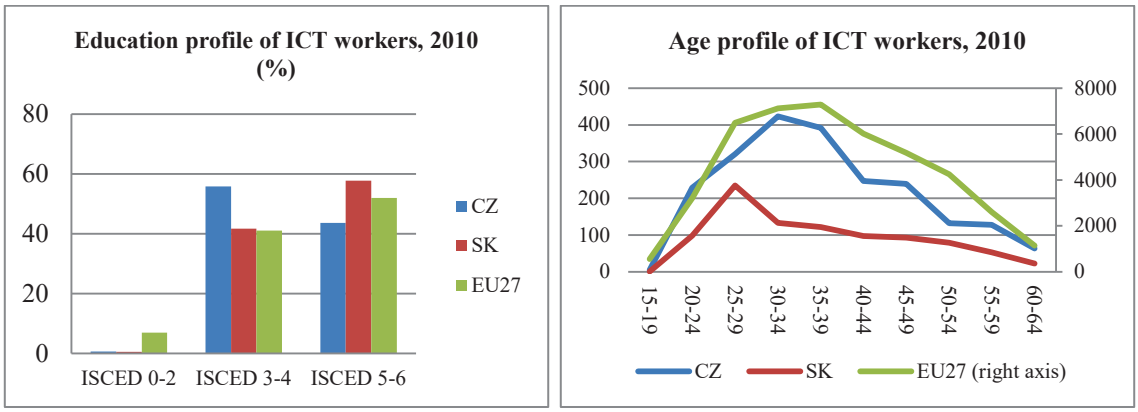
Employee profiles

A typical employee in the ICT sector is a young person with a technical education background. Graduates represent a key and preferred source of workforce. This is underscored by the fact that even more than experience, the ability to learn and the possession of other soft skills (team work, knowledge of foreign languages) are considered important. More experienced employees were sought for team-leading and middle-management positions where, in addition to technical expertise, foreign language proficiency and communication and organisational skills were also considered necessary, demonstrating the international character of the sector (see Figure 2) (I-3, I-6, I-9, I-16).

Our analysis of the profiles of workers employed in the ICT sector based on the Labour Force Survey (LFS) data from 2010 showed that the sector employs more males than

females (70% in both countries are males), which is at the level of the EU-27 average. Nearly 60% of currently employed workers in the ICT sector in Slovakia have tertiary education, whereas in the Czech Republic and in EU27 this figure is much lower (44% and 52%, respectively) (Figure 3). Given a lower sophistication of the ICT activities in Slovakia compared to the Czech Republic, this seems to confirm information gained from the interviews (I-2, I-7) that the ICT sector might be formally employing more qualified labour than the complexity of the tasks actually requires. Hardy et al. (2011) argue that graduates were desired not because of the knowledge and skills gained during their university studies but specifically because of the language skills they possessed. A high reliance on the graduate labour market is evident from the age profile of employees. Across the EU-27, employees' age structure is more balanced with a peak age group of workers in the late 30s. In the Czech Republic the peak is reached in the early 30s and in Slovakia the late 20s. Such curves might reflect the initially lagged but then relatively massive entry of large ICT firms into these countries. However, for the automotive industry, Šćepanović (2011) finds that the Czech and Slovak workforce is better educated and on average much younger than, for example, in Germany, suggesting a general feature of the economy of former transition countries.

Figure 3. Age and education profiles of ICT workers, 2010



Source: EU LFS, own calculations. NACE 2, Code J.

Labour market regulation, contracting and flexibility

The crucial importance of the employees to the success of ICT companies is well understood and for that reason formal labour contracts and access to training are offered to core employees. Market leaders and innovation frontrunners in particular go to great lengths to retain employees by providing additional benefits to ensure their loyalty and satisfaction, gaining in return a generally low turnover of key staff (Andacky, 2004). Various fringe benefits including flexible working time, skill development and training and bonuses are provided. Wages in the ICT sector are the highest in the whole economy both in the Czech Republic and in Slovakia, and IT engineers at all levels of the skill pyramid continue to be in high demand (I-1, I-3). However, flexibility co-exists with more secure forms of employment. Similar to the employment dynamics in the US IT labour market (Benner, 2002), subcontracting, labour leasing and flexible forms of employment are widespread in the software industry in Central Europe.

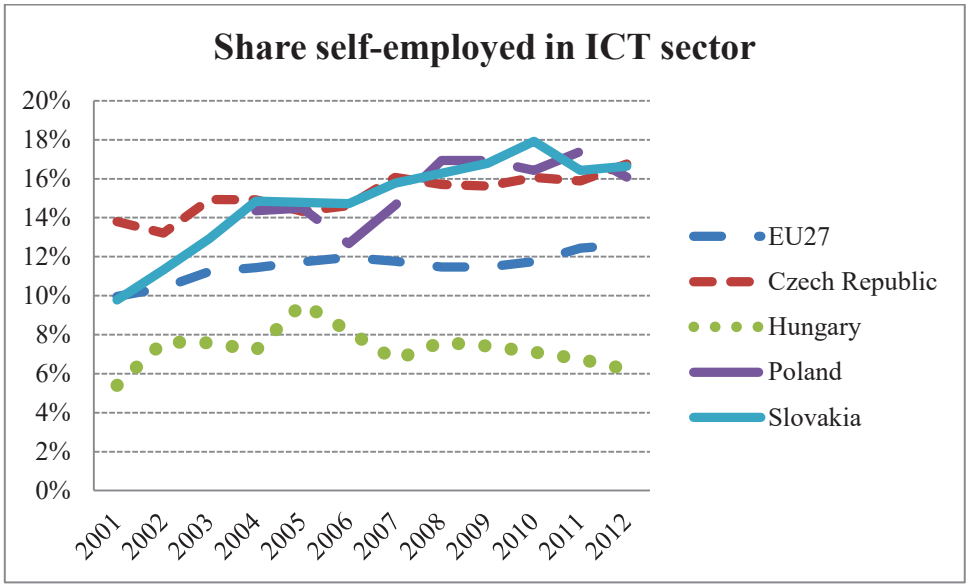
Field research helped us to clarify many nuances in contractual relations and forms of flexibility. In the R&D and innovation segment, long-term investment in skills and expertise is crucial; therefore both the firms and the employees prefer secure types of employment relations. Thus, after testing the qualities of the workforce (trial periods, internships), stable and permanent contracts are offered, with subcontracting or leasing seldom used for the core employees (developers, account managers, persons with long experience). However, flexible practices are especially used at the extremes of the technical part of the skill and task pyramid, and not only in the least skill-intensive part of the workforce, as is the case in the automotive industry. Flexible work arrangements are used both when a highly sophisticated and scarce expertise is needed to solve a specific task or – at the other extreme – to hire people with less sophisticated skills to aid implementation of projects and ensure the availability of human resources at peak project times (I-2, I-3, I-4).

Two particular forms of contractual relations that provide flexibility have been highlighted by our interviewees: self-employment and subcontracting. Indeed, the share of self-employment in the ICT sector has been growing and stands well above the EU-27 average (Figure 4). In the Slovak case, it has been estimated to be even larger and to range within double-digit figures (I-2). Furthermore, employment in the sector is increasingly characterised by the emergence of small businesses, which specialise in employing IT specialists and then function as subcontractors for multiple specialised

projects for various IT companies. The employees are offered full-time regular contracts, but are not directly employed by the main IT employers (I-3, I-4).[3]

Self-employment and subcontracting arrangements, in effect, are tools that help companies to save labour costs and contribute to the allocative efficiency of expertise and skills at the sectoral level. Interestingly, these flexible forms are also sought by employees in the sector who do not perceive them as precarious (as they typically are in automotive industry), but rather as options for collaboration and learning. Another reason why more flexible forms of contractual arrangements are accepted by IT employees arises from the demands of binding firm cultures which might not be acceptable to everyone (I-2).

Figure 4. Self-employment in ICT sector



Source: Eurostat, national accounts statistics, NACE 2, Code J

[3] Examples of such arrangements in Slovakia can be found in firms like HP and AT&T hiring through Soitron (I-3).

In general, the existing labour market legislation framework generally provides sufficient forms of flexibility, which the industry needs. Labour code rigidity was rarely mentioned as an institutional barrier or a disadvantage in the countries. While firm-level strategies might differ and rely on different sets of tools, generally speaking, companies are able to achieve flexibility through functional alternatives, e.g. hiring through subcontracting and using self-employed workers as well as testing skill potential through internships. The next section develops recruitment strategies and HR practices that feed into a sustainable model of workforce maintenance.

Recruitment and HR practices

Given the high reliance on an intake of graduates, linking companies directly to education systems and university programmes has been one of the key recruitment strategies and, effectively, a matter of competitive advantage. Across all the companies we interviewed, regardless of whether they were domestic or foreign, globalised or regional, HR departments made extensive efforts to influence existing curricula, for example by offering classes or lectures, or supervising students. The reasons ranged from improving the quality of education and increasing the attractiveness of technical fields and IT specifically in order to ensure a continued future supply to more functional motivations such as gaining direct access to young minds or screening students as potential future employees. In the Slovak context, linking companies to educational institutions is necessary also due to a declining quality of students over time (Jarosova, 2008), I-11). Such interlinking is also conditioned on the nature of the IT industry. Its fast pace of product development and progress results in a perpetuating gap between

what is taught in schools and demanded by firms. This is further exacerbated by institutional rigidities in the adaptation of the education systems and curricula in the two countries (I-2, I-8, I-4, I-16).

In response to this challenge, several initiatives have been taken to try to create business-education clusters. Examples include the Kosice IT Valley project (Slovak Spectator, 2009) or what seems to be a more bottom-up dynamic created in 'Brno Silicon Hill' where the IT technological park is co-located with the technical high schools and universities. On the negative side, however, the interviews revealed complicated procedures and legal environment for establishing more durable and formalised cooperation with the university sector in both countries (I-4, I-8, I-9, I-16). In any case, strong ties to universities as a source of human capital for the firms indirectly defines an important feature of the software industry, which is its locational concentration in urban centres – primarily in Prague, Brno, Bratislava and Košice (Boschma, 2005; Enright, 2003). This is related to two factors: a concentration of the availability of graduate supply as well as the preferences of foreign managers to reside in attractive and dynamic locations (Micek, 2008). Although locational concentration or clustering is apparent on the outside, it has not evolved into Silicon Valley-type features of interaction where a vibrant exchange of ideas and the quest for innovation and breakthrough are interlinked with a sharing of sales and marketing expertise and search for finance. The Brno cluster, however, might prove to be an exception.

An important recruitment feature is the fact that the IT recruitment market transcends the political borders of the two countries. This is an outcome of liberalised access of Slovak students to Czech universities and linguistic and cultural similarities, but is also

related to locational factors, whereby especially firms located in Brno area count on a potential workforce from nearby Slovak universities in Bratislava or Žilina (I-9, I-8). On the other hand, leading Slovak IT companies – both domestic and foreign – actively recruit from the Czech labour market, sometimes even through an aggressive headhunting among direct competitors (I-3, I-6). The de facto unified nature of the Czech and Slovak labour market represents an important 'competitiveness' asset for both countries as it effectively enlarges the available knowledge base.

The more globalised an IT company is and the more it seeks to grow, the more it needs to rely on an international labour pool. Internationalisation can take different forms and affect different parts of the company. Typically, the first to internationalise are the sales and marketing teams. In the case of IT companies with a global presence, other parts of the company internationalise as well, in particular the management and increasingly also the R&D functions (Beblavý and Mýtna Kureková, 2014). The internationalisation of key R&D functions seeks to ensure continued supply of innovation potential (I-16). Depending on its availability at home, firms make decisions about parallel locations of R&D elsewhere. A flexible immigration framework therefore represents a key institutional area through which supply can be brought in. Especially in Slovakia, flexibility through the import of a qualified workforce has been problematic. In both countries, a weak supporting infrastructure for highly qualified immigrants related mainly to the integration framework, such as access to the labour market and health care for family members, has imposed particular constraints on many firms.

Moreover, the liberalisation of employment within the EU has intensified competition for IT workers and contributed to an IT brain drain from Central Europe further West (I-

10) (Lauder, 2007; Valášek, 2012). While domestically available human capital might suffice in Central Europe at this point in time, our interviews have shown that the existing migration frameworks were viewed as a major obstacle (especially) by innovative firms that seek to recruit internationally and outside the EU. From this perspective, accession to the EU brought about a constraint on recruitment of third-country nationals, as by joining Schengen the Central European countries also had to change their policies towards the countries east of the EU, such as Ukraine or Russia, which potentially represent rich pools of IT expertise. With the demand for workers in the software sector likely to grow in the future, it is important to understand whether supply is sustainable and a 'knowledge advantage' is sufficient to ensure success in global competition (Sass and Fifekova, 2011).

Conclusion and summary

The software industry in Central Europe has seen over the past decade a fast growth in exports and employment, and this growth trajectory was partly based on the success of innovative home-grown firms. Given the core importance of human capital for the software industry, this paper discusses the organisation of the labour regime and access to the labour force in the Czech Republic and Slovakia. Our motivation to study this issue is driven by the fact that the existing institutional framework in employment, industrial relations and economic policy more generally has been tailored to sustain the competitive advantage of the automotive and electronics industries, which have been the leading sectors in Central European economies.

Our analytical concern therefore focused on explaining how the institutional framework in the organisation of skill provision and labour regulation, developed with the specific aim to sustain the growth of traditional sectors, provides (or not) conditions for growth of innovative industries where the organisation of the workforce has specific demands. This fills an important gap in the literature on developmental aspects of emerging economies, which in this region have prevailingly been analysed through the lens of the automotive industry. Our contribution is two-fold. First, we propose a model of skill hierarchy which helps us to better understand particular employee profiles, employment relations dynamics and recruitment practices in the sector. Second, we also fill an empirical gap by describing how the labour markets in a high-tech industry in Central Europe are organised and sustained.

We argue that rapid growth of the sector was facilitated on an institutional level by labour market regulation, which provides a framework that is both flexible (at the fringes) and secure (at the core). The existence of various alternative forms of employment (subcontracting, labour-leasing, self-employment) ensure flexibility in the necessary types of work (high-end and low-end) and at appropriate points in the product or service cycle, contributing to a vibrant and dynamic functioning of the IT sector. In effect, firms have developed functional alternatives that substitute flexibility, such as testing of skills through internships or by a network of subcontractors of smaller firms, which employ IT specialists on multiple projects at once. Intentional close links with universities ensure a continuous supply of workers whose skill-sets can be internally further developed for particular specific needs of individual companies. In sum, various forms of labour market flexibility and labour pool flexibility have been important

factors in explaining sectoral success and growth, not only in the automotive sector, but also in the IT industry, and have contributed to an improved position of Central Europe in the global division of tasks.

However, while the labour supply to date in Central Europe seems sufficient, many indications suggest that much more needs to be done to make the ‘knowledge advantage’ sustainable. The current model might be reaching its limits, and this is the case especially for innovative companies with the ambition to globalise, which need to draw on international expertise and face many barriers that complicate such processes.

Bibliography

Agrawal A, Kapur D and McHale J (2008) How do spatial and social proximity influence knowledge flows? Evidence from patent data. *Journal of urban economics*, 64(2), 258–269.

Andacky J (2004) In ESET until retirement. (V Esete až do dôchodku). *Trend*, 6th March, Available from: http://www.etrend.sk/trend-archiv/rok-/cislo-/v-esete-az-do-dochodku.html (accessed 4 June 2012).

Aranya R (2008) Location theory in reverse? Location for global production in the IT industry of Bangalore. *Environment and planning. A*, 40(2), 446.

Arora A, Gambardella A and Torrisi S (2001) In the footsteps of Silicon Valley? Indian and Irish software in the international division of labour. *SIEPR Discussion Paper No.*, Stanford Institute for Economic Policy Research, 00-41, Available from: http://www-siepr.stanford.edu/papers/pdf/00-41.pdf (accessed 16 May 2014).

Beblavý M and Mýtna Kureková L (2014) Into the first league: Competitive advantage of the antivirus industry in the Czech Republic and Slovakia. *Competition & Change*, 18(5).

Bell J (1995) The internationalization of small computer software firms: A further challenge to 'stage' theories. *European Journal of Marketing*, 29(8), 60–75.

Benner C (2002) *Work in the new economy: Flexible labor markets in Silicon Valley*. Wiley-Blackwell.

Benner C (2003) Labour flexibility and regional development: the role of labour market intermediaries. *Regional Studies*, 37(6-7), 621–633.

Bernaciak M and Ščepanovic V (2010) Challenges of Upgrading : The Dynamics of East Central Europe ' s Integration into the European Automotive. *Industrielle Beziehungen-Zeitschrift fuer Arbeit, Organisation und Management-The German Journal of Industrial Relations*, 17(2), 123–146.

Bohle D and Greskovits B (2012) *Capitalist Diversity on Europe's Periphery*. Cornell University Press, Available from: http://books.google.com/books?hl=sk&lr=&id=WNESVI4kbHQC&oi=fnd&pg=PR9&dq=bohle+and+greskovits+2012&ots=o9K1hHJ23a&sig=qRzvmkIXy-j79VUHW7YrJetj52g (accessed 21 March 2013).

Boschma R (2005) Proximity and innovation: a critical assessment. *Regional studies*, 39(1), 61–74.

Boschma R and Frenken K (2010) The spatial evolution of innovation networks. A proximity perspective. In: *The handbook of evolutionary economic geography*, pp. 120–135, Available from: http://www.google.com/books?hl=en&lr=&id=DW3mCzfqE6YC&oi=fnd&pg=PA120&dq=The+spatial+evolution+of+innovation+networks:+a+proximity+perspective.&ots=JoNS3g2DjA&sig=-JPJX555z0hnwZOqmKKw_ynRe58 (accessed 16 April 2014).

Čapek D (2012) National reform strategy neglects the importance of ICT (Národní program reforem opomíjí důležitost oblasti ICT, zejména služeb s vysokou přidanou hodnotou) - Press - CIAnews.cz. *ICT Unie. Press release.*, 28th March, Available from: http://www.cianews.cz/tiskove-zpravy-press/narodni-program-reforem-opomiji-dulezitost-oblasti-ict-zejmena-sluzeb-s-vysokou-pridanou-hodnotou/ (accessed 31 May 2012).

Capik P and Drahokoupil J (2011) Foreign Direct Investments in Business Services: Transforming the Visegrád Four Region into a Knowledge-based Economy? *European Planning Studies*, 19(9), 1611–1631.

Coe N (1997) Internationalisation, diversification and spatial restructuring in transnational computer service firms: case studies from the UK market. *Geoforum*, 28(3-4), 253–270.

Dayasindhu N (2002) Embeddedness, knowledge transfer, industry clusters and global competitiveness: a case study of the Indian software industry. *Technovation*, 22(9), 551–560.

Drahokoupil Jan, Myant M and Domonkos S (2012) Automotive industry. In: Beblavy M, Kurekova L, Drahokoupil J, et al. (eds), *Linking labour regimes and technological innovation in Central and Eastern Europe: The case of automotive and software industries*, NEUJOBS Working Paper no. 6.2, Available from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2402728 (accessed 15 April 2014).

Duman A and Kureková L (2012) The role of state in development of socio-economic models in Hungary and Slovakia: the case of industrial policy. *Journal of European Public Policy*, 19(8), 1207–1228.

Enright MJ (2003) Regional clusters: what we know and what we should know. In: *Innovation clusters and interregional competition*, Springer, pp. 99–129, Available from: http://link.springer.com/chapter/10.1007/978-3-540-24760-9_6 (accessed 12 December 2013).

Gereffi G (1994) The organization of buyer-driven global commodity chains: how US retailers shape overseas production networks. In: Gereffi G and Korzeniewicz M (eds), *Commodity Chains and Global Capitalism*, Westport, CT: Praeger, pp. 95–122.

Grimes S (2006) Ireland's Emergence as a Centre for Internationally Traded Services. *Regional Studies*, 40(9), 1041–1054.

Grimes S and White M (2005) The transition to internationally traded services and Ireland's emergence as a 'successful' European region. *Environment and Planning A*, 37(12), 2169 – 2188.

Guzik R and Micek G (2008) The impact of delocalisation on the European software industry. In: Labrianidis L (ed.), *The Moving Frontier: The Changing Geography of Production in Labour-Intensive Industries*, Ashgate Publishing, pp. 229–254.

Hancké B and Kureková L (2008) *Varieties of capitalism and economic governance in Central Europe*. NewGov/STACEE Report, London: LSE.

Hardy J, Sass M and Fifekova MP (2011) Impacts of horizontal and vertical foreign investment in business services: the experience of Hungary, Slovakia and the Czech Republic. *European Urban and Regional Studies*, 18(4), 427 –443.

Henderson J, Dicken P, Hess M, et al. (2002) Global production networks and the analysis of economic development. *Review of International Political Economy*, 9(3), 436–464.

Jakubiak M, Kolesar P, Izvorski I, et al. (2008) *The Automotive Industry in Slovakia: Recent Developments and the Impact on Growth*. Commission on Growth and Development, Working Paper, Washington DC: World Bank and CASE, Available from: http://www.growthcommission.org/storage/cgdev/documents/gcwp029web.pdf.

Jarosova G (2008) ESET attracted by abroad, its owners by vision (ESET láka cudzina, jeho majiteľov vízie). *Trend*, 10th February, Available from: http://technologie.etrend.sk/technologie/eset-laka-cudzina-jeho-majitelov-vizie.html (accessed 4 June 2012).

Kahancová M (2007) One Company, Four factories: Coordinating employment flexibility practices with local trade unions. *European Journal of Industrial Relations*, 13(1), 67–88.

Kočí P (2012) (Steve) Jobses of dead-ends (Jobsové slepých uliček). *Respect.cz*, 20th May, Available from: http://respekt.ihned.cz/c1-55852030-jobsove-slepych-ulicek (accessed 29 May 2012).

Kureková L (2012) Success Against All Odds? Determinants of Sectoral Rise and Decline in Central Europe. *East European Politics & Societies*, Available from: http://eep.sagepub.com/content/early/2012/05/16/0888325412440168 (accessed 4 June 2012).

Lauder S (2007) Brain hunt (Hon na mozky). *Respect.cz*, 6th September, Available from: http://respekt.ihned.cz/c1-36301780-hon-na-mozky (accessed 30 May 2012).

Lauder S (2010) Brno, full of brains (Brno, mozků plno). *Respect.cz*, 12th May, Available from: http://respekt.ihned.cz/c1-48451980-brno-mozku-plno (accessed 29 May 2012).

Micek G (2008) Sticky places in the globalized economy: the role of localities in attracting the software industry. *EUROPA XXI*, Warsaw, 169 – 182.

Millar J and Salt J (2007) In whose interests? IT migration in an interconnected world economy. *Population, Space and Place*, 13(1), 41–58.

Myant M (2013) The impact of the economic crisis on collective bargaining in the Czech Republic. *Transfer: European Review of Labour and Research*, 19(2), 185–194.

Myant M and Drahokoupil J (2011) International Integration, Varieties of Capitalism, and Resilience to Crisis in Transition Economies. SSRN eLibrary., Available from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1744726.

Němeček T (1999) Brain for a half of billion (Mozek za půl miliardy). *Respect.cz*, 11th January, Available from: http://respekt.ihned.cz/c1-36108340-mozek-za-pul-miliardy (accessed 30 May 2012).

Nölke A and Vliegenthart A (2009) Enlarging the varieties of capitalism: The emergence of dependent market economies in East Central Europe. *World Politics*, 61(04), 670–702.

Ó Riain S (2004) The politics of mobility in technology-driven commodity chains: developmental coalitions in the Irish software industry. *International Journal of Urban and Regional Research*, 28(3), 642–663.

Pavlínek P and Ženka J (2011) Upgrading in the automotive industry: firm-level evidence from Central Europe. *Journal of Economic Geography*, 11(3), 559.

Piech K and Radosevic S (eds) (2006) *The Knowledge-Based Economy in Central and Eastern Europe*. New York: Palgrave Macmillan.

Sass M and Fifekova M (2011) Offshoring and outsourcing business services to Central and Eastern Europe: Some empirical and conceptual considerations. *European Planning Studies*, 19(9), 1593–1609.

Saxenian A (2002) Transnational communities and the evolution of global production networks: the cases of Taiwan, China and India. *Industry and Innovation*, 9(3), 183–202.

Šćepanović V (2011) (Re)producing competitive advantage: workforce skills and automotive multinationals in Central and Eastern Europe. Paper prepared for the Third Transnational Capitalism Workshop at EUI in Florence., Florence, Available from: http://www.academia.edu/1477881/_Re_producing_competitive_advantage_workforce_skills_and_automobile_multinationals_in_East_Central_Europe.

Šćepanović V (2013) FDI as a solution to the challenges of late development: catch-up without convergence? PhD. Dissertation, Budapest: CEU, Budapest College.

Slovak Spectator (2009) IT Valley links firms, schools and local governments. 27th April, Available from: http://spectator.sme.sk/articles/view/35111/19/it_valley_links_firms_schools_and_local_governments.html (accessed 31 May 2012).

Valášek M (2012) IT professions of the future (IT profesie budúcnosti). *eTREND*, 6th March, Available from: http://technologie.etrend.sk/it-biznis/it-profesie-buducnosti.html (accessed 5 June 2012).

Wickham J and Bruff I (2008) Skills shortages are not always what they seem: migration and the Irish software industry. *New Technology, Work and Employment*, 23(1-2), 30–43.

Annex List of interviews and codes

The interviews were conducted between March and June 2012 in a face-to-face, semi-structured format solely for the purposes of this research. Interviewees agreed that their input could be used for the analytical purposes of this study, we anonymise the names.

Code	Interviewee
I-1	Angel investor and private entrepreneur in the web and communication field, Slovakia
I-2	IT association, Slovakia, director
I-3	Microsoft, Slovakia, head of human resources
I-4	ASSECO, Slovakia, former head of human resources
I-5	Venture capital fund owner and regional private equity investor, Czech Republic
I-6	AVAST, Czech Republic, chief technology officer
I-7	IKT Union Czech Republic, vice-chairman and former CEO of Oracle
I-8	AVG, Czech Republic, former CEO and chief technology officer
I-9	RedHat, Czech Republic, CEO and former CEO in AVG
I-10	CzechInvest, Czech Republic, former director
I-11	ESET, Slovakia, former director for sales and marketing
I-12	Web business entrepreneur, Slovakia
I-13	SARIO, Slovakia, project manager for research and development
I-14	SARIO, Slovakia, marketing and communications director
I-15	Venture capital investor, Slovakia
I-16	ESET, Slovakia, founder


CELSI