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WORKING PAPER 41

'Precarious upgrading' in electronics global production networks in Central and Eastern Europe: the cases of Hungary and Romania

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Abstract

The electronics manufacturing sector has played a prominent role in export-oriented development strategies, as participation in this high-tech industry promises access to new technology, high skilled jobs and a fast-growing market. Against this background, many governments in Central and Eastern Europe (CEE) have sought to attract investment in this sector, where foreign firms became the key actors in reshaping after 1989 and where integrating into global production networks (GPNs) was widely embraced as a means to modernize and upgrade local industries. We assess to what extent the potential benefits arising from integrating into electronics GPNs have materialized in Hungary, an established player and the most important electronics exporting country in the region, and Romania, a newcomer country in electronics manufacturing. To analyse these questions, we look at the organizational and geographical configuration of the electronics sector and examine the impact integration into these networks has had on local firms and workers and to what extent this integration has led to economic and social upgrading. With regard to economic upgrading processes, we suggest that the upgrading concept needs to pay more attention to the 'reach' of economic upgrading. This is particularly important when integration into GPNs takes place via foreign direct investment (FDI), where economic upgrading processes may be focused on transnational corporations (TNCs) with limited spillovers to local firms. The social upgrading trajectory is influenced importantly by global industry dynamics, for example high flexibility pressures and the tiered nature of the workforce in electronics GPNs, and countries' specific institutional and regulatory contexts.

Keywords

global production networks, electronics sector, foreign direct investment, economic upgrading, social upgrading, Central and Eastern Europe, Hungary, Romania

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Abbreviations

AVL	Approved Vendor List
CEE	Central and Eastern Europe
CEM	Contract Electronics Manufacturer
CMEA	Council of Mutual Economic Assistance
CPRC	Chronic Poverty Research Centre
DFID	Department for International Development
EIRO	European Industrial Relations Observatory
EPZ	Export Processing Zone
ESRC	Economic and Social Research Council
EU	European Union
FDI	Foreign Direct Investment
GCC	Global Commodity Chain
GPN	Global Production Network
GVC	Global Value Chain
ILO	International Labour Organization
IMF	International Metalworkers Federation
IMF	International Monetary Fund
ITA	Information Technology Agreement
NTB	Non-Tariff Barriers
OBM	Original Brand Manufacturer
ODM	Original Design Manufacturer
OECD	Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturing
R&D	Research and Development
SCI	Sustainable Consumption Institute
SEZ	Special Economic Zone
SME	Small and Medium-Sized Enterprise
TNC	Transnational Corporation
UK	United Kingdom
UN	United Nations
UNCTAD	UN Conference on Trade and Development
UNIDO	UN Industrial Development Organization
US	United States
WTO	World Trade Organization

1. Introduction

The organization of global production and international trade has changed significantly in the past three decades. Today, international trade and global production are increasingly organized in highly fragmented and geographically dispersed production networks, where transnational corporations (TNCs) break up the production process into different parts and relocate them on a global scale. A key factor in explaining the emergence of these production and trade structures is the broader policy change that has occurred since the early 1980s against the background of the debt crisis in developing countries. The emerging 'Washington Consensus' marked the departure from a more inward-oriented development model characterized by import-substituting, state-led industrialization policies towards an export-oriented model. A 'new international division of labour' (Fröbel et al. 1980) emerged that was based on advances in transport, as well as in information and communication technologies. In line with this new paradigm, integrating into global production networks (GPNs) became the ultimate policy aim on many countries' development agendas.

The electronics manufacturing sector has come to play a prominent role in this regard. Compared with 'low-tech' manufacturing industries such as apparel, footwear or toys, the electronics industry is perceived to be a 'high-tech', capital-intensive and innovative industry. In addition to a rise in employment, economic growth and foreign exchange, which are generally expected from embracing export-oriented industrialization, integrating into the global electronics industry promises access to new technology, high-skilled jobs and a fast-growing market. The underlying rationale is that a 'high-tech industry is one whose technology is still tacit rather than explicit owing to firm-specific, proprietary capabilities that create novel products and earn above-normal rents. High-tech industries are thus desirable for a country because they require high-wage, skilled workers and offer opportunities for entrepreneurs to earn technological profits' (Amsden 2004: 87).

Against this background, many governments in the post-socialist countries in Central and Eastern Europe (CEE) and in developing countries alike have sought to attract investment in this 'high-tech' sector over the past two decades. Prior to 1989, many CEE countries had developed an electronics industry within the Council of Mutual Economic Assistance (CMEA) framework and thus had an industrial tradition in the sector, but the more 'tangible' assets, such as production technology and facilities, were largely outdated by the end of the 1980s (Radosevic 2004). In most countries of the region, foreign TNCs became the key actors in reshaping the sector and integrating into GPNs was widely embraced as a means to modernize and upgrade it. The idea was to start with low-wage export platforms that would eventually increase the value added of production activities and lead to linkages with and knowledge spillovers to local firms, which in turn would improve the manufacturing and innovation capabilities of local firms. This 'economic upgrading' of foreign-owned plants and local firms was also thought to benefit workers, as the higher-value activities would require more skills and promise better working conditions and thus lead to 'social upgrading'.

The aim of this paper is to assess to what extent the potential benefits arising from integrating into electronics GPNs have materialized as CEE countries have been increasingly incorporated into the GPNs of foreign electronics TNCs. To analyse these questions, we look at the organizational and geographical configuration of the electronics sector, globally and in the CEE region, and examine the impact that integration into these networks has had on local firms and workers and to what extent this integration has led to economic and social upgrading. The analysis builds on the GPN approach that considers not only the key role of firms, in particular lead firms, in GPNs but also non-firm actors and institutional and regulatory contexts, as well as encompassing a more nuanced view on upgrading processes. The empirical focus is on Hungary, an established player and the single most important electronics exporting country in the region, and on Romania, an important newcomer country in electronics manufacturing. The paper is based on trade and national sector data and

interviews conducted in 2009 and 2010 with management, workers' representatives and workers at the four major electronics plants in Romania, as well as with institutional actors, including representatives from business associations and trade unions, and sector experts in Romania and Hungary.

The next section briefly introduces the analytical framework. The third section provides an overview of key actors, characteristics and developments of the global electronics sector with a special focus on the CEE region. The fourth section looks at the Hungarian and Romanian cases to assess the impact on local firms and workers through an analysis of economic and social upgrading experiences. Finally, some conclusions are drawn.

2. Analytical lens: the global production network approach

Over the past two decades, a body of literature has evolved using chain or network frameworks to conceptualize and analyse how global production is organized and governed and how this affects the development prospects of firms, regions and countries (Coe/Hess 2007: 2).[1] For the purpose of this analysis of the electronics sector, we want to stress three areas in the chain and network literature that have been taken most seriously in the GPN approach (Coe et al. 2008; Henderson et al. 2002).

First: The chain/network literature has to a large extent focused on the analysis of TNCs and inter-firm relations. As a result, it has tended to neglect the relationships between firms and non-firm actors and the broader institutional and regulative contexts within which production networks are embedded. Given the prevailing bias towards the state as the key reference frame and actor, and the simultaneous neglect of firms not only in development studies but also more generally in the social sciences (Fischer/Parnreiter 2007; Henderson et al. 2002), the concentration on firms has certainly made it possible to study more thoroughly corporate strategies and related organizational dynamics. This 'reversal' is, however, problematic given the influence that non-firm actors, including states, international organizations and civil society organizations, as well as institutional and regulatory contexts, have on the articulation of production networks. Coe et al. (2008: 4) state that the GPN approach attempts to go beyond global commodity chain (GCC) and global value chain (GVC) research by stressing two differences: 'First, GCCs/GVCs are essentially linear structures, whereas GPNs strive to go beyond such linearity to incorporate all kinds of network configuration. Second, GCCs/GVCs focus narrowly on the governance of inter-firm transactions while GPNs attempt to encompass all relevant sets of actors and relationships.'

Second: Within the chain/network literature, a significant amount of research has accumulated on how actors can improve their positions within the international hierarchy of value-added activities. The concept of economic upgrading – commonly understood as a firms', regions' or countries' trajectory from lower- to higher-value activities – has become a cornerstone in the research programme. The conventional view conceives economic upgrading as a process where local firms 'learn from global buyers' and subsequently improve their capabilities to move up in the value-added hierarchy (e.g. Gereffi 1999; Humphrey/Schmitz 2002). However, this ideal trajectory is but one of many possible outcomes resulting from participation in GPNs that may also lead to economic 'downgrading' (Bernhardt/Milberg 2011; Milberg/Winkler 2010, 2011). Upgrading efforts and processes are complex and contested affairs (Bair 2005; Gibbon 2001; Kaplinsky 2005; Schrank 2004). With regard to economic upgrading in electronics production networks that are characterized by a strong reliance on foreign direct investment (FDI), we distinguish between two types of economic upgrading: (i) 'internal economic upgrading', which relates to the activities

[1] The characteristics of the four main strands of research that constitute the field of chain and network research, namely, commodity chains, global commodity chains, global value chains and GPNs, have been discussed elsewhere (see Bair 2005; Bair 2009; Hess 2009; Plank and Staritz 2009).

assumed by the TNC at the foreign-owned plant in the host country; and (ii) 'external economic upgrading', which refers to the impact on local firms, in particular through local linkages and knowledge spillovers. The analysis of electronics production networks shows that these two processes can be quite unrelated and that internal economic upgrading does not automatically lead to external upgrading and improved capabilities of local firms (Gallagher/Zarsky 2007; Hürtgen et al. 2009).

Third: The chain/network literature has for a long time concentrated on economic upgrading and neglected broader socioeconomic effects arising from participation in GPNs. But the question of whether participation and economic upgrading are beneficial for workers and lead to social upgrading – understood as the improvement of the position of workers as reflected in decent working conditions – has received more attention recently, in particular in the context of the Capturing the Gains research project (Barrientos et al. 2011a, 2011b). As mentioned above, there are substantial obstacles to economic upgrading, and even if firms are 'successful' they do not necessarily gain the rewards with which it is generally associated, such as increased profitability and security (Bair 2005; Kaplinsky 2005; Ponte/Ewert 2009). And even if firms gain rewards for their upgrading efforts, the rewards may not be passed on to workers in the form of higher wages, greater job security or improved working conditions, and thus economic upgrading may not lead to social upgrading (Barrientos et al. 2011a; Knorringa and Pegler 2006; Plank et al. 2012; Rossi 2011). Access to GPNs is often even based on low wages and problematic working conditions, and many industries, including electronics, are characterized by various forms of flexible labour relationships that are closely related to GPNs (Flecker 2009; Raworth/Kidder 2009; Standing 1999).

3. Global production networks in the electronics sector

Comprising a variety of products, including computers, mobile phones and mp3-players, the electronics manufacturing sector (which covers the hardware and not the software segment) is among the largest and fastest-growing manufacturing industries in the world and accounts for almost one-quarter of world trade in manufactured products. Electronics manufacturing has experienced fragmentation and relocation from developed to developing and 'transition' countries; more recently, geographical and organizational concentration has increased, however. Key factors underlying these developments are corporate strategies of lead firms, in particular the adoption of the 'vertical specialization' model, the emergence of large supplier firms organizing manufacturing on a global scale and changes in the regulatory context, including the adoption of liberal investment and trade regimes in many developing and 'transition' countries.

3.1. Changing competitive dynamics in global electronics

Historically, the electronics industry was characterized by large vertically integrated firms where basically all activities were carried out in-house. Thus, the lead firms in the electronics sector (also called Original Brand Manufacturers (OBMs)) such as IBM and Digital Equipment in the US, Fujitsu in Japan and Siemens in Germany, used to follow the 'vertical integration' model and designed and produced the key components and assembled these components in-house. This Fordist business model has undergone dramatic changes since the inception of the industry in the 1940s (Henderson 1989), initiated by the 'PC revolution' originating in Silicon Valley in the early 1980s. IBM's decision to enter the rapidly growing niche market for micro-computers with a product that relied on standardized components led to a profound change in the industry structure (Ernst 2002; Lüthje et al. 2002). Until then, manufacturing of components and the technology and know-how needed were considered key elements of the 'competitive strategy' of lead firms. In contrast, the modular architecture of micro-computers assembled from standardized components offered new possibilities for

highly specialized firms that concentrated on specific segments within the value chain. In this way, the standardization and subsequent commercialization of processes formerly contained within the boundaries of vertically integrated firms created 'a mass market for personal computers as well as literally thousands of new producers of a diverse range of components, peripherals and applications' (Saxenian 2006: 39). Most of the emerging specialized technology firms from the Silicon Valley focused only on specific parts of the final product, such as microprocessor (e.g. Intel) or software operating systems (e.g. Microsoft) (Dedrick/Kraemer 1998; Ferguson/Morris 1993).

These developments were not limited to the PC segment but increasingly spread across the whole electronics sector as 'new electronics products markets began to converge on a common technological foundation of networkable, quasi-open, microprocessor based systems' (Borrus/Cohen 1997: 7). As the final products became increasingly 'complex commodities' (e.g. servers, desktops), which were assembled from openly traded components (e.g. chips, hard-disks, displays, modems), the competitive strategy of lead firms shifted away from the control and ownership of the entire production system (Hürtgen et al. 2009). In this system of 'vertical specialization', lead firms aim to create new product markets through the development of breakthrough technologies or product designs (Lüthje 2002), which furthers the decoupling of product innovation and manufacturing and, hence, they increasingly have shed manufacturing activities.[2] The production system developed from a vertically integrated hierarchical system into a 'modular' form where final products such as computers or mobile phones are not manufactured in-house in one firm but where manufacturing is outsourced to a variety of external firms (Sturgeon 2002). Today, most production relies on a network of firms that operate in various specialized sub-segments of the electronics industry. These networks are characterized by highly asymmetrical relationships and value capture, as lead firms control them via their technological capabilities and their ability to define and control the innovation cycle in the respective market segment (Ali-Yrkkö et al. 2011; Dedrick et al. 2010; Lee/Gereffi 2013; Linden et al. 2009).

3.2. Emerging powerful actors in the corporate sphere: ODMs and CEMs

The reorientation of lead firms away from manufacturing has created room for other firms to organize manufacturing activities that again made further outsourcing possible. Two important actors are Original Design Manufacturers (ODMs) and Contract Electronics Manufacturers (CEMs). ODMs and CEMs are distinct from traditional subcontracting arrangements (known as Original Equipment Manufacturing (OEM)), which are characterized by tight organizational control through lead firms as they aim to provide a 'one-stop shop' for lead firms and offer a far greater range of capabilities and services. Thus, vertical specialization at the top of the chain is accompanied by vertical reintegration at the first-tier supplier level.

ODMs emerged from the early offshoring and outsourcing activities of lead firms since the 1960s, in particular in Taiwan (Henderson 1989). Initially, they were involved primarily in rather simple assembly work, but they went on to upgrade their activities substantially and took over a set of responsibilities that was formerly integrated within lead firms, including product design. Related to this move was the concentration on a limited number of high-volume products (e.g. notebooks, monitors, mobile phones) for which they could refine their design skills. Hence, ODMs deliver the final product – for which they own the design – to lead firms, which then sell it under their brand name. For instance, the lion share of notebooks that are sold under the brand names of Hewlett Packard or Apple are manufactured by Taiwanese ODMs that produce more than 90 percent of the world's

[2] However, outsourcing strategies have developed differently in different segments of the electronics sector. In particular only about 30 percent of mobile phones are produced through outsourcing, whereas more than 90 percent of game consoles and laptops are (NIPA 2011, cited in Lee and Gereffi 2013). There are also differences among lead firms in terms of the extent of outsourcing.

notebooks (Sturgeon/Kawakami 2011). The rapid expansion of the ODM model since 2001 has been accompanied by the build-up of massive industrial plants in China where initially labour-intensive production steps have been relocated (Hürtgen et al. 2009). The most telling example is 'Foxconn-City', an enormous industrial park located in Shenzhen where roughly 240,000 workers are employed by Foxconn (Taiwan), the largest ODM globally (The Economist 2012).

Besides ODMs, large parts of the manufacturing activities have been taken over by CEMs – the largest ones being Flextronics (Singapore, formerly US and still managed from the US, which bought number two-ranked Solectron in 2007), Jabil Circuit (US), Celestica (Canada), Sanmina-SCI (US), Benchmark Electronics (US) and Plexus (US) (Sturgeon/Kawakami 2011). In addition to assembly work, they have extended their range of activities to encompass supply chain management functions such as component purchasing, logistics management and after-sales services. In contrast with ODMs, they generally do not engage in product development and design. Hence, their key competitive advantage arises from the ability to pool orders for a variety of clients, which is achieved by offering generic, rather than product-specific manufacturing capabilities (Sturgeon 1999). Thereby, they can achieve significant economies of scale given their broad client base and can increase time to market as their generic manufacturing capabilities allow for rapidly switching between product lines as clients' demands are changing (Gallagher/Zarsky 2007). Many CEMs started to operate as small, independent manufacturers in Silicon Valley in the late 1970s providing manufacturing services to emerging specialized technology firms (Lüthje 2001; Sturgeon 2002). As the trend to standardize and outsource manufacturing operations accelerated, the importance of this type of firms increased – as reflected in their impressive growth rates, in particular since the 1990s.

The increasing importance of CEMs can further be related to shifting strategies of lead firms during the 1990s. First, as some ODMs moved to downstream segments and began to compete directly with lead firms by selling under their own brand (e.g. Acer), lead firms have increasingly moved away from ODMs towards CEMs (Sturgeon/Lester 2004). Second, as the 'vertical specialization' industry model gained ground, subcontracting networks expanded rapidly, including increasingly complex outsourcing relationships. To streamline these networks, lead firms started to consolidate their supply base and demanded global manufacturing and process support (Sturgeon 2002). As a consequence, CEMs have themselves developed a 'global footprint', enabled and fuelled by the 'new economy bubble' at the end of the 1990s that gave CEMs the 'deep pockets' for their expansion (Phillips/ Henderson 2009). The major CEMs today employ tens of thousands of workers (ILO 2007).

The burst of the 'new economy bubble' in 2001 has changed the dynamics in the electronics sector. Lead firms reacted by further shifting towards fully outsourced manufacturing models to reduce costs and increase flexibility (Lüthje/Sproll 2004). CEMs on the one hand continued to acquire production capacities outsourced by lead firms but on the other had to divest some of their recently acquired plants, and relocated their plants increasingly to Asia as, owing to their previous expansion, they were particularly hit by the crisis. ODMs have emerged more stable from the burst. However, the lines between the two business models are partly blurring, as some ODMs and CEMs operate both business models (e.g. Foxconn). As a reaction to the global economic crisis in 2008-09 and the sharp decline in demand, lead firms have further retreated from manufacturing while CEMs and ODMs have again expanded their production capacities by acquiring their assets (as well as skills and customer bases). Further, existing trends toward consolidation and shifts to low-cost production locations, in particular to China, have been accelerated by the crisis (Sturgeon/Kawakami 2011).

Although ODMs and CEMs follow different strategies, their rapid growth has contributed to the emergence of mass production in a number of low-wage countries. Both types of firms are vertically reintegrating manufacturing activities and act as reorganizers for lead firms'

global supply chains. They have to balance scale and scope advantages of global mass production with flexibility and quality requirements in an instable market characterized by rapidly changing (technology) cycles and demands from lead firms (Gallagher/Zarsky 2007; Hürtgen et al. 2009). A key element in this business model is the global standardization of key functions, new forms of labour organization and heavy reliance on flexible labour. As the increasing standardization allows for fragmenting the production process into labour-intensive and more capital- and knowledge-intensive parts, there is a considerable amount of low-value and thus low-skill and low-wage activity, which is often combined with advanced production technologies in this 'high-tech' sector.

3.3. The political 'infrastructure' of global electronics

Besides the importance of corporate strategies, broader policy changes and specific regulations at various levels shape the electronics sector in important ways. A precondition for the globalization of electronics production has been the shift towards an outward-oriented development model in many developing and 'transition' countries since the 1980s. This paradigmatic policy change has not been limited to the electronics sector, but it occupied an important role in many countries' liberalization strategies (Gallagher/Zarsky 2007). Governments at the national and local level were eager to attract electronics FDI and to access electronics GPNs as the sector promised new technology and better jobs. Export processing zones (EPZs) and similar instruments, generally offering tax, duty and infrastructure incentives, were of particular relevance, and firms involved in the electronics sector account for a major share of EPZ-related activities (UNCTAD 2004).

A second important aspect concerning regulatory changes relates to the increasing liberalization of trade in electronics. In particular, the conclusion of the Information Technology Agreement (ITA) in 1996 negotiated under the auspices of the World Trade Organization (WTO) marked an important change in the strategy of major countries. For instance, from the 1960s onwards, the main approach of European Union (EU) member countries consisted in promoting 'national champions' behind tariff walls. For various reasons, including the changes in industrial organization and competitive strategies, this approach did not pay off as expected (Zysmann/Boruss 1994). Against the background of the EU enlargement process and the development of a larger, 'harmonized single market', the EU policy changed, culminating in the signature of the ITA with the aim of eliminating all tariffs on electronics products. Since then, the scope of the agreement has increased in terms of its membership and coverage of products, which is estimated at 97 percent of world electronics trade (WTO 2012). There is further pressure to expand product and country coverage and to include binding rules on non-tariff barriers (NTBs) that are up to now excluded (Monahan 2011). However, tariff reductions have been applied unevenly and tariffs continue to play an important role for some product groups (Dryer/Hindley 2008). Further, regional trade agreements overlap with the liberalization process at the international level (Borrus/Cohen 1997; Labrianidis et al. 2008).

3.4. Shifting geographies of the electronics sector: global and regional dimensions

Generally, electronics manufacturing has been fragmented in the past decades as a result of outsourcing by lead firms and the relocation of production to developing and 'transition' countries. But more recently, geographic and organizational concentration has increased, driven by a handful of lead firms and large ODMs and CEMs (Lee/Gereffi 2013; Sturgeon/Kawakami 2011). Only a few firms and developing and 'transition' countries managed to upgrade in 'manufacturing hotspots' and a few large exporting countries began to take up the majority of world electronics exports. While the EU-15, Japan and the US accounted for more than 60 percent of global electronics exports in 1995, their combined share had dropped to 29.7 percent in 2011 (Table 1). In contrast, China climbed from mere

4.9 percent in 1995 to more than 30 percent in 2011 and is the leading electronics exporter in the world. East Asian countries' export share as a group has remained relatively constant since 1995. Within the group, Taiwan, South Korea, Thailand, the Philippines and Indonesia have slightly improved their position, whereas Malaysia, Singapore and Hong Kong have experienced a slight decline. In addition, regional supplier countries, including Mexico for the US market and Hungary and the Czech Republic for the EU-15 market, have increased in importance since the mid-1990s.

Table 1: Top 15 electronics exporters, 1995-2011

	1995		**2000**		**2004**		**2008**		**2011**	
	US$m	**%**	**US$m**	**%**	**US$m**	**%**	**US$m**	**%**	**US$m**	**%**
China	39.545	4.9	106.351	8.3	302.575	18.0	588.073	25.4	796.476	30.5
EU-15	198.657	24.6	293.724	22.8	357.732	21.3	430.206	18.6	410.909	15.7
US	144.701	17.9	220.675	17.1	182.382	10.9	205.026	8.9	196.558	7.5
Taiwan	42.590	5.3	83.575	6.5	119.554	7.1	162.254	7.0	193.891	7.4
South Korea.	37.900	4.7	65.506	5.1	107.243	6.4	151.422	6.6	171.446	6.6
Japan	144.929	17.9	164.292	12.8	176.056	10.5	176.141	7.6	168.753	6.5
Malaysia	41.045	5.1	70.469	5.5	90.568	5.4	107.134	4.6	123.124	4.7
Mexico	16.028	2.0	43.606	3.4	47.216	2.8	70.853	3.1	84.885	3.3
Singapore	48.010	5.9	56.946	4.4	63.218	3.8	69.561	3.0	74.661	2.9
Thailand	16.157	2.0	24.338	1.9	34.885	2.1	54.606	2.4	59.969	2.3
Switzerland	13.471	1.7	16.587	1.3	24.205	1.4	38.345	1.7	45.118	1.7
Philippines	8.123	1.0	30.249	2.3	38.396	2.3	44.160	1.9	39.263	1.5
Hungary	**1.016**	**0.1**	**8.669**	**0.7**	**16.725**	**1.0**	**28.341**	**1.2**	**26.172**	**1.0**
Czech Rep.	**781**	**0.1**	**2.940**	**0.2**	**8.312**	**0.5**	**21.700**	**0.9**	**26.099**	**1.0**
Costa Rica	112	0.0	2.640	0.2	6.307	0.4	9.195	0.4	21.794	0.8
World	809.024		1.287.907		1.679.386		2.311.516		2.610.408	

Notes: Ranked by 2011 values; exports shown as imports from reporting countries.

Source: UN Comtrade.

Asia's increasing involvement over the last half of the century is a key feature of the electronics sector. In particular, China and the East Asian region have become the central manufacturing base for the industry. More recently, manufacturing-related engineering work has also been relocated to East Asian countries (Lüthje 2005) and the occasional outsourcing of research and development (R&D) functions has fuelled a debate on the 'hollowing-out' of industrial capacities in the Triad (Ernst 2008). However, most important lead firms are still based in developed countries, especially the US, Western Europe and Japan, and market power and value capture are concentrated at those firms. However, the global economic crisis of 2008-09 and the increasing importance of developing country markets have provided new opportunities to expand value added and R&D functions and further the development of lead firms in developing countries (Brandt/Thun 2011; Lee/Gereffi 2013; Sturgeon/Kawakami 2011).

Another development that has occurred in particular since the 1990s is related to the shift in lead firms' strategies, the subsequent internationalization of CEMs and increasing regional integration. As lead firms increasingly demanded that CEMs 'go global' and offer 'one-stop-

shopping' solutions to serve the key markets in the Triad, CEMs built up integrated manufacturing capacities in every major macro-region (Linden 1998; Lüthje et al. 2002), including Mexico for North America, Malaysia and China for Asia and Hungary, Poland and the Czech Republic for Western Europe. The emergence of these regional production networks is not only motivated by low labour costs (compared with in the Triad) and trade regulations but also based on responsiveness and time-to-market.

3.5. Low-cost export-platform: CEE's role in global electronics

In the electronics sector, the past two decades have seen a deepening of European integration that has been paralleled by shifting production capacities from Western Europe to CEE (Labrianidis 2008; OECD 2008). By the late 1980s, Western European electronics firms faced increasing competition from US and Japanese lead firms (Zysmann/Boruss 1994). Against this background, the fall of state socialism provided opportunities for the revitalization of the industry by tapping the cheap but skilled workforce in geographic proximity. In particular, Phillips and Siemens were among the first to invest in the CEE region in the first half of the 1990s, first via the acquisition of state assets in the privatization process and later through greenfield investments. A second wave occurred from the mid-1990s onwards, driven particularly by CEMs that started to establish integrated manufacturing capacities close to the final markets in Western Europe (Lüthje/Sproll 2004; Radosevic 2002).

Against this background, in particular Hungary, Poland and the Czech Republic have come to play a major role as low-cost production platforms (Radosevic 2004). In the late 1990s, these relocations can at least partly be described as 'complementary specialization', where plants in Western Europe were involved in higher-value and more capital- and knowledge-intensive production activities and plants in CEE in labour-intensive, low-value production steps (Lüthje/Sproll 2004; McGowan et al. 2004). However, relocation dynamics soon became more complex, and in particular CEMs also relocated higher-value and more complex production activities to their plants in CEE (Hürtgen et al. 2009). In the context of the burst of the 'new economy bubble' in 2001, CEMs increased relocation of plants from Western Europe to CEE but more importantly to Asia. Within CEE, relocations occurred further eastwards, which is reflected in the emergence of newcomer countries such as Romania, Bulgaria and the Ukraine (Frost & Sullivan 2007; Hannon 2006). Further, CEMs tried to transform more established regional production locations in CEE to produce higher-value, lower-volume products previously manufactured in Western Europe. These trends of further relocations to low-cost locations and upgrading attempts at existing capacities in higher-cost regional hubs have been accelerated in the context of the global economic crisis of 2008-09 (Sturgeon/Kawakami 2011).

Table 2 shows the development of electronics exports from the CEE region. Exports are concentrated in Hungary, the Czech Republic, Poland and Slovakia. In 2011, they accounted for 27 percent, 26.9 percent, 15.6 percent and 11.4 percent of total CEE electronics exports, respectively, which adds up to 80.9 percent. Within this group, Hungary emerged as a key exporter country by 2000 and accounted for almost half of total CEE electronics exports by then. Since 2000, the Czech Republic, Poland and Slovakia have raised their share, and Romania could catch up, particularly in the late 2000s.These exports are driven by different lead firms and contract manufacturers. Within CEE, Hungary remains a key spot for CEMs and Romania the 'new hotspot', whereas the Czech Republic has increased its electronics exports thanks to ODM investments, including from Foxconn. Polish and Slovak exports are mainly related to Asian OBMs in the consumer electronics industry (Plank/Staritz 2011).

Table 2: CEE's electronics exports, 1995-2011

	1995		2000		2004		2008		2011	
	US$m	%	US$m	%	US$m	%	US$m	%	US$m	%
Hungary	1.016	27.1	8.669	49.4	16.725	45.1	28.341	335	26.172	27.0
Czech Rep.	781	20.8	2.940	16.8	8.312	22.4	21.700	25.6	26.099	26.9
Poland	619	16.5	1.700	9.7	4.411	11.9	12.630	14.9	15.103	15.6
Slovak Rep.	207	5.5	549	3.1	2.073	5.6	10.911	12.9	10.993	11.4
Romania	48	1.3	571	3.3	1.011	2.7	3.098	3.7	6.435	6.6
Estonia	134	3.6	1.269	7.2	933	2.5	857	1.0	3.982	4.1
Russia	351	9.4	684	3.9	954	2.6	1.603	1.9	2.248	2.3
Ukraine	45	1.2	230	1.3	410	1.1	1.673	2.0	1.395	1.4
Slovenia	293	7.8	462	2.6	681	1.8	1.102	1.3	1.239	1.3
Bulgaria	49	1.3	97	0.6	298	0.8	858	1.0	1.131	1.2
Croatia	107	2.9	144	0.8	623	1.7	1.046	1.2	822	0.8
Latvia	21	0.6	47	0.3	125	0.3	332	0.4	637	0.7
Lithuania	78	2.1	180	1.0	504	1.4	543	0.6	593	0.6
CEE	3.750	100	17.543	100	37.060	100	84.694	100	96.850	100
World	809.024		1.287.907		1.679.386		2.311.516		2.610.408	

Notes: Ranked by 2011 values; exports as imports from reporting countries.

Source: UN Comtrade.

While electronics production networks in CEE strongly reflect lead firms' strategies, other actors and their policies contributed to the specific type of integration. In particular, since the mid-1990s, governments in CEE, with Hungary and the Czech Republic being most active, have deployed several policies at the national and local level to attract FDI (Linden 1998). These have included, among others, favourable tax regimes, grants, subsidized prices for land and utilities and special economic zones (SEZs) (Plank/Staritz 2011). For instance, the Hungarian government funded the development of 115 industrial parks, which has proven attractive to electronics firms such as Flextronics, IBM, Jabil and Philips (Sass 2004). In addition, governments targeted specific foreign investors that they deemed of strategic importance via special deals. At the local level, authorities have also played an active role in attracting FDI as they provided land and utilities, supported the retraining of workers and even invested in specific facilities (e.g. in improving the airport in Cluj in relation to Nokia's investment in Romania). These liberal policies towards TNCs' investment in the electronics sector in CEE countries are influenced by the legacy of the state socialist past and the neoliberal policies adapted during 'transition' and EU accession (Bohle/Greskovits 2012). Locational decisions have also been based on existing business relations, in particular in the case of Hungary, and industrial capacities built up during state socialism (Linden 1998).

4. Economic and social upgrading experiences in Hungary and Romania

Hungary has emerged as the major production platform for lead firms from Western Europe, and later Asia and the US, which can be seen by the fact that Hungary accounted for the highest electronics export growth rates worldwide between 1996 and 2006 (OECD 2008). Hungary is among the top 15 global electronics exporters (Table 1) and the number one exporter from CEE (Table 2). Compared with established locations in Hungary, Poland and the Czech Republic, the electronics industry in Romania is still in its making. But the investments of major CEMs in recent years, including Flextronics/Solectron, Celestica, Elcoteq, Benchmark, Zollner and Plexus, as well as Nokia', are indicative of the increasing importance of the Romanian electronics industry. Romania's electronics exports increased by more than a factor of 10 between 2000 and 2011 (Table 2).

4.1. Internal economic upgrading

The relocation of more labour-intensive activities in electronics away from Hungary to countries such as Romania, the Ukraine and China can be a positive indicator in terms of internal economic upgrading if such simple, low-value activities are replaced by more complex, higher-value activities. To a certain extent, this seems to be the case in Hungary, as can be seen by the emergence of more knowledge-intensive activities, including the transfer of some R&D-related activities by lead firms such as Nokia, Ericsson and Siemens and CEMs such as Flextronics (Csizmadia et al. 2009; Szanyi 2006). The trajectory of Videoton, the only relevant Hungarian CEM, illustrates the dynamic nature of GPNs and the shifting division of labour. By the end of the century, Videoton employed 16,000 workers in Hungary (Radosevic/Yoruk 2001). In 2008, the number had fallen to roughly 8,000, but Videoton had extended its production capacity in Bulgaria and the Ukraine. Hence, labour-intensive products (e.g. cable loops) are now produced in Bulgaria. The production process within Hungary has become more knowledge-intensive. While Videoton did not have an engineering department in 1995 it employs now around 150 engineers (Meijers et al. 2008).

These internal upgrading processes have, however, been triggered by the burst of the 'new economy bubble' and the subsequent 'dot-com' crises in 2001 that led to a sharp decline in demand and further relocations to low-cost locations (Hürtgen et al. 2009). These relocation pressures were also felt in Hungary, which was perceived as a 'higher-cost' location (within the wider CEE low-cost region). Hence, the expansion of Hungary's electronics industry that characterized the second half of the 1990s lost momentum (Sass 2004). The first major sign in this regard was the relocation of IBM's hard-disk-drive plant to China in 2002. The closure of the largest electronics plant in Hungary led to a job loss of 3,700 employees and a reduction in electronics exports by 5 percent (UNCTAD 2003). Flextronics also moved further east into the Ukraine to assemble circuit boards that supplied the Hungarian Nyiregyhaza plant. Similarly, TDK relocated a Hungarian plant to the Ukraine and Artesyn moved production to Romania (Hunya/Sass 2005). Philips replaced part of its Hungarian production capacity by subcontracting from firms based in the Ukraine (HBD 2003). These relocations to lower-cost production locations in Asia and within CEE underline the 'transitional' nature of electronics manufacturing activities in the context of high competition and lead firms' strategies (Szanyi 2006). In the context of these relocation pressures, the existing, often relatively newly established, production capacities in Hungary had to be transformed to produce higher-value, low-volume products to withstand low-cost competition. Hence, Hungary's production has moved from direct competition with high-volume, price-sensitive items in China and lower-cost CEE countries to production of higher-value and lower-volume products that were previously manufactured in Western Europe.

With regard to Romania, the recent investments of lead firms and CEMs have certainly contributed to the modernization of the sector but activities relocated to Romania tend to be more labour-intensive and less complex, with labour costs and geographical proximity being central investment criteria. However, as most investments in Romania are very recent, the relocation of more complex and higher-value activities could follow. There are relationships between electronics plants in Romania and Hungary: some lower-value production in Romania feeds into Hungarian production.

Thus, although the main motivations for electronics FDI in Hungary and Romania have been low labour costs and flexibility coupled with geographical proximity, important internal economic upgrading processes have, at least in Hungary, taken place. The emergence of more complex capabilities challenges the 'harmonious' view on the division of labour where Western European locations are tasked with higher-value activities and CEE locations carry out lower-value activities as described by 'complementary specialization'. Despite the persistence of hierarchical structures within Europe and also CEE, the move to vertical specialization and reintegration of production processes at the level of CEMs has facilitated at least some internal upgrading processes and has challenged the 'extended work bench' metaphor in the electronics sector in CEE. However, does the partial internal economic upgrading also translate into external economic and social upgrading?

4.2. External economic upgrading: local linkages and spillovers

Integration into GPNs may contribute positively to the development of local industrial structures through spillovers to the local economy. In contrast with the direct transfer of equipment and technology from a parent to an affiliate firm, spillovers involve leakages of knowledge, encompassing both technology and all forms of 'tacit knowledge' related to production, including management and organizational practices, from foreign affiliates to local firms. Based on the assumption that foreign investors enjoy technological advantages and therefore higher levels of productivity, these spillovers, intended or unintended, are assumed to benefit local firms and industries as they can tap the superior knowledge of foreign investors. The potential impact of electronics FDI on spillovers depends on the type of investment, as low-value production activities bear less external upgrading potential than higher-value, more complex and knowledge-intensive activities, pointing to the link between internal and external economic upgrading processes.

Three channels of FDI-related spillovers can be identified (Gallagher/Zarsky 2007; Günther 2003, 2005): (i) supply chain linkages; (ii) labour markets and human capital spillovers; and (iii) technology and knowledge spillovers through demonstration effects. The latter two can work both at the horizontal (intra-industry) and the vertical (inter-industry) level. Working for TNCs or the investment of foreign investors in the workforce can provide workers with knowledge and skills, the benefits of which may not be completely internalized, as knowledge embodied in the labour force may be carried over to local firms through labour mobility. Demonstration effects might generate spillovers as local producers are exposed to the foreign investor's products, marketing strategies and production processes. Demonstration can involve the imitation or reverse engineering of foreign firms' technology or the adoption of higher standards (e.g. production, quality, environmental and labour).

The most significant vertical spillovers are likely to happen through the first channel. Linkages can be categorized in backward linkages that occur when local firms become input or service suppliers in the supply chains of foreign investors and forward linkages that emerge when the goods and services provided by foreign investors are used as inputs in local industries. Given the export focus of electronics firms integrated in GPNs in Hungary and Romania, only backward linkages are relevant (Csizmadia et al. 2009).

The remarkable growth of the electronics manufacturing industry in Hungary and the parallel transformation of the sector's production profile are widely interpreted as successful modernization of the sector (Szanyi 2006). This boom has certainly helped stimulate growth and exports as well as create jobs and reconfigure the activities carried out by TNCs' plants, but had not led to a significant emergence of local linkages that could increase the capabilities of local firms and local value added, change local industrial structures and increase the territorial embeddedness of the industry. Indeed, the role of local firms as suppliers in electronics GPNs has remained below expectation in Hungary and Romania. In Hungary, the large, export-oriented greenfield investments of Flextronics, Philips, IBM or Samsung had a maximum share of 10 percent of local supplies, which includes 'purely' locally owned firms and foreign-owned firms located in Hungary (Csizmadia et al. 2009; Sass 2008).

In Romania, case study evidence from major electronics manufacturing firms supports this picture, as locally owned firms play a minor role as suppliers to foreign owned plants (Plank/Staritz 2011). Hürtgen et al. (2009) state a share of local suppliers of only 3 to 5 percent based on case studies of CEMs in Hungary, Poland and Romania. If local firms participate, they are generally found in second- or third-tier positions and produce non-electronic components (e.g. metal sheets) and consumables (e.g. chemicals) or inputs such as packaging and paper, or provide service activities such as catering, cleaning or guarding. Those activities are obviously not key to economic upgrading as they do not relate to the core products.

The limited emergence of local backward linkages can be addressed from two perspectives. First, one can search for factors in the local sphere, generally discussed under the headings of 'missing absorptive capacity' or 'performance gaps' in the FDI literature (Bellak 2004). The lack of technological and organizational capacity of local firms is often highlighted as a key obstacle to supplier integration. Indeed, small and medium-sized enterprises (SMEs) in Hungary and Romania often do not meet the size and quality requirements necessary to qualify as supplier for TNCs (Sass 2008). In particular, the missing layer of medium-sized firms that have the technological capabilities and financial strength to supply large-scale batches is generally pointed out as a major obstacle (Szanyi 2002).

Second, one can analyse the limited involvement of local suppliers against the background of changing industrial structures of global electronics production (Phillips/Henderson 2009). Given the established structures within these networks, including the organizationally and geographically concentrated supply base, there might be little room for potential local suppliers – regardless of their capabilities. When lead firms or ODMs/CEMs relocate to CEE countries, they already have established sourcing relationships that they use for their manufacturing activities on a global scale. Some of those more important suppliers even relocate with lead firms and ODMs/CEMs (so called 'follow-sourcing'). For instance, when Nokia relocated to Romania it 'invited' its key suppliers, including Chinese BYD (batteries, enclosures), Finish Hansaprint (manual printing) and Finish-Swedish Stora Enso (packaging), to co-locate into its new industrial park near Cluj (Plank/Staritz 2011). Also, the common industry practice to negotiate supply contracts at the global level between headquarters acts as a substantial entry barrier and leaves little autonomy for local management when it comes to deciding on the role of local suppliers. The decision power of ODMs/CEMs is further reduced as lead firms often specify supplier lists – so-called 'approved vendor lists' (AVLs) – which ODMs/CEMs have to use for their orders.

Hence, the strategic interest of TNCs (be they lead firms or ODMs/CEMs) might not allow for a more significant involvement of local suppliers that goes beyond the production of non-core products and services (Phillips/Henderson 2009). The limited success of the Hungarian government's programmes targeted at SMEs points in this direction. Despite active participation of SMEs in the programmes since the late 1990s and the parallel improvement of their capabilities, TNCs generally did not show particular interest in these new potential

suppliers (Plank/Staritz 2011). This has in some cases led to TNCs repaying public funds, as they could not meet the requirements to involve local suppliers. Similar problems were reported with regard to the Polish government's efforts to promote local linkages (Hürtgen et al. 2009). In Romania, such government initiatives do not exist so far. Thus, the prevailing business model, which relies heavily on imported inputs, primarily from Asian plants, or on inputs manufactured by established foreign-owned suppliers that relocate with the TNCs, may have been underestimated as a key reason for the limited integration of local firms in electronics GPNs. Initial government initiatives were not aware of the limited opportunities related to follow-sourcing.

As a result of these limited linkages and 'superficial embeddedness', the potential for spillovers is weak. Indeed, in Hungarian electronics manufacturing, there were 'very few exceptions, where special circumstances induced multinationals to be active in promoting linkage creation or transferred preparatory knowledge and technology to potential local suppliers' (Szanyi 2006: 20f).

The evidence for the existence of spillovers through labour markets/human capital and demonstration is also at best mixed (Gallagher/Zarsky 2007; Günther 2005). As regards workers' inter-firm mobility, while the proportion of expats in management positions and high-skill jobs used to be high, this has changed; today, locals hold the majority of management positions and skilled jobs in Hungary and to a lesser extent also in Romania. However, it is generally unattractive to switch from a foreign TNC to a local firm, as the latter cannot afford to offer comparable conditions for skilled work and management positions where spillovers are potentially the highest. Along the same line, the image of a 'modern', 'Western' TNC is not to be underestimated on a cultural level. Also, launching one's own business is rather difficult in the Hungarian and Romanian context, as there has been a historical bias in CEE towards large firms to the detriment of start-up firms and SMEs when it comes to public support and access to finance (Narula/Bellak 2009). Finally, the scope for skills enhancement and learning opportunities for un-/semi-skilled workers remains limited from the onset, given the strict standardization of TNCs' work processes (Hürtgen et al. 2009).

With regard to spillovers via demonstration, the predominant model of geographically concentrated large production plants, often located in industrial zones or parks, limits the potential for spillovers resulting from imitation, as these geographical agglomerations tend to be 'isolated islands' with little external cluster effects. '[A]ccording to the definition, clusters are characterized by intensive cooperation, companies in clusters operate in a tight network. As for Hungarian industrial districts, there are no intensive linkages among the firms, or among firms and institutions. In the Hungarian growth-poles the co-located branch-plants of multinational companies operate isolated from each other' (Szalavetz 2003: 24). Also, the imitation effect might by limited by the fact that some industries in CEE countries are heavily dominated by foreign firms, with very few local firms remaining that could absorb potential spillovers (Narula/Bellak 2009).

4.3. Social upgrading

As we discuss for the Hungarian and Romanian case, the evidence for 'high-tech' jobs arising from participating in electronics GPNs is not very strong. Despite its 'high-tech' and occasionally post-industrial image, the electronics manufacturing industry is still based on a significant amount of labour-intensive activities that require a limited number of skilled workers, while the majority of work consists of repetitive tasks and can be assumed by un-/semi-skilled workers. Hence, the workforce in plants in Hungary and Romania is polarized in a small segment of relatively well-paid, skilled jobs in engineering and management (indirect employees) and a large segment of un-/semi-skilled workers on the lines (direct employees). We now turn to analyse the working conditions of the direct employees (for an overview see Table 3).

A key motive to set up operations in CEE continues to be relatively low wages: in contrast with the perception that foreign-owned plants are islands of high wages, lead firms and CEMs in electronics may even pay wages below the regional average (Hürtgen et al. 2009). A characteristic in the electronics sector is that the variable part of wages is high. In Romanian plants of CEMs, the monthly base gross wage for line operators at entry positions ranges from €192 to €219. The variable wage part accounts for 20 to 40 percent on average. Case study evidence from selected CEMs in Hungary suggests that line operators' gross wages (including base wage and variable bonus payments) range from €280 to €480 (Plank et al. 2009). Even if workers are not as productive as in Western Europe, these modest wages translate into competitive unit labour costs. For instance, line operators in Nokia's plant in Cluj earned €250 on average per month, which was only a small share of what workers in Bochum got for more or less the same activities (Lauer 2009). In addition, they worked in shifts of 12 hours, which was not possible in Germany (Stanescu/Sevianuon 2009).

The flexibility requirements of electronics TNCs are mainly reflected in two ways in working conditions. First, flexible working time models have been established at the plant level and shift work is a common practice, given the industry's need to operate 24 hours a day (Hürtgen et al. 2009). A key concern of CEMs is to effectively manage the fluctuating demand of their customers. Hence, working time at these plants is strongly exposed to the volatility of (consumer) end markets. Further, it seems to be common practice to announce overtime at short hand or to send people home when there are not enough orders. In the latter case, this does, at least occasionally, result in losing annual leave. In Hungary, for instance, the law stipulates that up to 75 percent of total annual leave can be taken in accordance with the business' needs if the workers agree (ibid.). Given the weak bargaining power of line operators, their choices may be rather limited.

Second, different precarious forms of employment are a standard practice, as they help 'stabilize' the volatile business environment. Key advantages from the TNCs' perspective are lower costs (e.g. some benefits are not paid) and higher flexibility, which makes it possible to fire workers on shorter notice. The International Metalworkers Federation (IMF 2007) estimates that currently, in many instances, 50 percent of the labour force in electronics plants consists of temporary workers. The share of temporary workers in major Romanian electronics manufacturing plants ranges between 20 and 30 percent (Plank et al. 2009). According to VASAS, the most important trade union in the electronics sector in Hungary, there were roughly 10,000 'temps' out of roughly 68,000 total employees in the sector, mostly employed by private labour agencies, and only three TNCs – Flextronics, Nokia and Elcoteq – accounted for 70 percent of the total (VASAS 2007).

The strategic 'fragmentation' (Ietto-Gillies 2005) of the workforce not only is pursued along the lines of employment contracts, as reflected in the split between 'core workers' and 'temps', but also has a gender, an ethnic and a migratory dimension. Women are the majority of the line operators, accounting for 60 to 70 percent of the workforce on average in Romanian plants and for around 60 percent in Hungarian plants (Acsády 2008). With regard to ethnic divisions, in early 2005 some 30,000 migrant workers, mostly ethnic Hungarians, commuted to Hungary from depressed regions of Slovakia, where some of them worked for Nokia and Foxconn. Since they were employed via a network of Slovak and Hungarian labour agencies, the TNCs had to pay only the lower Slovak minimum wage (Bohle and Greskovits 2006). In Estonia, the majority of workers in the electronics sector were employed by Elcoteq, the biggest European CEM, in 2008. Between 70 and 80 percent of all employees were women aged between 30 and 40 years, mostly from the northeast, an area with relatively high unemployment and a large Russian-speaking minority (Eamets 2008). More recently, the labour migration from the CEE region towards Western Europe has led some TNCs to look even further for low-wage and flexible labour. BYD's initial plans to staff

its operations in the new Nokia-Park in Cluj with Chinese migrant workers were stopped by the global economic crisis and local trade union efforts.

Table 3: Main social upgrading issues for direct employees in electronics manufacturing in Hungary and Romania

Main social upgrading issues	
Wages	Higher wages than manufacturing average; however, occasionally below regional average; high variable part (20-40%)
Working time	Long and flexible work shifts; flexible working time models; flexible overtime and annual leave
Employment contracts	Split in core workers and 'temps'; precarious forms of employment to lower costs and increase flexibility
Discrimination	Large share of women (60-70%) and ethnic minorities, including plans to bring Chinese migrant workers
Union representation	Weak position of trade unions in context of de-legitimization but structures exist and some successes in organizing plants (including greenfield)
Labour legislation	Protective labour legislation but weakened in context of EU accession, e.g. more flexible working time
Training	Limited opportunities for line workers, except for initial training

Source: Authors' illustration.

These working conditions are related to TNCs' strategies to standardize work on a global level but are also mediated through local institutional and regulative contexts, including the legacy of the state socialist past and the neoliberal policies adopted during 'transition' and EU accession. The weak position of trade unions is a general feature of the global electronics sector. Compared with other low-wage production countries, trade unions structures are quite well established in CEE. However, they were de-legitimized after 1989 as they were perceived to be part of the 'old system' – even if they were newly founded independent trade unions. Their position was further weakened as large parts of the former state-owned firms were privatized or went bankrupt, leading to significant labour shedding and plummeting membership numbers. Despite unfavourable conditions, trade unions in some CEE countries have succeeded in organizing electronics plants, including several greenfield locations (Hürtgen et al. 2009; Plank et al. 2009). For instance, VASAS could successfully organize several plants, including Nokia, Sanyo and Philips, but many of the major players are still hostile towards trade unions, in particular CEMs. In Romania, the former Solectron site was finally organized after a long struggle in the context of the acquisition by Flextronics, but other plants continue to be trade union free zones (Plank et al. 2009).

During the accession process, the national (labour) legislation of CEE countries had to be brought into line with the EU 'acquis'. From the workers' point of view, this has in several cases led to less protective regulations, for example further reduction of night/weekend bonuses and more 'flexible' working time models (Hürtgen et al. 2009). Besides employers' associations that have actively lobbied for more flexible labour laws, the International Monetary Fund (IMF) was also active in this arena. In Romania, after the adoption of a new and comprehensive labour code in 2003 that should prepare the country for accession, the IMF criticized the strong influence of trade unions and the too restrictive regulations regarding working hours, which led to a renegotiation in 2004 between the government, the Council of Foreign Investors and the IMF, without trade unions (EIRO 2004).

5. Conclusions

Much recent debate on industrial and economic development has focused on the merits of 'breaking in and moving up' in GPNs (UNIDO 2009). The underlying assumption is that local firms from developing and 'transition' countries can tap the superior knowledge of TNCs and leapfrog to higher productivity as they 'learn from global buyers' and improve their manufacturing and innovation capabilities. This economic upgrading of local firms has also been thought to benefit workers as the higher-value activities will require more skills and promise better working conditions. The aim of this paper was to assess to what extent this hope has materialized in the CEE region as governments have sought to attract electronics TNCs since the 1990s.

Our analysis reveals that the potential positive effects from TNCs' investment in Hungary and Romania, as reflected in the relevance of local linkages and knowledge spillovers, have remained low and below expectation. While the lack of 'absorptive capacity' of local firms is often cited as a key obstacle to suppliers' integration, this reason may have been overstated. Instead, the competitive dynamics in GPNs may explain limited local linkages. Given the organizationally and geographically concentrated supply base, there may be little room for potential local suppliers – regardless of their capabilities. Hence, the strategic interest of TNCs may not allow for a more significant involvement of local suppliers that goes beyond the provision of non-core products and services. Further, the geographical isolation of foreign-owned plants limits potential demonstration effects, and some industries in CEE countries are heavily dominated by foreign firms with very few local firms remaining, and it is difficult to establish new firms that could absorb potential spillovers.

As regards the promise of 'high-tech' jobs, the electronics sector is still based on a significant amount of labour-intensive activities that require a limited number of skilled workers, while the majority of work can be assumed by un-/semiskilled workers. This relates to changing industry structures, including the rise of CEMs and attempts to standardize work practices across the globe. Against this background, the dominant role of CEMs in the restructuring process in CEE since the mid-1990s has contributed to the prevalence of neo-Taylorist work practices coupled with flexible employment relationships and direct control regimes (Hürtgen et al. 2009). This 'McDonalds' approach (Lüthje 2002) has limited the scope for skills enhancement and learning opportunities for un-/semi-skilled workers from the onset and has resulted in working conditions that are characterized by a polarized work force, relatively low wages with a high variable share, flexible working time regimes and precarious employment relationships, as well as hostility towards trade unions. The social upgrading experiences in Hungarian and Romanian electronics plants shed a differentiated light on the socioeconomic impact of 'high-tech' industries.

As the Hungarian and Romanian upgrading experiences suggest, internal economic upgrading processes do not automatically lead to external economic upgrading as reflected in the emergence of local linkages and knowledge spillovers, nor are they a guarantee for social upgrading. The lack of deeper integration with the host economy results in a superficial territorial embeddedness of TNCs' operations and exposes these operations to relocation threats. Orders of lead firms can shift easily between production plants of ODMs and CEMs, between different ODMs/CEMs or between different plants of the same ODM/CEM, which puts plants and locations under permanent relocation pressures as they are subject to the global relocation strategies of lead firms and ODMs/CEMs. In the context of permanent relocation pressures, the achieved internal economic upgrading is also highly contested, as locations are constantly 'benchmarked' against each other and fighting for orders. Thus, economic upgrading in the electronics sector in Hungary and Romania remains a highly precarious process given the short-termism and the related insecurities in the industry (Hürtgen et al. 2009).

These findings question the development model based on FDI and integration into GPNs whereby governments have sought to attract TNCs' investment and hoped for the development of local suppliers and industrial structures that are characterized by decent working conditions. FDI, in particular in electronics, is praised as an important part of countries' industrial development processes and support from national and local governments is usually justified by the positive contributions that foreign investors make to the national and local economy. Certainly, exports and jobs have arisen from these investments, as well as (at least to a certain extent) internal upgrading processes. However, the positive longer-term impact on local firms and workers is not straightforward, which means there are significant questions as to whether the significant levels of largely unconditional government support for electronics FDI are justified and whether government resources should not be used for more proactive and interventionist policies to create linkages and build up local industrial structures.

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