



Open Access Repository

www.ssoar.info

Skill formation, automation and governance: comparing German and Korean automotive manufacturers in Central-Eastern Europe

Krzywdzinski, Martin; Jo, Hyung Je

Postprint / Postprint

Zeitschriftenartikel / journal article

Zur Verfügung gestellt in Kooperation mit / provided in cooperation with:

Wissenschaftszentrum Berlin für Sozialforschung (WZB)

Empfohlene Zitierung / Suggested Citation:

Krzywdzinski, M., & Jo, H. J. (2020). Skill formation, automation and governance: comparing German and Korean automotive manufacturers in Central-Eastern Europe. *Critical Perspectives on International Business*. <https://doi.org/10.1108/cpoib-02-2020-0007>

Nutzungsbedingungen:

Dieser Text wird unter einer CC BY-NC Lizenz (Namensnennung-Nicht-kommerziell) zur Verfügung gestellt. Nähere Auskünfte zu den CC-Lizenzen finden Sie hier: <https://creativecommons.org/licenses/by-nc/4.0/deed.de>

Terms of use:

This document is made available under a CC BY-NC Licence (Attribution-NonCommercial). For more information see: <https://creativecommons.org/licenses/by-nc/4.0>

Krzywdzinski, Martin; Jo, Hyung Je

Article — Accepted Manuscript (Postprint)

Skill formation, automation and governance: comparing German and Korean automotive manufacturers in Central-Eastern Europe

Critical perspectives on international business

Provided in Cooperation with:
WZB Berlin Social Science Center

Suggested Citation: Krzywdzinski, Martin; Jo, Hyung Je (2020) : Skill formation, automation and governance: comparing German and Korean automotive manufacturers in Central-Eastern Europe, Critical perspectives on international business, ISSN 1758-6062, Emerald, Bingley, Iss. EarlyCite Articles,
<http://dx.doi.org/10.1108/cpoib-02-2020-0007>

This Version is available at:
<http://hdl.handle.net/10419/225643>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by-nc/4.0/>

Skill Formation, Automation, and Governance: Comparing German and Korean automotive manufacturers in Central Eastern Europe

Martin Krzywdzinski (WZB Berlin Social Science Center), Hyung Je Jo (University of Ulsan)

Authors' accepted manuscript (4 September 2020), published in *Critical Perspective on International Business* (2 October 2020), DOI [10.1108/cpoib-02-2020-0007](https://doi.org/10.1108/cpoib-02-2020-0007)

This AAM is deposited under the [Creative Commons Attribution Non-commercial International 4.0 \(CC BY-NC 4.0\) license](https://creativecommons.org/licenses/by-nc/4.0/). This means that anyone may distribute, adapt, and build upon the work for non-commercial purposes, subject to full attribution. If you wish to use this manuscript for commercial purposes, please contact permissions@emerald.com.

Abstract

Building on neo-institutionalist models of the transfer of HRM practices within multinational companies, this article analyzes the transfer of skill formation concepts using the cases of two automotive OEMs in Slovakia. The purpose of the article is twofold. First, it aims to explain the differences between the two multinationals. Second, it builds on the empirical analysis to reconsider the neo-institutionalist theoretical framework.

The article is based on two qualitative case studies of automotive multinationals in Slovakia. The home country locations of both companies represent different approaches to skill formation: systematic vocational education for blue-collar workers is regarded as crucial at the German manufacturer, while the Korean company relies mainly on on-the-job-training and puts much less emphasis on skilled blue-collar work.

The article shows that the differences between the companies are related to different understanding of technology/automation. It argues that the increasing automation and the decentralization of responsibilities for the product-launch processes supported the transfer of German skill formation concepts to the plant in Slovakia, while the Korean manufacturer's specific engineering-led automation concept and centralization of product launch responsibilities in its Korean headquarters reduced the need to invest in skill formation for blue collars abroad. The article concludes that theories of the transfer of HRM practices within multinationals must include technological factors, and must also develop more specific concepts of the centralization of multinationals.

The article is to our knowledge the first to include technology as a core variable into the neo-institutionalist theory in the field of international business and HRM. While the relationship between technology and organization has gained huge prominence in the recent discussions about digitalization, it has been so far neglected by scholars of international business.

1. Introduction

The skill-formation practices of multinational company (MNC) subsidiaries have often been studied within a (neo)institutionalist framework (Kostova et al. 2008). The major argument here has been that multinationals operate in diverse organizational fields. Therefore, any analysis of multinationals' skill-formation should link the macrolevel of institutional differences between the company's home and host countries, the mesolevel of headquarters-subsidiary relations within the multinational companies, and the microlevel of politics and institutional entrepreneurship among managerial actors (Fortwengel and Jackson 2016; Jürgens and Krzywdzinski 2016). In this paper, we build on the institutionalist literature but propose two extensions to the existing theoretical framework. First, we argue that we have to introduce technology as an important factor influencing the skill-formation practices of MNC subsidiaries. Second, we argue that we have to specify how centralized power and competences are within multinational companies to a greater extent than has occurred in the dominant approaches (e.g., Bartlett and Ghosal 1989; Kostova et al. 2018). In order to understand skill-formation, we will particularly focus on the division of labor between the headquarters and the production plants in the ramp-up process for new products. The inclusion of these two points represents the innovative contribution of this paper to the research debate.

Our focus is on skill formation in the blue-collar area. We develop our theoretical model using the cases of a German and a Korean automotive OEM in Slovakia. Both companies are leading global automobile MNCs with a strong presence in emerging economies. Both have been producing in Central Eastern Europe (CEE) for a long time. Their factories in Slovakia (and other CEE countries) have performed excellently, not only within the group but also worldwide.

The skill-formation practices of the two companies differ considerably. Put simply, vocational training and the recruitment of well-trained blue-collar workers are regarded as crucial at the German company, while there is much less emphasis on skilled blue-collar work at the Korean manufacturer. The educational systems in the companies' home countries as well as the traditions of labor relations are particularly important. The German company is characterized by the highly cooperative labor relations it maintains and by the status accorded to skilled workers in the company (Jürgens and Krzywdzinski 2016). The Korean manufacturer, by contrast, has a long history of antagonistic labor relations, which has led the management to a strategy that avoids a reliance on skilled blue-collar work (Jo and You 2011). In this paper, we will argue that these different approaches to skill formation are also linked to different understandings of technology, and, in particular, automation. These differences are reinforced by different relations between headquarters and subsidiaries. For a long time, the transfer of the German company's home-country skill-formation practices to Slovakia was fairly minimal. Only in 2015/16 did it substantially expand its vocational education and training (VET) programs. We show how the increasing automation and the decentralization of responsibilities for the product-launch processes supported investments in skill formation in the German case, while the Korean company's specific automation concept and centralization of product launch responsibilities in its Korean headquarters reduced the need to invest in skill formation abroad.

2. Transferring skill formation practices: theoretical framework

Research on skill-formation practices in MNC subsidiaries has been dominated by (neo)institutionalist approaches. We focus here on skill formation for blue-collar workers including (a) the recruitment and training policies for skilled workers (company-internal programs and cooperation with vocational schools), and (b) the long-term personnel development approaches (career paths) of this group (vertical/hierarchy careers and horizontal careers).

2.1 The (neo)institutionalist model

Skill formation represents a particular challenge for multinational companies. On the one hand, it is one of the core HRM practices. In particular in industries and companies characterized by high standardization of products and production systems – such as the automotive industry –, multinational companies have to assure a certain level of standardization of skill formation, which often takes the form of transferring skill formation approaches from their home countries (Chiang et al. 2017; Pudelko and Harzing 2008; Rosenzweig 2006). On the other hand, skill formation approaches are embedded in specific institutional conditions, in particular the educational system and labor relations, which make the transfer of practices particularly difficult (Busemeyer and Trampusch 2012; Crouch 2005). Research has shown that MNC's success in transferring their skill-formation practices (as well as other HRM practices) depends on a number of factors, including their compatibility with host-country institutions (Kostova 1999). Kostova et al. (2008) coined the term “institutional distance” to describe the extent of differences between home-country and host-country institutions. Research on the transfer of production and personnel systems in the automotive industry has accordingly found that the interaction of home-country and host-country effects leads to a hybridization of MNCs' HRM practices and production systems (Boyer et al. 1998).

Yet, recent publications have shown that arguments about the role of institutional distance and hybridization of MNC policies may have been exaggerated. Jürgens and Krzywdzinski (2016) showed that Volkswagen and Toyota have successfully transferred their skill-formation practices globally (see also Florida and Kenney 2000; Shibata 2008). A prerequisite was a strong formal standardization of practices and—in the case of Volkswagen—institutional entrepreneurship, i.e., a commitment to establishing vocational education and training institutions in countries with Volkswagen plants. Standardization facilitates the process of global transfer and the implementation and learning of practices at multinational sites abroad (Herrigel et al. 2013). In some cases, MNCs have relied solely on internal company standards; when transferring them, they have isolated themselves from host-country institutions (e.g. Toyota). In other cases—especially in the case of German companies—they have tried to influence host-country institutions and thus implemented their own concepts (Fortwengel 2017a; Jürgens and Krzywdzinski 2016). The role of institutional entrepreneurship of MNCs when transferring their skill-formation practices has also been emphasized in some publications (Ferner et al. 2012; Fortwengel and Jackson 2016; Wiemann and Fuchs 2018), while others have stressed the role of initiative-taking by subsidiaries (Dörrenbächer and Gammelgaard 2016).

2.2 The role of technology

The role of technology has been so far neglected in the “conventional” model of the transfer of HRM practices in MNCs, even though the insight that skill requirements and thus skill-formation practices are related to the technology used is regarded as common sense in research. In the field of industrial sociology, a number of classical studies (Piore and Sabel 1984; Kern and Schumann 1984; Adler 1988) have argued that there is a positive correlation between technology (and automation) and skill levels. In the economic discussion, similar arguments have been made in the context of skill-biased technological change theory (Autor et al. 1998; Antonietti 2007; Brynjolfsson and McAfee 2014; Katz and Margo 2014). Based on this research, we can therefore expect the technological level of the subsidiary as compared with the headquarters to be important for the transfer of skill-formation practices within MNCs.

However, several studies in the sociology of work have shown that there is not a deterministic connection between the level of technology (or automation) and skill-formation practices (Briken et al., 2017; Hall, 2010). This is because the same technologies can be used with different forms of work organization. Highly automated processes can be accompanied by a strongly polarized form of work organization or by a broad distribution of responsibilities and skill requirements between different groups of employees (Krzywdzinski 2017; Hirsch-Kreinsen 2016; Jo and You 2011; Jürgens et al. 1993). The impact of technology on work depends on factors such as the type of technology, the organizational context, the technology selection and implementation processes (Liker et al. 1999).

Research on automation approaches of automotive companies (Adler 1988; Jürgens et al. 1993; Fujimoto 1997) showed that even in this industry which is characterized by strongly standardized products and production systems, different strategies are possible with regard to the combination of technology on the one hand and skill formation and work organization on the other. In the German automotive industry, the orientation towards high-tech automation in the 1980s and 1990s was accompanied by a strategy of upskilling and professionalization of production work (Jürgens et al. 1993; Kuhlmann 2004); this was true at least in highly automated areas such as car body construction, while assembly areas continued to be characterized by high shares of semi-skilled workers. Automation approaches of Japanese companies emphasized flexibility and were accompanied by a strong emphasis on qualification and personnel development, which included production workers. However, this did not take the form of formal vocational training but rather of internal company development paths (Jürgens and Krzywdzinski 2016; Adler 1988). In the American case, by contrast, the studies of the 1980s and 1990s reported a continued orientation toward Taylorist forms of work organization, persistently tight job demarcations and very limited investment in training (Jürgens et al. 1993; Adler/Cole 1993) - a development that continued into the 2000s (Rothstein 2016).

We can understand the different strategies pursued by companies as expressions of different “technological frames of reference” in the sense of Orlikowski and Gash (1994; cf. Jones and Orlikowski 2009; Wajcman 2006). These two authors dealt with how employees perceive and make sense of information technologies. They defined technological frames as the “assumptions, expectations, and knowledge” actors use to understand technology (Orlikowski and Gash 1994: 17). They emphasized that this also includes understandings of the “specific conditions, applications, and consequences of that technology in particular contexts” (Orlikowski and Gash 1994: 17). While the concept of “technological frames” has mainly been used in research on information technologies (Olesen 2014; Treem et al. 2015), it also provides a very fruitful basis for analyzing the development and implementation of automation technologies. In turn, the technological frames of companies develop in a specific institutional

context and are influenced, for example, by the educational systems and also industrial relations at the locations of the companies (Jürgens and Krzywdzinski 2016; Haipeter and Jo 2020).

We can thus specify the role of technology in our theoretical model as follows: We expect the skill-formation practices of MNC subsidiaries to be influenced by the technological level of the subsidiary as well as by the technological frames that define the understanding of automation in the company.

2.3 The role of governance

The second important factor we want to emphasize is the centralization or decentralization of responsibilities within multinational companies. This factor has been at the core of the research on headquarters-subsidiary relations in MNCs (Kostova et al. 2018; Hoenen and Kostova 2015; Perlmutter 1969; Heenen and Perlmutter 1979). The classical MNC strategy literature (e.g., Bartlett and Ghosal 1989) has developed different models of headquarters-subsidiary relations in MNCs. Bartlett and Ghosal (1989), for instance, distinguished between the (decentralized) multidomestic model, the (centralized) global model, and the (decentralized but coordinated) transnational model. Concepts for measuring the centralization of rules and practices in MNCs were developed in the 1980s (e.g., Ghosal and Noria 1989; Gates and Egelhoff 1986; Otterbeck 1981); they were further adapted in the following decades (e.g., O'Donnell 2000) and are still used today (cf. Harzing and Noorderhaven 2008; Lee et al. 2017).

A fundamental characteristic of these approaches is that the centralization of responsibilities is measured in a very generic way. Ghoshal and Noria (1989; see also O'Donnell 2000) measured centralization using four items related to the extent of subsidiary responsibilities (ranging from no responsibility to sole responsibility) for the four dimensions (1) the introduction of new products, (2) changes in product design, (3) changes in manufacturing processes, and (4) career development plans for senior managers. Gates and Egelhoff (1986) used a more detailed list of items in the dimensions of (1) marketing, (2) manufacturing, and (3) finance, where the “manufacturing” dimension contained items related to decisions about subcontracting, production schedules, manufacturing processes, purchasing activities, and quality control.

All these dimensions certainly play a role in the skill-formation practices of MNC subsidiaries. For instance, if subsidiaries are responsible for product development, they have to build up the necessary skills and competences. However, the very generic questions on whether MNC subsidiaries can take decisions on product development or on changes in manufacturing processes do not enable researchers to establish a clear linkage between the subsidiaries' responsibilities and the skill requirements. Changes in a manufacturing process can entail small, routine adaptations of the process or bigger leaps in automation. Furthermore, it is striking that research on the transfer of HRM practices has (with a few exceptions, e.g. Ernst 1997, Adler 1999, Terwiesch et al. 2001) completely ignored the most important point with regard to the distribution of manufacturing competences between headquarters and subsidiaries, particularly in its concepts for measuring the centralization of decisions in headquarters-subsidiary relations: *responsibility for product ramp-up processes*. Our paper focuses on this point and tries to contribute to a further development of theoretical knowledge about MNC governance and especially about the centralization of decisions in MNCs.

Product ramp-ups are a particularly critical process, as has been shown in sociological research on manufacturing and engineering processes. In the automotive industry, product ramp-ups can take from several months to a year, which is the time required to achieve the

anticipated productivity and quality. The ability to quickly ramp up products has large cost reduction potential for companies. The product ramp-up process consists of several phases (see Surbier et al. 2014; Winkler et al. 2007; Clark and Wheelwright 1992): (1) the conception and planning of the production processes as well as the manufacture or procurement of the required equipment and tools, (2) pre-series production, in which the production technologies and processes are tested, and (3) the start-up of series production up to full capacity production in the desired quality and productivity. Product ramp-ups (and introduction processes of new technologies) require close cooperation between product development, planning, and production, which places considerable demands on the skills of the workforce (cf. Clark and Fujimoto 1991; Jürgens 2000). During such ramp-ups, any remaining problems with the so-called manufacturability of a product are uncovered, as are potential problems with the design of production processes and with the functioning of production technologies.

Only a few studies on MNCs have explicitly addressed strategies in product ramp-up processes, and there is a considerable variance in possible approaches. One strategy is to strongly centralize product ramp-up competencies in the corporate headquarters. This reduces the need for skill development at foreign production locations. Ernst (1997), for example, showed that in the 1990s, product ramp-ups in Chinese plants of Japanese electronics companies were prepared and run by teams from the Japanese headquarters—the Chinese plants had hardly any competencies in the whole process. According to Ernst, this resulted from a strategy of risk minimization, which the Japanese management adopted due to the Chinese locations' limited experience and also the limited knowledge of the Japanese management about the conditions in China.

Other studies have identified strategies that are based on a close exchange between headquarters and production sites. In a study on the data storage industry, Terwiesch et al. (2001) argued that the successful ramp-up of products by an American company at production sites in Singapore required a massive exchange of personnel (a large number of employees from Singapore spent almost half a year in preparation in the USA), the intensive use of communication platforms, and the complete transfer of production equipment and software from the USA to Singapore. Apparently, the skills of the employees at the production site were an important point here. The study by Adler et al. (1999) on the product ramp-up processes in the NUMMI joint venture between Toyota and General Motors can be interpreted in a similar way. NUMMI had a so-called mother plant in Japan (Takaoka), where product ramp-up always took place first. In case of new product introduction at NUMMI, a pilot team of engineers and workers was formed at an early stage to organize communication between the product development, process engineering, and manufacturing teams and thus to prepare the ramp-up. This pilot team was sent to Japan, where it participated in the ramp-up of production at the Takaoka plant. Afterwards, the team was responsible for coordinating the preseries production and the start of series production at NUMMI with the support of Japanese expats and on the basis of the production equipment sent from Japan. This process ensured that the skills required to master the product ramp-up were developed in the American factory.

2.4 Heuristic framework

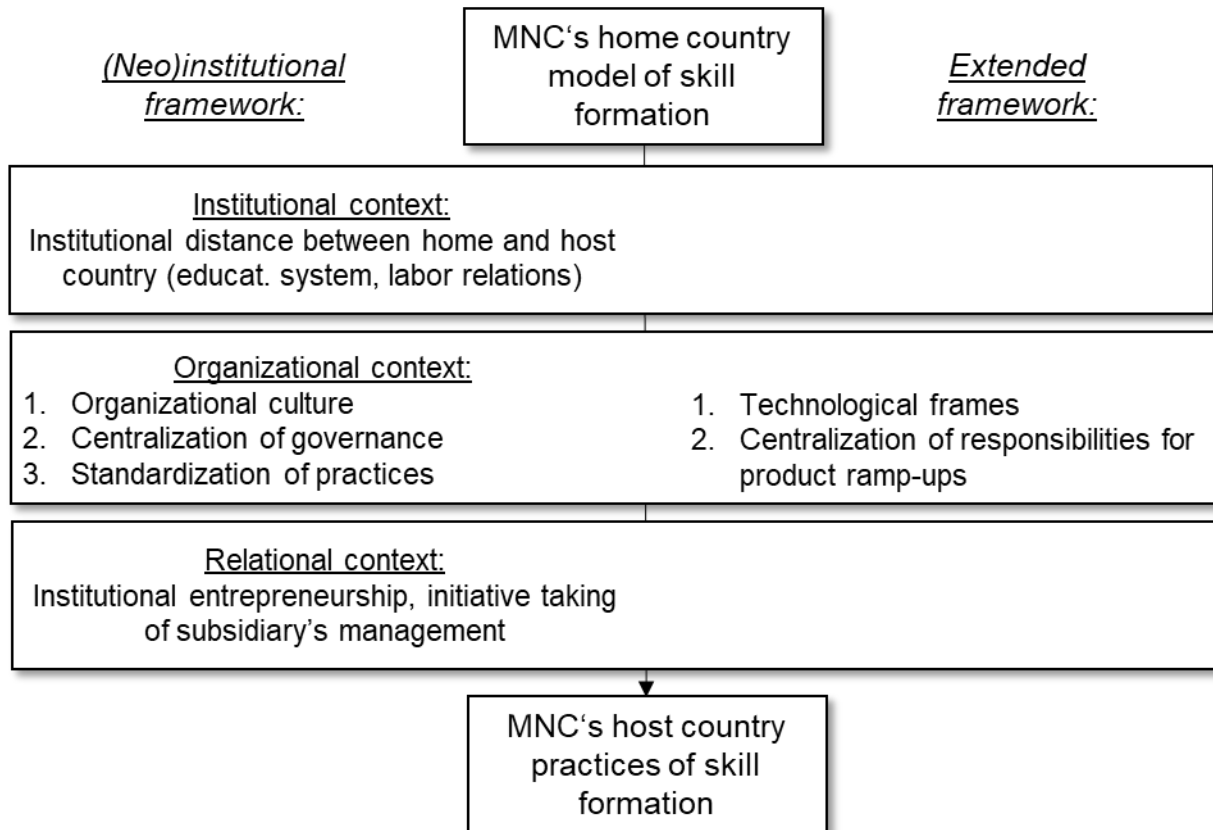
To sum up, our heuristic framework focuses on two major factors influencing skill-formation practices in foreign locations of MNCs: technology and the centralization of competences in the company regarding production ramp-up (Figure 1). We see these firm-level factors as an important extension of the conventional (neo)institutionalist approach.

We understand the conventional (neo)institutionalist framework as including the institutional context (the institutional conditions in the MNCs home country, the institutional distance between the home and host country), the organizational context (the centralization and standardization of rules and practices in the company, the organizational culture), and the relations between headquarters and the subsidiary of the MNC (institutional entrepreneurship of the MNCs management, initiative taking by the subsidiary's management).

In our extended framework, we add two factors to the organizational context. First, we emphasize that technology and technological frames have to be considered as an important factor influencing MNCs' skill-formation practices in their host countries. We see technological frames as part of the organizational culture. In addition, we expect that the technological level of the subsidiary influences the extent to which MNCs will try to transfer their home country practices of skill formation. It should be noted that the technology (e.g. automation approaches) and the technological frames (i.e., the assumptions about the application and consequences of the technology for the organization) of the companies themselves are *influenced* but *not determined* by the economic and institutional conditions (see Section 2.2).

Second, we argue that for our specific topic – the analysis of skill-formation practices for blue-collar workers in manufacturing companies –, we have to go beyond very generic conceptualizations of governance centralization. We suggest focusing on responsibilities for product ramp-ups as a core process with strong influence on skill requirements in the blue-collar area and as a way how to operationalize governance centralization.

Figure 1: Theoretical model for the transfer of skill-formation practices in MNCs



3. Methodological approach and data

The analysis is based on comparative case studies of skill-formation practices at a German and a Korean automotive company in Slovakia – hereafter called GerCar and KoCar. A case study approach was chosen in order to analyze the complex processes and mechanisms influencing the development of MNCs’ skill-formation practices across national borders (Edwards et al. 2007; Yin 2009).

We selected the two cases that are the most similar in terms of the sector, the product, the manufacturing processes, and the technological level—both are successful automobile mass producers with high automation levels—but they differ with regard to skill-formation practices and the two factors of interest to us: the division of labor, more specifically the governance of responsibilities between the headquarters and the global subsidiaries and the understanding—or framing—of technology (see Gerring 2007). We will discuss these differences in Section 4. It is worth emphasizing that we do not benchmark the companies. Both selected cases are highly successful plants, both master high automation and quick product ramp-up processes. They do it, however, with different skill formation approaches.

Table 1 presents basic information about both cases. GerCar’s presence in Slovakia goes back to the beginning of the 1990s. In the 1990s, the plant underwent continuous modernization of its production equipment and product range. Its current production program includes SUVs as well as small A segment cars. The fact that the small car production line includes traditional combustion engine powertrains as well as pure electric powertrains further

increases the product complexity. All these products are produced exclusively in the Slovak plant.

Table 1: Basic information about the cases

	GerCar	KoCar
Employees (2017)	14,000 (including transmission and component production)	3,800 (including engine assembly)
Products	A-segment and SUVs	C-segment and small SUV
Capacity	400,000	300,000

KoCar was founded in the mid-2000s and was the company’s first site within the EU. The factory employs 3,800 workers. The main products of the factory have been C-segment sedans and a small sports utility vehicle (SUV). The sedans were developed for the European market and are produced exclusively in Europe. The SUV is produced in Korea, China, and Europe.

The analysis is based on in total 26 in-depth one-hour to two-hours interviews. We focused on interviews with managers responsible for setting up the plant’s skill-formation practices, for example, representatives of HR management (including persons responsible for the training programs) and production management, both in the companies’ headquarters and the Slovak subsidiaries. The case study of GerCar draws on interviews conducted from 2014 to 2016 in the context of two projects on global production and HRM standards at automotive manufacturers (cf. Jürgens and Krzywdzinski 2016) and follow-up interviews conducted from 2018 to 2019.ⁱ In this article, we used four interviews conducted with HR representatives in the company’s German headquarters, as well as nine interviews with representatives of the Slovak HR management, production management, and the heads of different areas (pilot center, maintenance, body shop, paint shop, assembly shop).

The case study of KoCar draws on interviews conducted from 2014 to 2017 as part of a research project on the global strategies and productions system of Korean transnational corporations (cf. Jo et al. 2017) and follow-up interviews conducted in 2018–2019.ⁱⁱ In this article, we used six interviews with R&D, pilot center and personnel management representatives in the company’s Korean headquarters, as well as ten interviews with representatives of the HR management, production management, and the heads of different departments (maintenance, assembly shop).

The data used in the case studies stem from different projects which shared, however, a number of core questions and the methodological approach. We interviewed the same types of actors in both companies. The interviews lasted one to two hours and used semi-structured questionnaires with questions related to (a) the development of employment and skill structures in the plants, (b) the development of the production system and technology in the plants, (c) global standards for skill formation and (d) evolution of skill-formation practices in the plants. We supplemented the interviews with analyses of documents provided by the companies. We consider the similarity of the research design and empirical approaches in our projects as sufficient to assure the comparability of both case studies.

4. The skill-formation practices—the home-country perspective

The research on MNCs and their skill-formation practices has emphasized the transfer processes of home-country practices to the subsidiaries as well as the institutional factors that promote or hamper this transfer. Our analysis therefore starts by presenting the home-country skill-formation approaches of both companies.

4.1 GerCar in Germany

The major institutional factor influencing skill-formation practices at the company level is the skill-formation system—in the German case, the vocational education system. Skilled work at GerCar (and in German firms in general) means that workers have completed a formal vocational training program based on the dual approach, i.e., a combination of school and in house training that leads to a qualification that is recognized beyond the company. Around 1,500 apprentices begin training in all German GerCar plants annually. The standardization of vocational qualifications in the German system implies uniform, industry-wide quality criteria, which are adapted in line with changes in company requirements. Due to the merging of previously specialized fields of competence, new occupational profiles have emerged in recent years. The dual system means that training takes place partly in a public vocational school and partly in the company. As a general rule, practical training at GerCar is becoming increasingly important. Looking at how apprenticeship time is spent in the company, in the past, 60 percent used to be spent in the training workshops and around 40 percent in various production areas. Today, the ratio is reversed.

The contents of vocational education include both subject-specific knowledge and topics like teamwork and continuous improvement activities in the GerCar production system. At the end of the training period at GerCar, apprentices take a final examination before the Chamber of Industry and Commerce and are employed in direct production for a minimum period of one year. In the context of globalization, GerCar has undertaken its own standardization measures; it has defined two or three core occupations for each of the central direct and indirect areas of the automotive plants (body shop, paint shop, assembly, maintenance, etc.). These are at the heart of training activities and also serve as a reference point for the training programs at foreign locations (Jürgens and Krzywdzinski 2016).

Skilled blue-collar work enjoys high recognition at GerCar. Skilled workers are a status group in their own right and have their own pay and promotion systems. The skilled worker jobs are mainly in maintenance, quality assurance laboratories, prototype construction, the pilot hall (responsible for product ramp-ups), and technical development. However, GerCar is increasingly deviating from the practice of employing skilled workers only in these “indirect” areas by defining more demanding tasks in direct production as skilled worker activities (Interview GerCar Academy). The best known of these is the position of automated equipment operator, introduced in the 1980s; this job involves mechanized and automated plants in production. While the majority of blue-collar workers in direct production are semi-skilled workers employed via temporary employment agencies, the share of skilled workers in direct production is increasing.

The high status of skilled work and the importance of the vocational education at GerCar has been reinforced by two important historical developments. The first one is its experience with the automation push of the 1970s and 1980s, which led to an increased use of

skilled work and greater recognition of its role. Influenced by changing market conditions, German companies in the 1980s adopted an accelerated automation strategy (Heßler 2014; Jürgens et al. 1993). The goal was to turn computer-integrated manufacturing (CIM) into a solution for centrally controlled, end-to-end production automation. Their experiences with the problems and complexities of ambitious automation strategies led firms to expand the responsibilities of automated equipment operators, invest in strengthening their problem-solving capabilities, and reorient their recruitment strategies to focus on skilled workers with vocational qualifications (Kern and Schumann 1984; Sorge and Streeck 1988). These corporate strategies—which can be described as high-tech automation using Fujimoto’s (1997) concepts—thus became a driver of the modernization and expansion of vocational training.

These initial developments during the 1970s and 1980s were strengthened by the role and influence of works councils in the German manufacturing sector—an important institutional factor. Works councils pushed for expanding vocational training in companies and the recruitment of skilled workers. At GerCar, there is a consensus between management and the works council on the role of vocational training in recruiting skilled workers (Interview GerCar Works Council). This consensus, along with the cooperative relations between management and the works council in general, forms an important basis for the stability of vocational education and training.

4.2. KoCar in Korea

The institutional framework for skill-formation in Korea is very different to the one in Germany. School-based vocational education and training does not have a very long history in the country. Vocational schools only developed at the end of the 1960s as part of the country’s catch-up industrialization. The first phase of this industrialization was based on low-skilled labor. In the 1960s, the government sought to upgrade the economy by promoting the establishment of vocational schools (Park 2013). Yet, Korean employers have never perceived cooperation with vocational schools as very attractive, which forced the Korean government to introduce obligatory company quotas for apprentices and cooperation with vocational schools.

The acceptance of this system is low (cf. Jeong 1995). KoCar, for example, only accepts around 100 workers per year on its training programs in cooperation with vocational high schools (these mainly work in the maintenance departments and foundry). Compared with GerCar’s vocational training activities in Germany, this is very little. Programs to introduce more extensive vocational training activities have in part failed due to the lack of support from trade unions (Jo et al. 2016: 59). The major form of training for maintenance and other skilled functions is on-the-job training (OJT). The training is interwoven into the work process and is based on instructions from superiors and experts in the fields themselves. There are no global formal standards for skill-formation practices at KoCar, but the Korean approach is regarded as the major reference point.

The role of skilled blue-collar work is much more ambiguous at KoCar than at GerCar. Our argument here is *not* that workers at KoCar are less skilled than at GerCar because the Korean company relies on pure OJT. This is surely not true as our own studies show (Jürgens and Krzywdzinski 2016). Our arguments are that (a) the group of skilled blue-collar workers is smaller at KoCar than at GerCar due to the specific automation strategy described below, and (b) that skilled workers enjoy a much higher status at GerCar, while at KoCar there is no status differentiation as workers in direct production and indirect areas (e.g., maintenance) belong to the same grades. The major differentiation factor at KoCar is seniority and

competence but not the tasks and skill requirements of the job. In this respect, KoCar illustrates the person-based system, which differs strongly from the job-based approach at GerCar (Jürgens and Krzywdzinski 2016).

The limited role of skilled blue-collar work at KoCar and its subsidiaries is based on two important historical developments. First, KoCar's experience with automation differs significantly from that of GerCar. Since the 1970s, KoCar has pursued a very ambitious automation strategy, which has been accompanied by a strong modularization of production that aimed to reduce complexity (Lee and Yo 2007). Digital process-control technologies were also introduced at an early stage to centrally monitor production processes. In view of limited skills in the blue-collar labor force, KoCar opted for engineering-led automation (Jo and You 2011). This approach has also been characterized as a “skill-saving” strategy that minimizes investment in worker education and training (Youndt et al. 1996). KoCar invested in the expansion of its own training programs for engineers and increased the proportion of engineers in the direct production and indirect areas (Jo et al. 2016). All process-control and problem-solving tasks were concentrated in the hands of the engineers.

The development of engineering-led automation was also related to industrial relations—an important institutional factor. During the period of military rule, the state's development strategy—even for large companies like KoCar—relied on keeping wages low. The state promoted company-friendly “yellow” unions and suppressed all efforts to organize workers freely. Under these conditions, industrial relations were marked by mistrust and conflict developed—a trajectory Cho (2005) called “militant economism.” Independent unions emerged despite state repression. They rely on their mobilization strength to achieve material concessions and reject any cooperation with management (Yoo 2012). Management, in turn, does not invest in the education and training of workers because it cannot expect such investments to result in better performance (Jo and You 2011).

5. Transferring skill-formation practices to Slovakia

In the institutionalist framework, transfers of MNCs' home-country practices are mediated by the institutional distance between home and host country and also by factors such as the standardization level of the practices and the institutional entrepreneurship of management at the host-country location. Regarding the institutional framework of skill-formation practices in Slovakia, school-based vocational training plays an important role. Around 70 percent of all high-school students are enrolled in vocational schools (CEDEFOP 2016) but only a minority of these schools cooperate with companies and offer programs combining school-based and in-company internships. This purely school-based system differs strongly from both the German and the Korean approaches and reflects high institutional distance (Jürgens and Krzywdzinski 2010). In 2016, however, the Slovak government reformed regulations on vocational training to allow the introduction of so-called “dual” programs that follow the German approach and include 50 percent in-company training (CEDEFOP 2016). As this policy shift illustrates, the institutional context for the transfer of the companies' skill-formation practices can be regarded as relatively permissive (i.e., it is characterized by relatively low institutional strength, Fortwengel 2017b), as there is no regulation or collective agreement that would enforce a specific approach to skill formation (e.g., a quota for vocational training of apprentices).

In the following, we analyze the skill-formation approaches of GerCar and KoCar in their Slovak plants. We focus not only on the similarities and differences to the home-country practices but in particular on (a) the role of technology and technological frames and (b) the

governance structures of the companies, in particular with regard to the division of responsibilities in product ramp-up processes.

5.1 GerCar Slovakia

Recruitment and training

As usual at GerCar, skilled workers are a distinct group in the company's Slovak plant and differ clearly from the semi-skilled production workers. The basic requirement for the latter to be hired is a secondary vocational certificate, which does not have to be related to automotive production. All newly recruited direct production workers undergo a two-week training course at the beginning of their employment, followed by two weeks of supervised training on the production line (interview GerCar Academy).

While no specific vocational qualification is required for semi-skilled production workers, automated equipment operators in direct production (in particular the welding shop) and workers in indirect areas (maintenance and others) are regarded as skilled workers (interview GerCar Slovakia body shop manager). A relevant vocational qualification and professional experience are considered necessary. Especially in the 1990s, GerCar Slovakia was able to rely on the experienced industrial workers who had been let go by the former socialist manufacturing companies. The labor market situation at that time made it possible to apply a rigorous selection process, during which not only professional knowledge but also motivation, willingness to learn, and other desired characteristics were tested.

For these reasons, GerCar's own vocational training in Slovakia remained relatively limited until the 2000s, with around 20 apprentices being taken on each year for the VET program run jointly by GerCar and a vocational school. After around 2013, however, GerCar began to face difficulties in finding enough skilled workers on the labor market. In 2016, the company decided to create its own so-called Dual Academy to organize the internal vocational education and training and the cooperation with vocational schools (interview GerCar Slovakia HR). Vocational training expanded rapidly. From 2017 on, 100 new trainees were taken on annually. The training courses last four years, with a university entrance qualification being acquired in addition to the vocational qualification. The education is organized according to the German model, with 80 percent of the time being spent in GerCar internal courses and projects and 20 percent being organized by the Slovak vocational school. The graduates receive German VET certification (according to the standards of the Chamber of Industry and Commerce of Baden Württemberg), and the corresponding Slovak VET certificate. In 2020, the first cohort of graduates left the academy and was hired as GerCar workers.

GerCar Slovakia offers seven vocational qualifications (interview GerCar Slovakia HR): mechatronics technicians (*Mechatroniker*, around 25 percent of all apprentices), automotive mechatronics technicians (*Kfz-Mechatroniker*, 25 percent), electronics technicians for automation technology (*Elektroniker für Automatisierungstechnik*, 30 percent), tool mechanics (*Werkzeugmechaniker*), Industrial Mechanics (*Industriemechaniker*), warehouse logistics experts (*Fachkraft für Lagerlogistik*), and computer-science experts (*Fachinformatiker*), with the last four occupations representing around 20 percent of all apprentices. The training of computer-science experts represents an interesting case, because it shows that GerCar Slovakia is utilizing the most modern training programs, which are regarded as particularly important for future changes in automation concepts. The training for computer-science experts combines knowledge of traditional automation concepts (including

CNC and PLC programming) with expertise in third-generation programming languages (e.g., Java, which is often used in the automation field) and new process-control software systems.

Personnel development

The management's recognition of the importance of skilled workers for the successful development of the plant is reflected not only in the expansion of vocational training, but also in the internal development opportunities available to workers from direct production. While there are no long-term work-life plans for workers as is the case at Toyota (Jürgens and Krzywdzinski 2016), the internal labor market opens up a number of opportunities for vertical and horizontal development opportunities.

The first typical development path for workers is to rise in the hierarchy (interview GerCar Slovakia HR). A career begins with an appointment as team leader. The supervisors (*Meister*) are recruited from the ranks of the team leaders. The next hierarchical level, section leaders (*Fertigungsabschnittsleiter*), is recruited from the supervisors; here, a secondary vocational certificate with university entrance qualification is assumed. The shop/department manager level requires a university degree. While some shop/department managers at GerCar entered the company through the trainee program for university graduates, others started as production workers and either had finished university studies before entering GerCar or did it while working there.

The second important development path for workers leads from production to indirect areas like maintenance, quality assurance, toolmaking, and the pilot hall (interviews GerCar Slovakia body shop manager, head of maintenance, head of pilot center). This path requires vocational training in a technical profession as well as professional experience. Some production workers also study alongside their job in order to increase their chances of moving into an indirect area. The company supports these activities. In 2017 and 2018, 200 experienced production workers received two years of training as mechatronics technicians and were promoted to automated equipment operators, maintenance workers, or pilot hall workers. Workers from pilot hall maintenance can move into white-collar areas like process engineering or planning, if they finish a university degree while working.

Automation and role of the plant in production ramp-ups

In our interviews, management provided two explanations for expanding the VET program and supporting the upskilling of production workers: (1) the increasing automation of production and (2) the particular responsibilities of the plant in production ramp-up processes. Managers explicitly emphasized that the legal changes in Slovakia had had little impact on the company's decisions about VET (interview GerCar Slovakia HR).

Around 50 percent of graduates from the Dual Academy are going to be hired in maintenance (mainly the mechatronics technicians, the electronics technicians, and computer-science experts), around 25 percent as automated equipment operators (mainly the mechatronics technicians and the electronics technicians), and around 25 percent in the pilot hall and toolmaking (mainly the automotive mechatronics technicians, the industrial mechanics, and tool mechanics).

Since around 2015, the automation level in the body shop has increased from around 70 percent to above 90 percent. The GerCar plant has a particular expertise within the group in forming and joining aluminum due to its specialization in premium SUVs. The increasing degree of automation, along with the introduction of new materials and processes, has significantly increased the necessary skills in recent years (interviews GerCar Slovakia body

shop manager, head of maintenance). This is most evident in maintenance. Whereas in the past, maintenance staff were mainly experienced production workers with a secondary vocational training qualification, for example, in electrical engineering, and several years of work experience in the body shop (or other shops), the new technologies require more systematic and complex technological and process knowledge.

Besides increasing automation, the growing responsibilities of the GerCar plant in product ramp-up processes represent an important factor influencing skill requirements (interview GerCar Slovakia head of pilot center). Product ramp-up is the last phase of the product-creation process (*Produktentstehungsprozess*, PEP), which at GerCar is usually stimulated to take 48 months. The first year is dedicated to strategic product planning, which is handled by the company headquarters. Once the basic concept has been established, factories can apply to produce the model and a location decision is made. Now product development in the narrower sense begins; this should ideally be completed at least 12 months before the start of production (SOP). A functioning prototype and the manufacturing concept is developed at this point. Normally, the product development phase also takes place at the company's central departments; involvement by future production sites is limited. However, the GerCar Group is endeavoring to strengthen the role of the production plants—a process that has made considerable progress in the case of the Slovak plant.

The product-launch process in the Slovak plant is directed by the pilot center (*Pilothalle*), which employs about 350 engineers and 450 skilled workers. The pilot center's blue-collar workers are usually recruited from the most experienced workers in the plant and the best apprentices from the plant's vocational education scheme. 36 months before SOP, a team of engineers and workers will be formed to work together with the German headquarters to develop the product and manufacturing concept. In the purchasing process, experts from Slovakia are already involved during the product development phase, too.

With the start of the product-launch phase 12 months before SOP, the Slovak plant officially takes the lead for the process. The pilot center organizes the test preproduction series (*Versuchsvorserie*, VVS) and the full preproduction series (*Produktionsvorserie*, PVS), with all the steps now strictly linked and each component having to meet the required quality standards. After that, finally, the zero series, in which everything has to work, takes place.

The pilot center also leads an internal product launch team at the Slovak plant, which includes representatives from all functional areas and shops. An important task is to identify key employee groups for the product launch and to train them. While only a few weeks of preparation are required for most of the assembly workers, other groups like maintenance workers, programmers, or automated equipment operators may require several months and, in the case of completely new technologies, 1–2 years of training. In a typical product launch, several hundred employees (on average around 25 percent indirect and 75 percent direct) are sent from Slovakia to the German plants of the GerCar Group or to equipment manufacturers for training; they also receive training at the pilot center itself.

5.2 KoCar Slovakia

Recruitment and training

The recruitment process at KoCar does not differ for direct and indirect areas. KoCar hires new workers with a high school certificate or university entrance qualification. Formal vocational qualifications are not required. New workers at KoCar are first hired via an agency and then

converted into full-time regular workers after a one-year evaluation period. Newly hired workers receive a company introduction and safety training for a week. They are then placed at a workstation after one week's training and receive OJT (Interview KoCar HR Manager A).

Of course, working in indirect areas requires more training. During its first years, KoCar relied on experienced, skilled workers hired from other companies. After a short period of time, the company started its own in-house training with OJT and now only relies on external education when necessary. The internal training for skilled workers' positions takes 3–4 years, but unlike GerCar, KoCar does not issue any formal licenses or certificates to the skilled workers in order to make a move to another company difficult. The rate of turnover is low, because the wages at KoCar are relatively high. There are around 100 persons overall who are regarded as core skilled workers (from maintenance but also core workers in areas like engine fabrication or repair) by the plant management (interview KoCar HR Manager B).

Somewhat similarly to GerCar, KoCar began cooperating with vocational institutes in Slovakia in 2016, in order to train skilled workers (interview KoCar HR manager A). The company offers four 3–4 year vocational training programs focusing on traditional manufacturing professions: mechanics, CNC programmers, and mechanics mechatronics. In 2019, the mechanics-mechatronics program was replaced by a mechanics electrotechnics program; it includes control unit programming, PLC programming, automation technology, and robotics in the curriculum.

Each year, 20–30 apprentices start training, but the company finds it difficult to find good applicants in the local area. In the training program, 60 percent of the time is spent in KoCar internal courses and projects and 40 percent in the Slovak vocational school. Around 25–30 percent of the apprentices are hired in maintenance, around 70–75 percent as automated equipment operators. The engagement of KoCar in this vocational program is a response to a request by the Slovak government. The program is regarded by the company mainly as part of its corporate social responsibility – regarding skill formation, the company's traditional OJT-based approach is seen as much more important (interview KoCar HR manager C).

Personnel development

The significantly lower focus on skilled blue-collar work compared to GerCar is not only reflected in the more limited training activities. There is also a stronger segmentation of development paths. In particular, there is a strict separation between blue-collar and white-collar areas that hardly permits any transitions. The job ladder for a production worker goes from operator to senior operator to supervisor in ascending order. Promotion to a higher job position takes at least two years. The next hierarchical level above supervisor is the shift leader, which is a white-collar position. About half of the shift leaders are promoted from the supervisor level; the remaining half is recruited from white-collar areas (mainly engineers) in the company. For workers, the shift leader is the highest reachable hierarchy level (interview KoCar HR manager B).

There is hardly any personnel exchange between the direct production and indirect areas. Blue-collar workers in indirect areas are selected at the beginning of their employment at KoCar. Direct workers are only able to switch to indirect areas in a few exceptional cases. It is impossible for blue-collar workers in both direct and indirect areas to move into white-collar areas like process engineering or planning.

Automation and role of the plant in production ramp-ups

The KoCar plant in Zilina has a very high automation rate (100 percent in the body shop, 67 percent in the paint shop). According to management, the requirements of automation were one factor that led to the decision to introduce mechanics-electrotechnics training. At the same time, however, the management emphasizes that this dual VET only plays a limited role and that the internal OJT of skilled workers is more important. The reason why the high automation level has so limited effects on the demand for skilled blue-collar labor is KoCar's specific approach of engineering-led automation.

An important factor that reduces the need for skilled workers at KoCar is the plants' limited role in product ramp-up processes. The responsibilities for the product-launch processes are centralized in the company's Korean headquarters due to the associated economies of scale. In the case of KoCar, the product ramp-up process, the last stage of the product development process, begins nine months before SOP (interview production technology manager at KoCar headquarters).

The responsibility for this ramp-up phase is located at the pilot center in Korea. The pilot center prepares pilot production and checks the state of preparation of KoCar's suppliers. Before SOP, pilot production is started and tested in the Korean pilot center. At this time, the final adaptations of the production process and production equipment are made. During the pilot production phase, around 40 blue-collar workers from the Slovak KoCar plant are sent to Korea for around six weeks (usually in the form of three 2-week visits) in order to take part in pilot production, learn about the processes and requirements, and have the opportunity to give recommendations about necessary adaptations.

Pilot production (test preproduction) is expected to run smoothly before SOP. At this time, the equipment is shipped to overseas factories, where the full preproduction phase at local level follows. This phase usually takes one month and is meant to be the last phase of implementing and testing the production processes in the factory. During this time, 40–50 engineers and skilled workers from the Korean headquarters are dispatched to KoCar Slovakia. They direct the product launch and train the local employees. They usually stay in the factory for 2–5 months to provide support and ensure a smooth start of production.

KoCar Slovakia only takes the formal lead for the product launch in the last month before SOP, when the zero series is produced and the new product is finally tested under mass production conditions. Here, the plant has to show that it is able to produce the vehicle by itself. In the case of the sedans, which are produced exclusively in Europe, the product ramp-up processes took two to three months more than usual. In the case of the Sportage model, which is also produced in Korea and China, mass production started in Korea first. The product launch in Slovakia benefitted from the experiences gathered in Korea.

5.3 Summary

In both cases, we observe a transfer of home-country skill-formation practices to Slovakia. GerCar has implemented its concept of dual vocational training; remarkably, however, for a long time this concept was only minimally practiced. Yet, the increasing automation (especially in the context of Industry 4.0), the special requirements of the complex product range, and the upgrading of tasks in product ramp-up prompted a massive expansion of vocational training, which is a response to the need for skilled workers. KoCar focuses on the internal OJT of a selective and small group of skilled workers. This approach has its roots in the company's home-country model of engineering-led automation. In addition, KoCar's non-Korean plants

have a very limited role in product ramp-up and lower requirements for skilled workers. Although KoCar has started a dual vocational training program, this was done at the request of the Slovak government and it does not change the company's orientation on OJT as the major form of skill formation.

While GerCar Slovakia supports the upskilling of blue-collar areas through additional VET programs for experienced workers and by promoting transitions and career paths from direct production (semi-skilled workers) to the skilled-worker areas (e.g., maintenance) and also in white-collar areas such as process engineering, KoCar maintains strict segmentation between direct production, indirect areas (maintenance), and the white-collar area—transitions are only possible in exceptional cases.

Of course, how these two companies will develop in the future is open. It is also worth emphasizing that neither of the two approaches is superior in terms of mastering automation and product-ramps ups and achieving high productivity and profitability. Both Slovak plants under study are regarded as benchmarks in their companies and in the whole automotive industry.

6. Discussion and conclusions

Some of our empirical findings can be explained by the classical (neo)institutionalist paradigm. Both companies have developed different skill-formation approaches in their home countries, which have become part of their organizational culture and are embedded in dense institutional frameworks. For a long time, Slovakia was characterized by a school-based vocational education system, which differed from both the German and the Korean model. At the same time, the Slovak regulatory environment was relatively permissive towards different skill-formation approaches. The government has only recently begun to strengthen dual vocational training approaches (in a combination of school-based and in-company training). The expansion of vocational training at GerCar and KoCar after 2016 could therefore be related to the activities of the government and thus to host-country influences. In the case of GerCar, the new policies of the Slovak government reduced the institutional distance and in this way reinforced the company's focus on dual VET. In the case of KoCar, we could argue that the new VET policies increased the institutional distance (by moving from a purely school-based to a dual VET approach) but also created certain normative pressure on companies, resulting in the hybridization of skill-formation practices within the company's Slovak subsidiary.

Yet, while this explanation is not wrong, it is incomplete. Our interviews with managers show that dual VET in cooperation with vocational schools is accorded a very different priority in both companies under study. The differences between both companies become even more clear if we look at the personnel development activities for blue-collar workers: While GerCar supports upskilling and transitions from semi-skilled to skilled-worker areas, this is not the case at KoCar.

As our analysis shows, we need to integrate the role of technology and the centralization of responsibilities within MNCs in order to fully understand the evolution of skill-formation practices. In the case of GerCar Slovakia, the interviews with managers show that state support for dual vocational training is welcome; nevertheless, it is not the actual reason for the expansion of vocational training. The motives for modernizing and expanding vocational training activities were strongly related to technological changes—increasing automation and the growing complexity of automation solutions in the context of Industry

4.0—as well as to the plant's increased long-term responsibilities, for example, in product ramp-up processes. Without these changes, no comparable expansion of vocational training would have taken place.

In the case of KoCar, the implementation of dual vocational training can only be understood as a case of hybridization by host-country influences if we look at the surface. If we look more deeply, we see that this type of skill formation is assigned limited importance by the management of the plant. The core skill formation process remains the internal OJT. In addition, the company's engineering-led automation concept relies less on skilled blue-collar workers than it is the case at GerCar. To be clear: we do not argue that dual vocational training in the German tradition provides higher skill levels than pure on-the-job training. Our argument is that the group of skilled workers is smaller and their status in the company is lower at KoCar than at GerCar. The importance attached to skilled blue collar work in the production systems of both companies differs considerably.

Our first main conclusion, therefore, is that we have to introduce technology as a relevant variable into institutionalist frameworks. More specifically, we should consider the company's general understanding of technology (the technological frame) and the specific technology level of the subsidiary when analyzing skill-formation practices. The relationship between technological level and skill-formation practices is straightforward: It only makes sense to transfer skill-formation practices abroad if the foreign subsidiary is characterized by the same level of technology as the headquarters.

Technology, however, cannot be studied in isolation from social organization. Companies are socio-technical systems (Wajcman 2006) in which technology is linked to work organization and to conceptions of skill. We have argued that the concept of “technological frames” (Orlikowski and Gash 1994) be used to describe the (company-specific) understandings of the relationship between technology and organization, in particular regarding automation technologies. KoCar understands automation mainly as a labor-saving instrument and emphasizes the use of digital process-control systems and the centralization of information in the hands of engineers. Automation here is unrelated (and partially even opposed) to skill formation in the blue-collar area and empowerment of blue-collar workers. In the case of GerCar, past experiences have led to an understanding of automation technologies that emphasizes the need to combine central process control by engineers and supervisors with the skills and competences of blue-collar workers operating the automated lines.

Our second conclusion concerns the governance of the MNCs. The centralization of rules and responsibilities within the MNCs has been a central issue in the (neo)institutionalist research on the transfer of HR policies. However, centralization has so far been measured and investigated using very generic concepts that are not suitable for the analysis of skill-formation practices in manufacturing plants in MNCs. We propose a focus on the product ramp-up as a core process that influence skill requirements in manufacturing, in particular . Beyond our specific case, we emphasize the usefulness of case-specific concretization of generic measuring instruments for variables such as centralization in order to obtain meaningful results.

In particular, the role of technology and technology frames in the development of management practices in MNCs is a key issue for future research. On the one hand, this concerns company-specific, industry-specific, and country-specific forms of understanding and using technology. On the other hand, this also applies to the use of technology for the governance of MNCs. Here, research on MNCs can benefit from the extensive research on the

implementation of information systems in companies and also from scholarship on the effects of technology on work (Galliers and Leidner 2014).

Our empirical research design has one important limitation which points to the need for further research. As our analysis is mainly based on management interviews, it allows us to capture the relationship between automation approaches and recruitment, training and personnel development strategies. It does not provide the possibility, however, to analyze the actual labor process and the division of labor between blue-collar workers and engineers. Based on our analysis, we expect to find a much stronger involvement of blue-collar workers in problem-solving and optimization in the case of GerCar compared to KoCar. The test of this hypothesis would require a research design based on interviews with workers and workplace observation, which we could not realize in our project.

References

- Adler, P. (1988). Managing Flexible Automation. *California Management Review*, 30(3), 34-56.
- Adler, P., & Cole, R. (1993). Designed for Learning: A Tale of Two Auto Plants, in: *Sloan Management Review*, 34(3), 85-94.
- Adler, P., Goldoftas, B., & Levine, D. (1999). Flexibility Versus Efficiency? A Case Study of Model Changeovers in the Toyota Production System. *Organization Science*, 10(1), 43-68.
- Antonietti, R. (2007). Opening the “Skill-Biased Technological Change” Black Box: A Look at the Microfoundations of the Technology-Skill Relationship. *Economia Politica*, 24(3), 451-475.
- Autor, D., Lawrence, K., & Krueger, A. (1998). Computing Inequality: Have Computers Changed the Labor Market? *Quarterly Journal of Economics*, 113(4), 1169-1213.
- Bartlett, C., & Ghoshal, S. (1989). *Managing across borders: The transnational solution*. Brighton: Harvard Business Press.
- Boyer, R., Charron, E., Jürgens, U., & Tolliday, S. (eds.) (1998). *Between imitation and innovation: The transfer and hybridization of productive models in the international automobile industry*. Oxford: OUP.
- Briken, K., Chillas, S., Krzywdzinski, M., & Marks, A. (2017). Labour Process Theory and the New Digital Workplace. In K. Briken, S. Chillas, M. Krzywdzinski & A. Marks (Eds.), *The New Digital Workplace. How New Technologies Revolutionise Work* (pp.1-20). London: Palgrave Macmillan.

- Brynjolfsson, E., & McAfee, A. (2014). *The Second Machine Age. Work, Progress and Prosperity in a Time of Brilliant Technologies*. New York: W.W. Norton & Company.
- Busemeyer, M., & Trampusch, C. (2012). The Comparative Political Economy of Collective Skill Formation. In M. Busemeyer, C. Trampusch (Eds.), *The Political Economy of Collective Skill Formation* (pp.3-38), Oxford: Oxford University Press.
- CEDEFOP (2016). *Vocational education and training in Slovakia*. Luxembourg: Publications Office of the European Union.
- Chiang, F., Lemanski, M., & Birtch, T. (2017). The transfer and diffusion of HRM practices within MNCs: lessons learned and future research directions. *International Journal of Human Resource Management*, 28(1), 234-258.
- Clark, K., & Fujimoto, T. (1991). *Product Development Performance: Strategy, Organization and Management in the World Auto Industry*. Brighton: Harvard Business Press.
- Clark, K., & Wheelwright, S. (1992). *Revolutionizing Product Development: Quantum Leaps in Speed, Efficiency and Quality*. New York: The Free Press.
- Crouch, C. (2005). Skill formation systems. In S. Ackroyd, R. Batt, P. Thompson & P. Tolbert (Eds.), *The Oxford Handbook of Work and Organization* (pp.95-114), Oxford: OUP.
- Ernst, D. (1997). Partners for the China circle? The Asian production networks of Japanese electronics firms. In B. Naughton (Ed.), *The China Circle* (pp.201-253). Washington, DC: The Brookings Institution, Washington.
- Ferner, A., Edwards, T., & Tempel, A. (2012). Power, institutions and the cross-national transfer of employment practices in multinationals. *Human relations*, 65(2), 163-187.
- Florida, R., & Kenney, M. (2000). *Transfer and replication of organizational capabilities: Japanese transplant organizations in the United States*. New York: Oxford University Press.
- Fortwengel, J. (2017a). Practice transfer in organizations: The role of governance mode for internal and external fit. *Organization Science*, 28(4), 690-710.
- Fortwengel, J. (2017b). Understanding when MNCs can overcome institutional distance: a research agenda. *Management International Review*, 57(6), 793-814.
- Fortwengel, J., & Jackson, G. (2016). Legitimizing the apprenticeship practice in a distant environment: Institutional entrepreneurship through inter-organizational networks. *Journal of World Business*, 51(6), 895-909.
- Fujimoto, T. (1997). Strategies for Assembly Automation in the Automobile Industry. In K. Shimokawa, U. Jürgens & T. Fujimoto (Eds.), *Transforming Automobile Assembly* (pp.213-237), Berlin: Springer.

- Galliers, R., & Leidner, D. (2014). *Strategic Information Management: Challenges and Strategies in Managing Information Systems*. Oxford et al.: Butterworth Heinemann.
- Gates, S., & Egelhoff, W. (1986). Centralization in Headquarters-Subsidiary Relationships. *Journal of International Business Studies*, 17(2), 71-92.
- Gerring, J. (2007). *Case Study Research. Principles and Practices*. Cambridge: Cambridge University Press.
- Ghoshal, S., & Noria, N. (1989). Internal Differentiation Within Multinational Companies. *Strategic Management Journal*, 10(4), 323-337.
- Haipeter, T., & Jo, H.J. (2020). Varieties of Capitalism in Transnational Companies: A Comparative Study of Volkswagen Slovakia and Kia Motors Slovakia. *Competition & Change*, advanced access.
- Hall, R. (2010). Renewing and Revising the Engagement between Labour Process Theory and Technology. In P. Thompson & C. Smith (Eds.), *Working Life. Renewing Labour Process Analysis* (pp.159-181), London: Palgrave Macmillan.
- Harzing, A., & Noorderhaven, N. (2008). Headquarters-Subsidiary Relationships and the Country-of-origin Effect. In Feldman, M. & Santangelo, G. (Eds.), *New Perspectives in International Business Research* (pp.13-40), Bingley: Emerald.
- Heenan, D., & Perlmutter, H. (1979). *Multinational organization development: a social architectural perspective*. Reading, Mass.: Addison-Wesley.
- Herrigel, G., Wittke, V., & Voskamp, U. (2013). The Process of Chinese Manufacturing Upgrading: Transitioning from Unilateral to Recursive Mutual Learning Relations. *Global Strategy Journal*, 3(1), 109-125.
- Hoenen, A., & Kostova, T. (2015). Utilizing the broader agency perspective for studying headquarters-subsidiary relations in multinational companies. *Journal of International Business Studies*, 46(1), 104-113.
- Jeong, J. (1995). The Failure of Recent State Vocational Training Policies in Korea from a Comparative Perspective. *British Journal of Industrial Relations*, 33(2), 237-252
- Jones, M., Orlikowski, W. (2009). Information technology and the dynamics of organizational change. In C. Avgerou, R. Mansell, D. Quah, & R. Silverstone (Eds.), *The Oxford Handbook of Information and Communication Technologies* (pp.293-313), Oxford: OUP.
- Jo, H.J., Jeong, J., & Kim, C. (2016). Unpacking the “black box” of a Korean big fast follower: Hyundai Motor Company’s engineer-led production system. *Asian Journal of Technology Innovation*, 24(1), 53-77.
- Jo, H.J., & You, J.S. (2011). Transferring production systems: an institutional account of

Hyundai motor company in the United States. *Journal of East Asian Studies*, 11(1), 41-74.

Jürgens, U. (2000). Communication and Cooperation in the New Product and Process Development Networks. In U. Jürgens (Ed.), *New Product Development and Production Networks* (pp.107-148), Berlin: Springer.

Jürgens, U., & Krzywdzinski, M. (2010), *Die neue Ost-West-Arbeitsteilung. Arbeitsmodelle und industrielle Beziehungen in der europäischen Automobilindustrie*. Frankfurt am Main: Campus.

Jürgens, U., & Krzywdzinski, M. (2016), *New Worlds of Work. Varieties of Work in Car Factories in the BRIC Countries*. Oxford: Oxford University Press.

Katz, L., & Margo, R. (2014). Technical Change and the Relative Demand for Skilled Labor: The United States in Historical Perspective. In L. Boustan, C. Frydman & R. Margo (Eds.), *Human Capital in History. The American Record* (pp.15-57), Chicago, IL: University of Chicago Press.

Kern, H., & Schumann, M. (1984). *Das Ende der Arbeitsteilung?*. München: Beck.

Kostova, T. (1999). Transnational transfer of strategic organizational practices: A contextual perspective. *Academy of Management Review*, 24(2), 308-324.

Kostova, T., Nell, P., & Hoenen, A. (2018). Understanding Agency Problems in Headquarters-Subsidiary Relationships in Multinational Corporations: A Contextualized Model. *Journal of Management*, 44(7), 2611-2637.

Kostova, T., Roth, K., & Dacin, T. (2008). Institutional Theory in the Study of Multinational Corporations: A Critique and New Directions. *Academy of Management Review*, 33(4), 994-1006.

Krzywdzinski, M. (2017). Automation, Skill Requirements and Labour-Use Strategies. High-Wage and Low-Wage Approaches to High-Tech Manufacturing in the Automotive Industry. *New Technology, Work and Employment*, 32(3), 247-267.

Kuhlmann, M. (2004). *Modellwechsel. Die Entwicklung betrieblicher Arbeits- und Sozialstrukturen in der deutschen Automobilindustrie*. Berlin: sigma.

Lee, B.H., & Jo, H.J. (2007), The Mutation of the Toyota Production System: Adapting the TPS at Hyundai Motor Company. *International Journal of Production Research*, 45(16), 3665-3679.

Lee, K.P., You, C.Y., & Bae, J.Y. (2017). The impact of foreign ownership and control on the organizational identification of host country managers working at MNC subsidiaries. *International Journal of Human Resource Management*, 28(12), 1739-1765.

Olesen, K. (2014). Implications of dominant technological frames over a longitudinal period. *Information Systems Journal*, 24, 207-228.

- Otterbeck, L. (1981). Concluding remarks and a review of subsidiary autonomy. In L. Otterbeck (Ed.), *The management of headquarters subsidiary relationships in multinational corporations* (pp. 337–343). Aldershot: Gower.
- Park, S.Y. (2013). The political and institutional basis of Korea’s skill formation system. *Journal of Education and Work*, 26(3), 291-308.
- Perlmutter, H. (1969). The Tortuous Evolution of the Multinational Corporation. *Columbia Journal of World Business*, 4(1), 9–18.
- Piore, M., & Sabel, C. (1984). *The Second Industrial Divide: Possibilities for Prosperity*. New York: Basic Books.
- Pudelko, M., & Harzing, A.-W. (2008). The golden triangle for MNCs. *Organizational Dynamics*, 37, 394–404
- Rosenzweig, P. (2006). The dual logics behind international human resource management: Pressures for global integration and local responsiveness. In G. K. Stahl & I. Björkman (Eds.), *Handbook of research in international human resource management* (pp. 36–48). Cheltenham: Edward Elgar.
- Rothstein, H. (2016). *When Good Jobs Go Bad. Globalization, De-Unionization, and Declining Job Quality in the North American Auto Industry*. New Brunswick: Rutgers University Press.
- Shibata, H. (2008). *The transfer of Japanese work practices to plants in Thailand*. *International Journal of Human Resource Management*, 19(2), 330-345.
- Surbier, L., Alpan, G., & Blanco, E. (2014). A comparative study on production ramp-up: state-of-the-art and new challenges. *Production Planning & Control*, 25(15), 1264-1286.
- Terwiesch, C., Bohn, R., & Chea, K. (2001). International product transfer and production ramp-up: a case study from the data storage industry. *R&D Management*, 31(4), 435-451.
- Treem, J., Dailey, S., Pierce, C., & Leonardi, P. (2015). Bringing Technological Frames to Work: How Previous Experience with Social Media Shapes the Technology's Meaning in an Organization. *Journal of Communication*, 65(2), 396–422.
- Wajcman, J. (2006). New connections: social studies of science and technology and studies of work. *Work, Employment and Society*, 20(4), 773-786.
- Wiemann, J., & Fuchs, M. (2018). The export of Germany’s “secret of success” dual technical VET: MNCs and multiscalar stakeholders changing the skill formation system in Mexico. *Cambridge Journal of Regions, Economy and Society*, 11(2), 373-386.
- Winkler, H., Heins, M., & Nyhuis, P. (2007). A Controlling System Based on Cause-effect Relationships for the Ramp-Up of Production Systems. *Production Engineering*, 1(2), 103-111.

Yoo, H.G. (2012). Militant Labor Unionism and the Decline of Solidarity: A Case Study of Hyundai Auto Workers in South Korea. *Development and Society*, 41(2), 177-199.

ⁱ Ulrich Jürgens and Martin Krzywdzinski, “Personnel and Production Systems in the BRIC Countries”; Martin Krzywdzinski and Valentina Mählmeyer, “Performance Management Policies in International Comparison”.

ⁱⁱ Hyung Je Jo, Jang Pyo Hong, Jun Ho Jeong, Joongsan Oh and Chulsik Kim, „A Global Strategy of a Korean Transnational Corporation”.