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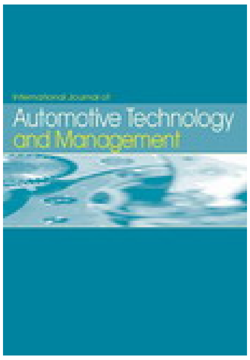

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Between geoeconomic competition and local embeddedness – how Chinese investors influence digitalisation in acquired German manufacturing companies

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Abstract: The growing economic and geopolitical importance of digital technologies and data, coupled with the Chinese Government's expressed ambition for Chinese companies to occupy a leading position in this domain, raises questions regarding the role of acquired foreign subsidiaries in realising this objective. Drawing on comparative capitalism research, this paper discusses how local institutions, investor strategies, and the aspirations of the Chinese Government interact to shape the digital transformation of manufacturing companies in Germany. It empirically investigates how digitalisation is unfolding in 15 German manufacturing companies with Chinese investors and enhances the understanding of the influence of Chinese MNCs on company-level digitalisation abroad. The eight companies that undertake digitalisation projects show that the German companies mainly control the digitalisation of processes while Chinese parent companies and subsidiaries in China play a key role in developing digital business models. This signals a shift in innovation patterns and changes in inter-firm relationships.

Keywords: digitalisation; Chinese investment; comparative capitalism; global China; business model innovation; Industry 4.0.

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1 Introduction

The growing competitiveness of Chinese companies in core technologies such as cloud computing, artificial intelligence (AI), and electric vehicles (EV), paired with the Chinese state's ambitions to leverage the current digital and ecological transformation to gain a global leadership position, has internationally led to tightened regulation. The EU and its member states have raised the bar for new Chinese investments, particularly for acquisitions of local companies in the high-tech and critical infrastructure segment (Bauerle Danzman and Meunier, 2023; Gräf and Schmalz, 2023). What draws less political attention is the already existing Chinese Foreign Direct Investment (FDI) stock in Europe, namely companies acquired through mergers and acquisitions over the past two decades. A significant share of these companies operates in manufacturing industries (Rusche, 2020), and Germany is a leading receiver of Chinese FDI in Europe (Kratz et al., 2023).

Existing academic studies on the post-merger integration process in acquired companies in Germany have revealed that Chinese investors mostly accept the local institutional environment. They grant their acquired subsidiaries significant independence, pursue long-term interests, invest in process upgrading, and embrace the established institutions of plant-level co-determination (Müller, 2017; Mense-Petermann, 2022; Schmalz et al., 2024a). These companies might have been initially attractive to their investors because of their hardware technologies and related patents, but in recent years, digital technologies have become a central field of innovation in manufacturing as well. Whether the behaviour of Chinese investors is changing due to their newly acquired competitiveness in technologies for digitalisation has not yet been a subject of investigation.

Manufacturing sectors see strong investments in digitalisation projects focused on the production process and products, developing and applying technologies such as AI, the internet of things (IoT), algorithms, and cloud computing. Digitalisation of such traditional industries is an important dimension of how Chinese companies could shape and influence the digitalisation of the European economy because, different from the consumer-facing digital economy, where American and Chinese technology companies compete over market shares with very few European participants, digitalisation of manufacturing industries and products concern the core of European know-how and competitiveness. In manufacturing industries – not so different from the digital economy – who develop software and new business models and collect, process, and analyse data significantly influence who can drive innovation and capture value in an economy that increasingly relies on intangible assets. Manufacturing industries currently experience a hybridisation of their business models by adding a data layer to their otherwise physical production processes and products, e.g., by collecting data in the manufacturing process or from the operation of products (Schneidemesser and Butollo, 2025).

The increased importance of leadership in digital technologies for companies, the Chinese Government, and the European Union's economy yields the question of whether the balance between Chinese parent companies' interests, industrial policy goals of the Chinese state, and local institutional embeddedness of acquired companies is changing. This paper makes a contribution here by investigating the digitalisation strategies of Chinese-invested manufacturing companies in Germany and the investors' role in their digitalisation processes. Specifically, I ask:

1 How is digitalisation taking shape in manufacturing companies acquired by Chinese investors?

2 What influence do Chinese investors exert on the digitalisation strategies of their acquired companies?

Understanding whether there is a shift in who drives innovation and company strategy regarding digital technologies in companies with Chinese investors in Germany is a relevant indicator of Chinese companies' involvement in the digitalisation of the European economy.

The findings from a two-step analysis of 15 case studies on Chinese-owned manufacturing companies in Germany, consisting of 27 company visits and 73 interviews and focus group discussions with works council members, trade union and management representatives in Germany and China, suggest two dynamics:

a Engagement with digitalisation varies greatly among companies, process digitalisation and digital business model development are important fields of activity for some companies.

b Through digitalisation, the relationship between Chinese investors and their German subsidiaries changes, with reverse innovation (Govindarajan and Trimble, 2012) occurring in some cases.

Cooperation on digital business model development is the point of entry for Chinese investors to shape digitalisation in their acquired companies, contributing core technologies for developing software to collect and analyse data which becomes an important source for product and process innovation.

The paper makes two contributions: Theoretically, it contributes to an understanding of a variety of digitalisation within MNCs. It makes a case for expanding the field of inquiry from looking only at process digitalisation to including digital business model development, as both fields are shaped differently by the institutional context as well as parent companies' strategies and potentially state interests. Empirically, it shows how Chinese-owned manufacturing companies are digitalising and how they are entering cooperations in the development of digital business models. Three modes of digital business model innovation can be observed: Chinese-owned companies cooperate with European Software Companies (mode 1), with their subsidiaries in China (mode 2), or with their Chinese parent companies (mode 3).

The remainder of the paper is structured as follows: Section 2 discusses important factors that shape Chinese-owned manufacturing companies' digitalisation on the ground by integrating two debates from comparative capitalism research, the literature on the role of the party-state for China's economic development, and the literature on a variety of innovation systems, particularly a variety of digitalisation. After describing the sample and methodology for data collection and analysis in Section 3, Section 4 presents findings from the two-step analysis of the digitalisation strategies of Chinese-owned manufacturing companies in Germany, showing that eight of the 15 companies engage in digitalisation projects. Chinese investors get involved in process design and digitalisation only under certain conditions while actively shaping the digital business models of acquired German companies. Section 5 summarises and concludes.

2 Comparative capitalism research – Chinese capitalism and institutional embeddedness

German companies with Chinese investors operate in a specific state of tension between their embeddedness within the German institutional context and their parent companies' interests and expectations. To understand how German manufacturing companies with Chinese investors digitalise within this constellation, I draw on two debates from comparative capitalism research that each emphasise a specific element as important for company strategy and behaviour. The literature on Chinese capitalism discusses the Chinese (party-)state as a key actor. It intervenes and regulates the domestic economy (Nölke et al., 2019; Pearson et al., 2021) and the internationalisation of Chinese companies (Gräf and Schmalz, 2023; Pearson et al., 2022), however with varying success and not without contestation (Nee and Opper, 2012; Rogelja and Tsimonis, 2020; Zhang and Peck, 2016).

The second set of literature I draw on is the classic varieties of capitalism (VoC) literature. It emphasises local institutions as important for shaping company development. The VoC framework enables an integrated analysis "of firm behaviour with analysis of the political economy as a whole" [Hall and Soskice, (2001), p.15]. It recognises companies as agents with considerable autonomy in shaping their strategies, but the VoC's main emphasis is that companies' actions and strategies are conditioned by the institutional structures of a nation's political economy (Allen, 2004; Hall and Soskice, 2001).

German manufacturing companies with Chinese investors are a specific group of companies to which both hypotheses potentially apply. Through their Chinese investors, the Chinese state's ambitions could affect their development. At the same time, they are embedded in the German context with its specific institutions. In the following, I will first discuss the literature on the Chinese party-state's ambitions in the field of technological development. After that, I will engage with the debate on a variety of digitalisation that is inspired by the VoC framework.

2.1 Digitalisation and the Chinese state

The Chinese party-state exercises its economic steering capacities through the governance of state-owned enterprises (SOEs) (Leutert, 2016; Pearson, 2005), industrial policy, five-year plans, loans, and subsidies (Heilmann and Shih, 2013; Naughton, 2009, 2021). Although the Chinese state significantly influences how companies operate and strategise, this influence is far from all-encompassing (Gräf and Schmalz, 2023), and China should not be perceived as a 'singular entity' [Rogelja and Tsimonis, (2020), p.113]. State control varies across types of capital (private/state), sectors and regions (Köncke et al., 2022; Nölke et al., (2019), pp.40–75; Weber and Qi, 2022) and can be contradictory across administrative levels (Zhang and Peck, 2016). Private companies have managed to develop 'from below' despite the economic steering capacity of state agencies (Nee and Opper, 2012), and internationalisation strategies vary based on factors such as company ownership type. While the internationalisation of SOEs has been found to be strongly influenced by the geopolitical and strategic objectives of the Chinese state, the internationalisation of private companies is more market-driven (Lee, 2017). This diverse and nuanced picture of Chinese state influence is also reflected in technological development as a crucial factor for economic competitiveness. To strengthen the domestic market and to transform industrial sectors in the aftermath of the financial crisis of 2008/2009, the 12th Five-Year Plan (2011 to 2015) of the Chinese central government made technological development, automation, and fostering indigenous innovation a core goal (cf. Casey and Koleski, 2011). More recently, the Chinese central government has explicitly stated that leadership in AI and other digital technologies for manufacturing is a top priority. This was expressed in the Made in China 2025 strategy (MiC2025) announced in 2015 (Zenglein and Holzmann, 2019), followed by 24 policies concerning the development of the industrial internet (Liu and Li, 2022), the AI development plan (State Council, 2017), additional AI-related policies and the 'China Standards 2035' program (Fuchs and Eaton, 2021). Policy implementation is often organised with direct company involvement, identifying important players in the field and trial or demonstration projects for certain technologies that receive state funding. For developing the industrial internet, for example, in 2019, the Chinese Ministry of Industry and Information Technology selected and funded ten cross-industry industrial internet of things (IIoT) platforms and 81 IIoT demonstration projects (Lüthje, 2022).

How the formulation of policies by the Chinese Government effectively steers companies' activities towards anticipated outcomes, domestically or abroad, is controversially debated. One group of researchers emphasises the importance of distinguishing between the formulation of policy initiatives and their implementation in practice (Butollo and Lüthje, 2017; Hu, 2023; Jie, 2023; Lieberthal, 2004; Schmalz et al., 2024b). However, investments and cooperation projects abroad that suggest a connection to one or more of these policy initiatives have also been identified (DPC, 2023; Jungbluth, 2018; Zenglein and Holzmann, 2019). Think tanks and policymakers especially perceive Chinese investments and collaborations as increasingly politically motivated. This viewpoint is particularly common regarding the digital sector, where issues of digital sovereignty, data access, and data privacy become sources of conflict (Pearson et al., 2022).

This strand of research demonstrates that China's 'party-state capitalism' (Pearson et al., 2021) shapes industrial and technological development in China as well as the internationalisation of Chinese companies and actors. Although its influence may be less direct and more contested than often believed, the Chinese Government follows an agenda to become a leading force in future technologies. To this end, it involves and supports companies in developing and leveraging new technological opportunities. Chinese MNCs with European subsidiaries can become part of this endeavour by building capacities to develop and utilise digital technologies. The current phase of technological development presents opportunities for reverse innovation. This refers to an innovation initially developed for and adopted in emerging or developing countries before 'spreading' or 'trickling up' to developed countries (Govindarajan and Trimble, 2012). Such a dynamic of reverse innovation could occur between Chinese parent companies or subsidiaries and German companies, with the former providing digital innovation and expertise to the latter. However, introducing innovations from emerging markets to developed markets presents several challenges. Products and services must be adapted to the expectations of market participants, comply with regulatory standards, and be compatible with existing infrastructures, among others (Midler et al., 2017).

2.2 Varieties of digitalisation

Discussions on a variety of digitalisation are prominent in automotive industry research, which has a tradition of historical, internationally comparative investigation that is unparalleled in depth and detail (Boyer and Freyssenet, 2003). The argument for a context specificity of digitalisation practices within MNCs draws on debates from the 2000s when automotive industry researchers contended that the success of production models in the industry is based on context-specific economic and social conditions: "Practices and production models that are successful in one country and for one company cannot simply be transferred to other countries and companies" [Boyer and Freyssenet, (2003), p.14]. Studies on digitalisation processes reach similar conclusions. Holst et al. (2020), Mokudai et al. (2021) and Schröder et al. (2023) observed that Japanese and German automotive firms utilise digital technologies in distinct ways. While Japanese firms enhance their existing lean production practices with digital technologies in bottom-up experimentation, German firms adopt a more expert-led top-down approach to designing and implementing digital technologies. More recent studies suggest that, while remaining distinct, some differences may diminish over time as Japanese and German automotive firms seek solutions for the shortcomings of their respective approaches (Holst et al., 2024; Schröder et al., 2024). Other studies suggest that digitalisation approaches might also vary among production locations within automotive OEMs. Olejniczak et al. (2020) observed that Japanese automotive firms operating in Central and Eastern Europe have employed digital technologies more extensively than in Japan, aligning with the German vision of Industry 4.0. And Caria et al., in their study of an Italian subsidiary of a German OEM, demonstrate a slower and different application of digital technologies compared to those pursued by the OEM in Germany. Their findings "challenge the general perception of German firms' as oriented towards the adoption of I4.0 pattern" [Caria et al., (2023), p.318].

These studies on a variety of digitalisation have produced first empirical evidence of the local embeddedness of the digitalisation of company internal processes. From the VoC perspective, such differences in innovation patterns are accounted for by different institutional arrangements between countries (Hall and Soskice, 2001). Differences in institutions can be observed, for instance, in how company activities are financed, in industrial relations, workforce training, and corporate governance. Schröder et al. (2023) apply the VoC lens to theorise the different digitalisation approaches in German and Japanese automotive companies, identifying structural differences in employment and skill formation in both countries as essential factors.

In the German industrial relations system, sector-wide collective bargaining agreements, co-determination, and the dual vocational training system are traditionally typical institutional characteristics (Kirchner et al., 2012; Schröder et al., 2023). Such observations were originally based on manufacturing sectors and although a diversification of the institutional arrangement has taken place over the past years, such institutions still characterise the core of German manufacturing companies (Kirchner et al., 2012) to which the companies in our data sample belong.

These institutional arrangements shape digitalisation processes within companies in Germany, with the German industrial relations system being particularly relevant, which grants labour representatives special co-determination rights in the introduction of technology at the workplace. The German Works Constitution Act (Betriebsverfassungsgesetz – BetrVG) stipulates that works councils have the right to be informed and consulted before the introduction of technical innovations (§90 BetrVG), and if such technical systems can be used for controlling performance and behaviour, they are subject to co-determination under §87 BetrVG (Krzywdzinski et al., 2023). While these are long-standing information and co-determination possibilities in technology implementation, the 2021 German Works Council Modernisation Act specifically addresses the implementation of AI-based systems and works councils' rights in this process. Works councils can seek expert support when AI systems are implemented (consultation rights); they have to be informed when technical innovation or changes to the work process explicitly include AI (information rights), and they have co-determination rights when AI tools are used in the HR processes recruitment, transfers, regrouping and dismissal of employees. Even though the Works Council Modernisation Act does not grant a general right of co-determination in digitalisation processes as demanded by the trade unions (Albrecht and Görlitz, 2021; IG Metall, 2023), works councils' rights to participate in the rollout of new IT systems expanded. How these rights are invoked varies greatly between companies (Gerst, 2020), and the term AI remains undefined, creating ambiguity and potential conflict over the range of technologies to which the new co-determination rights pertain.

The existing research on varieties of digitalisation (e.g., Caria et al., 2023; Holst et al., 2020; Mokudai et al., 2021; Olejniczak et al., 2020) focuses mainly on process digitalisation within companies, which the above-described institutions influence in Germany (Schröder et al., 2023). The digitalisation of processes is at the heart of the industry 4.0 vision. Digital technologies are used to improve company-internal processes and beyond, connecting information flows of production processes and business processes in the 'smart factory' to increase transparency and flexibility (Kagermann, 2013). Process digitalisation is, however, merely one side of the current digital transformation. The other side, which has so far been overlooked in the varieties of digitalisation debate, is the digitalisation of business models. "A business model describes the rationale of how an organisation creates, delivers and captures value" [Osterwalder et al., (2010), p.14]. It requires the working together of four architectural decisions: the customer group (Who?), the value proposition for the customer (What?), organising the value chain to deliver the value (How?) and the revenue model (Value?) (Gassmann et al., 2014). A business model innovation is considered 'digital' when digital technologies are a fundamental input for designing the interplay of these four dimensions. The definition provided by Gassmann et al. (2014) illustrate that business model digitalisation and process digitalisation are not necessarily separate from each other but that production and business processes constitute one of the four dimensions of a business model.

The institutional arrangement for business model development, however, is different. Unlike during the introduction of new technology in a company, the German industrial relations system does not equip labour representatives with rights to get involved in company strategy development and works councils rarely get involved in this field (Gerst, 2020). When looking at digitalisation of processes and the development of digital business models, we therefore have two different institutional arrangements in Germany regarding co-determination rights: These are stronger for process digitalisation than for digital business model development, which also means that Chinese investors (or any other investors) encounter fewer barriers when engaging in business model development for their German subsidiaries.

The possibilities for Chinese investors to get involved in these two areas of digitalisation might also differ due to differences in path dependency of developments. Structures of incremental improvement and automation of processes have been established in most companies for a long time. Here, the use of digital technologies is only the most recent development, and it has been found to be path-dependent (Hirsch-Kreinsen, 2019). It might be especially challenging for Chinese investors who acquired German companies in the past ten to 15 years to change these established structures for process evaluation and improvement within successful manufacturing operations. Digital business model innovation is a genuinely new field for many companies, which means less established structures to take into account for the Chinese investor.

To summarise: The two strands of literature discussed above emphasise different elements as decisive for shaping the digitalisation of companies. The literature on Chinese capitalism sees the Chinese party-state (Pearson et al., 2022) as an important actor that shapes the Chinese economy and the internationalisation of Chinese companies, even though its power varies greatly within the economy. The literature on a variety of digitalisation within MNCs emphasises the important role of local institutions in shaping digital innovation (Schröder et al., 2023). The following discussion of empirical findings from a study of digitalisation strategies of 15 German companies that have Chinese investors will pick up on both arguments and discuss how they feature and interact in the empirical context.

3 Methodology

This paper presents original qualitative empirical research, comprising 15 case studies of manufacturing companies in Germany with Chinese investors holding a controlling share. Data was collected between November 2021 and October 2024 in both Germany and China. Digitalisation is only one topic within a broader data collection on labour relations in Chinese-invested manufacturing companies in Germany featuring in eight of the 15 companies (for details on the sample, see Table 1).

Each case study comprises semi-structured interviews with stakeholders and company visits. In Germany, interviews were conducted with works council members, company management, advisory board members, local trade union advisors (Betriebsbetreuer*innen), and other experts with good knowledge of the company. In China, interviews were conducted with managers from the parent company as well as with managers from the German company’s Chinese subsidiaries (for a complete list of interviews and company visits see the Appendix). Semi-structured interviews are the primary method of data collection due to the explorative nature of this study and the lack of previous research on the acquisitions (Brinkmann, 2020). The interviews enabled us to gain first-hand knowledge of how the acquisition impacted the German companies’ labour relations, R&D and digitalisation and the post-merger integration process. The interviews with parent companies added their perspective on the acquisition, their evaluation of the German companies’ performance and their plans for the cooperation. Interviews with the German companies’ Chinese subsidiaries added information about the German companies’ activities in the Chinese market.

Table 1 Overview sample of case companies

Case study pseudonym	*Case study Nr.*	*Industry*[1]	*Product type*	*Company size*[2]	*Ownership types*	*Current acquired share*	*Date of acquisition*	*Process*	*Business model*
		Acquired company			Chinese investor	Acquisition		Digitalisation	
CS_infotainment	CS1	A	Automotive electronics and battery management systems	Very large	Private	100%	2012	X	
CS_loco-motive	CS2	O	Diesel-electric locomotives	SME	State-owned	100%	2020		X
	CS3	O	Precision cutting tools	SME	Mixed[3]	100%	2008		
	CS4	M	Hydraulic pumps and motors	Large	State-owned	90%	2012		
	CS5	M	Hydraulic presses and laminators	SME	Private	100%	2017		
CS_seat	CS6	A	Car interior components and seats for off-road vehicles	Very large	Private	84.23%	2017	X	X
	CS7	A	sheet metal for automotive	Large	State-owned	100%	2013		
CS_machine	CS8	M	Large machine tools (milling, turning, grinding)	Large	State-owned	100%	2005		X
CS_battery	CS9	A	Battery packs	SME	Private	100%	2021	X	
CS_pump	CS10	M	Pumping equipment	Large	Private	100%	2012		X
	CS11	O	Electric motors	Large	Private	85%	2017		
	CS12	A	Antennas	SME	State owned	100%	2016		
CS_forklift	CS13	O	Forklift trucks and warehouse systems	Very large	State-owned	46.5%[4]	2012	X	X
	CS14	O	Electric motors	SME	Mixed	98.93%	2011		
CS_robot	CS15	M	Robots and automation systems	Very large	Private	100%	2015	X	X

Notes: [1]A = automotive; M = mechanical engineering; O = other manufacturing industries.
[2]SME < 500 employees; large enterprise = 500 to <5,000 employees; very large enterprise ≥ 5,000 employees.
[3]Mixed = partly state, partly private owned.
[4]The Chinese investor holds less than 50% of the company but is still the largest investor. With its controlling share the investor can dominate the shareholder's annual meeting.

The second element of each case study is one or more company visits, which include a plant tour. These company visits were a valuable opportunity to collect data on the production process and working conditions and the implementation of automation and digitalisation projects. Our field research was complemented by an analysis of newspaper articles, press statements, company websites, annual reports, and policy documents to triangulate data from interviews and observations. The interviews were transcribed or documented as protocols, and observations from company visits were also documented as protocols. Transcripts and protocols were analysed using qualitative content analysis (Mayring, 2014). The research questions were translated into the following main categories to guide the coding and analysis of the empirical material. For RQ 1 – How digitalisation is taking shape – the main categories were 1) the internal digitalisation of business and manufacturing processes with the subcategories hardware (manufacturing equipment) and software (e.g., IoT platforms, software for data collection) and; 2) digital business models. For RQ 2 – Influence of the Chinese investor on digitalisation strategies – the main category was 3) the actor constellation involved in digitalisation processes: German companies, Chinese parent companies, Chinese subsidiaries, European third-party technology providers or Chinese third-party software and/or hardware providers. The analysis was conducted in a two-step process, for each research question separately. First, for RQ1, all 15 companies were included in the initial analysis. To answer the question of how digitalisation is taking shape in manufacturing companies that have been acquired by Chinese investors, it is important to evaluate how pervasive digitalisation is in Chinese-invested manufacturing companies overall. As a result, eight companies were identified as undertaking digitalisation projects. This ratio is higher than the findings from a 2019 representative survey of 2057 manufacturing companies in Germany by the trade union IG Metall (2023), which found that in one-third of surveyed companies, new business models or digital products are explored, or digital technologies are used to improve processes (Gerst, 2020). Secondly, for RQ2, the analysis of the actor constellation in digitalisation initiatives includes the eight case studies identified in the first analysis step as undertaking digitalisation projects. The focus of the following presentation of findings is the eight companies that pursue digitalisation projects.

4 Digitalisation within German manufacturing companies with Chinese investors

This section first puts the phenomenon of digitalisation into relation to the sample of case studies as a whole, assessing the relevance of the topic for the group of companies. Subsequently, the majority of this section presents empirical findings on digitalisation processes and the actor constellations that shape them in the eight case companies that undertake digitalisation projects, investigating the role of the Chinese investor in the process. Drawing on the discussion in section 2.2., the analysis is conducted separately for process digitalisation and digital business model innovation. Of the 15 studied companies, two engage in digital process and three in business model development, three undertake digitalisation in both areas. The case studies show, firstly, that digitalisation of processes is undertaken by German companies in collaboration with European technology providers, with the exception of one company that underwent a radical product transformation following an acquisition, where the Chinese investor plays an active role in the company's new process design. Secondly, the case studies indicate that

Chinese parent companies and the German companies' Chinese subsidiaries actively participate in the development of digital business models.

4.1 Modes of process digitalisation

The degree of automation within the case companies varies. In many companies, the departments for drilling, milling and laser cutting of metal components and pre-assembly use older machines that require more human labour side by side with newer, fully automated production centres that only require loading and unloading by workers. Comprehensive automation of more complex production processes, following the Industry 4.0 vision, can be observed in some companies as isolated projects, e.g., automation of the welding processes involved in forklift cabin assembly (CS_forklift), a fully automated spraying booth (CS_pump) and powder coating process (CS_forklift). The manufacturing equipment used by the German companies is from premium European brands; no hardware by Chinese brands is integrated into the production process, and according to our interviews, Chinese parent companies do not push for sourcing equipment from China when new investments are made. This observation holds true for all companies except CS_battery.

CS_battery, a former location of a tier-one car supplier that produced starters and light machines for off-road vehicles, is currently being transformed into a battery pack assembly plant after the acquisition by a Chinese battery manufacturer in 2021. The new product requires setting up a new production line. The Chinese investor allocated the contract to a Shanghai-based automation equipment provider, which designed the production line including machines and components from China-based and global brands. According to CS_battery's works council members, employees now have very limited competencies in designing and optimising the production process (CS_battery_3). The automation equipment provider creates dependency by requiring all changes to be made through them and has remote access to the machine software. The works council members of CS_battery evaluate this outsourcing of competencies and know-how as harmful to the productivity and independence of the plant (CS_battery_3). CS_battery has experienced a unique post-merger integration process and has to be considered exceptional at this point. Nevertheless, it is an informative case, as more companies may encounter a radical transformation of their products, particularly in the automotive industry. The transformation of the power train towards alternative drive models makes combustion engine-specific components obsolete and requires the affected component suppliers to rethink their product portfolio (Ziegler and Locher, 2024). CS_battery shows how a Chinese investor could get involved in organising the production process through reverse innovation when the product dimension of the business model is transformed radically, and the core production know-how is provided by the Chinese parent company.

Regarding the influence of Chinese parent companies on investments in manufacturing equipment (and embedded software), the following interim conclusion can be drawn: There is no evidence of influence from the Chinese parent companies in the selection of production equipment favouring Chinese brands. The exception is CS_battery, where the radical transformation of the product required a new production line, for which a Chinese company was awarded the contract.

Beyond the implementation of foundational automation equipment and isolated industry 4.0 application cases, four of the 15 case companies leverage software to collect data from manufacturing and business processes to better leverage the organisations' data. Apart from CS_robot, which was acquired because of its leadership in 4.0 technologies, all companies were already under Chinese ownership when they started these projects. For a summary of projects, see Table 2.[1]

Table 2 Process digitalisation projects in four of the 15 case companies

Case study	*Products*	*Project*	*Cooperation partner*
CS_infotainment	Infotainment systems; automotive electronics; battery management system	Manufacturing execution system (MES)	• Critical manufacturing (Portugal), a subsidiary of ASMPT (Singapore) • Local partners
CS_seat	Car interior components and seats for off-road vehicles	Business and manufacturing process optimisation	• Forcam (Germany)
CS_forklift	Forklift trucks and warehouse systems	Manufacturing execution system (MES) and production process analytics	• No cooperation, in-house development using SAP production scheduling software
CS_robot	Robots and automation systems	Data-driven assembly line optimisation	• Internal automation systems business unit • Multi-company alliance

These companies produce larger volumes, and their products are characterised by a certain standardisation while facing increasing model heterogeneity and shorter assembly cycles. They produce automotive infotainment systems, interior car components, forklifts and robots. All four companies have implemented SAP's modern database management system S4HANA which can be used in the cloud or on-premises. It allows data storage and fast data analysis in a single system. It should be noted that with SAP, the companies all use a German database, which is also the industry standard to manage their data. The concrete projects to leverage organisational data are specific for each company.

CS_infotainment is implementing a manufacturing execution system (MES) at its main manufacturing plant in Germany, which will eventually be introduced across all manufacturing locations globally. A key function of the MES is calculating manufacturing planning options based on data (CS_infotainment_3). For the implementation of the MES, CS_infotainment is working with the technology company Critical Manufacturing, which offers automation and manufacturing software for high-tech industries and has an indirect link to China. The company is headquartered in Portugal but is a subsidiary of ASMPT, a leading supplier of semiconductor production equipment based in Singapore, which is listed on the Hong Kong Stock Exchange. ASMPT has a global shareholding structure but significant operations in China. CS_infotainment is also involved in a research project that develops a 5G innovation platform for industrial applications, which is funded by the German Federal Ministry of Transport and Digital Infrastructure with 3 million Euros.

CS_seat is conducting a project to optimise its production process through data analysis with Forcam, a software provider for production control and the IIoT based in Heidelberg, Germany. A focus is the production of off-road vehicle seats. CS_seat is also working on a consolidated data infrastructure for its human resource management across all global locations while at the same time accounting for local particularities (CS_seat_2).

CS_forklift is independently pursuing its production development program to digitise and fully automate production management. Building on SAP S4HANA and SAP's production scheduling software, it is developing an in-house MES that automatically oversees the assembly of a large variety of forklifts on two automated assembly lines.

CS_robot is enhancing its robot assembly lines with software created by the company's automation systems division. It is also part of a Germany-based multi-company alliance that collaborates to develop software systems for the digital transformation of manufacturing.

For all four companies, process digitalisation initiatives are incremental, building on previous process improvements that form the foundation for the current initiatives. The four cases show a continuity of non-involvement by Chinese parent companies in process automation and digitalisation in their German subsidiaries. As observed for investments in manufacturing hardware, Chinese parent companies also do not get involved when it comes to more comprehensive data collection and analysis; the four companies develop such software systems with European technology partners or in-house.

4.2 Modes of digital business model innovation

Three of the five companies undertaking process digitalisation projects (CS_seat, CS_forklift, and CS_robot) and three other companies (CS_locomotive, CS_machine and CS_pump) develop digital services for their products. All companies were already under Chinese ownership when they started these initiatives.

Except for CS_seat, which produces interior car components and off-road vehicle seats, they are all offering end products to commercial customers: shunting locomotives (CS_locomotive), machine tools (CS_machine), pumping equipment (CS_pump), forklifts and AGVs (CS_forklift) and robots (CS_robot). What a company produces – whether a component or finished product – influences how data can be leveraged for business model innovation. Generally speaking, for component manufacturers, selling product-related digital services and securing access to data from the final product is particularly challenging. This is especially true in industries dominated by strong manufacturing lead firms, such as the automotive sector. The automotive OEMs have a strong interest and the capacity to provide core digital services in the car and have a more direct relationship to the end-user to ensure data access. They only rely on suppliers' services where it is necessary. CS_infotainment described this difficulty. As a producer of infotainment systems for cars, it has the capacity to offer many of the software functionalities but the OEMs are only interested in the hardware and fundamental connectivity of CS_infotainment's products (CS_infotainment_5). The OEMs develop digital functionalities in-house and compete in this domain with the smartphone operating system providers Apple and Google. CS_seat is the only component manufacturer in this sample that has nevertheless started to explore digital technologies to expand its business model towards the field of supply chain transparency. The five companies that manufacture end products and develop add-on services equip their products with IoT connectors that enable the transmission of machine data in the cloud or to data servers hosted on-premises. The data can then be analysed to provide services such as fleet management, offering suggestions for optimised use of the product and improved maintenance services through remote servicing or predicting component wear and tear based on data instead of scheduling routine maintenance cycles.

Transforming these services into a digital business model, alongside their hardware business, remains in its early stages. It is yet to be determined which of these will meaningfully contribute to their company's revenue long-term. Unlike the non-involvement of Chinese parent companies in process digitalisation, I observe a growing involvement of some Chinese parent companies and Chinese subsidiaries of German companies in digital business model development. Based on these observations, I identify three modes of digital business model innovation, which are characterised by distinct actor constellations. The modes are detailed below and summarised in Table 3.

Table 3 Three modes of digital business model innovation[1]

Mode 1: With a European software company		*Mode 2: With Chinese subsidiary*		*Mode 3: With Chinese parent company*	
CS_locomotive	Digital services for locomotives	CS_forklift	AGV management software	CS_pump	Digital services for pumping equipment
CS_robot	Operating system for robots			CS_seat	Supply chain transparency solution
CS_machine	Remote servicing				

Notes: [1]Most companies do some development of their digital business models in-house. However, this categorisation wants to emphasise the cooperation between actors and for the sake of clarity does not have a separate category for in-house development.

Mode 1 Digital business model development in cooperation with European software providers

Three companies cooperate with European (Belgian and German) software companies to develop digital business models. The level of cooperation varies: CS_locomotive adopts the product of the software provider, CS_robot and CS_machine mainly create digital products in-house supported by third-party companies where necessary. CS_locomotive is working with Railnova, a startup from Belgium that specialises in predictive maintenance for railway fleets. CS_locomotive, which lacks internal expertise in data analytics and IoT technology, offers its customers Railnova's IoT platform and data analysis services.

CS_robot has an internal unit focused on the development of digital products and a software development department that operates globally, employing 400 staff across Hungary, Germany, China, and the USA (CS_robot_1). In addition, the company has acquired a software startup based in Munich that specialises in customised IoT systems for the automation industry and interconnected products. The startup supports CS_robot with digitalisation projects in both areas. CS_robot offers digital services via its cloud-based software platform, allowing customers to gain insights into their robots' data. The platform is offered as a software as a service (SaaS). The latest project of CS_robot is a new operating system for robots that enables the programming of new functions for non-experts. Software components can be chosen from a platform without the need to write code (CS_robot_5). If the current pilot project is successful, CS_robot intends to bring the robot operating system to market in collaboration with a large German industrial software company, assessing that their internal expertise is insufficient to implement such a project independently. While the Chinese parent company is very active in exploring digital business models and process digitalisation for its products and factories (CS_robot_c_2), it is not involved in CS_robot's activities. However, there is an interest in exchanging experiences; recently, the software development department of CS_robot's parent company's European subsidiary visited to learn about CS_robot's digital products (CS_robot_5).

CS_machine offers remote servicing for its machines to customers (CS_machine_3). In the event of an issue with the manufacturing equipment, CS_machine's experts can identify potential causes and necessary repairs by analysing the machine data from a distance. The company maintains a strong awareness of its customers' data sensitivities and security issues, designing the service to ensure that no data leaves the customers' servers and that a remote connection to customer machines is established only when an issue arises. To establish the connection and grand access, a physical input is needed at the customer's machine. CS_machine is considering developing a predictive maintenance service; offering this would require comprehensive and continuous access to customers data (CS_machine_4).

Mode 2 Digital business model development in cooperation with Chinese subsidiaries

CS_forklift provides in-house developed fleet management software for forklift trucks. Included as standard equipment, each forklift is fitted with an IoT connector that gathers data on the machine's status and capacity utilisation (CS_forklift_2). This data can be used to manage and optimise usage and deployment, schedule maintenance intervals and driver training. In addition to this in-house product, a recent project initiated by the Chinese subsidiary of CS_forklift is being adapted to the European context. CS_forklift China has developed intralogistics management software with a small team of engineers, enabling AGVs to communicate and autonomously manage logistics processes within a warehouse or manufacturing plant. According to the management of the Chinese subsidiary the software is already implemented in 60 customer locations in China, including a manufacturing plant of CS_forklift's parent company. It is offered for a very competitive price, while the main revenue comes from AGV hardware (CS13_forklift_c_1). The adaptation of the software to the European market is calculated as not causing much additional costs (CS13_forklift_c_2). By adding CS_forklift China's service to their portfolio, CS_forklift can offer customers in Europe a simpler and cheaper product than the comprehensive, complex and expensive products already on the market.

Mode 3 Digital business model development in cooperation with Chinese parent companies

Two companies collaborate with their parent companies on the development of digital business models. In the case of CS_seat, the core innovation comes from their parent company, whereas CS_pump develops digital services in Germany but benefits from the Chinese parent companies' manpower and digital infrastructure.

CS_seat's parent company develops a supply chain transparency software together with a Chinese EV manufacturer and a third-party software developer in China to meet the customer's transparency requirements. The software collects data from CS_seat's parent company's production plant and sends order status updates and quality control results in real-time to the Chinese EV manufacturer (CS_seat_c_3). The project is in an early stage, and the implementation in Germany is still in the planning phase, according to our interviewees. However, CS_seat's German management was impressed by the project and is planning its adaptation to the European market and also the customer side (German automotive OEMs) signalled interest in using the software in Europe (CS_seat_c_2).

CS_pump has established an internal digitalisation unit tasked primarily with developing innovative future business models to uphold its status as a premium brand in concrete pumping equipment (CS_pump_4). The digital services they offer customers to monitor the equipment is just one of their ongoing projects. They have designed the services in-house but are utilising the manpower of their parent company's industrial internet subsidiary for the technical execution of the services and its digital platform infrastructure (CS_pump_7).

The cooperations around digital business model development in these six companies show a heterogeneity of approaches in which some Chinese parent companies and subsidiaries play a prominent role as innovators and providers of technical expertise.

4.3 Discussion

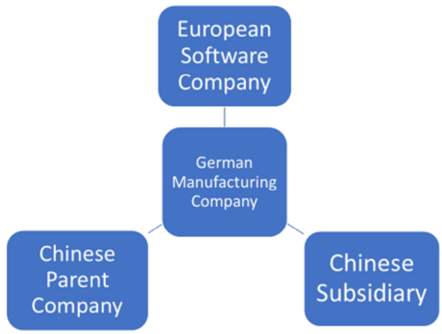
The findings described above demonstrate a wide range of approaches to digitalisation, from the absence of clear strategies and application projects to the ambitious development of digital business models. In terms of the participation of Chinese parent companies and subsidiaries, a difference between the digitalisation of processes and the development of digital business models is evident. There is no involvement from the Chinese side in process digitalisation projects except after a radical product conversion (CS_battery). Such disruptive change opens up new paths for development (Hirsch-Kreinsen, 2019) and creates possibilities for new players – such as Chinese investors or subsidiaries – to shape this development. Chinese parent companies and subsidiaries become actors in digital business model innovation in Germany by contributing infrastructure and expertise or even the core product idea and its execution (see Figure 1).

The reverse innovation experienced in the development of digital business models is new to the involved companies and, if successful, can foster a more reciprocal relationship. Previously, companies did not cooperate or had a unidirectional relationship characterised by the transfer of knowledge and technology from German companies to Chinese parent companies and subsidiaries. This observation that digital technologies represent a turning point for Chinese companies' involvement in global value chains was confirmed in interviews. The former CEO of CS_forklift identified digitalisation as the area where Chinese companies acquire the creativity and skill to design entirely new digital products:

> "There is […] research and development. For the D-part of it, development, there is no better country than China. In other words, if there is a product and it needs to be scaled up […] it needs to be constantly improved, then the Chinese can do it faster than anyone else I have seen so far. But when it comes to

research: Now I have a blank sheet of paper, please make a machine that can do it [a specific task, author], they are completely over-challenged. So, this creative part without any specifications, inventing something new, they are now starting to do that with software and digitalisation." (CS_forklift_4)[2]

Figure 1 Actor constellations for business model innovation (see online version for colours)



CS_forklift China demonstrates this progression; it was previously purely a manufacturing location, producing more affordable, adapted forklift models for the Chinese market. In recent years, it became a relevant player in (digital) R&D. It is working on a series of innovation projects with the ambitious aim to shape the company on a global level, a 'local-for-global' strategy, as it was described by the Chinese management (CS_forklift_c_1; CS_forklift_c_2). The AGV management software they develop is part of this local-for-global strategy.

The CEO of CS_pump identifies the cause of a shifting relationship with the parent company and possible reverse innovation in the strength of Chinese companies in digital innovation and electrification:

> "In the area of digitalisation, and we also know this from the B2C topic, from the consumer sector, China is of course brutally fast [...]. And it's similar in industry, [our parent company, author] has over 700,000 devices in China on its IoT platform and collects data there and has a huge team that deals purely with the topic of big data, digitalisation, etc. We don't have these resources. It's impossible to keep up to this extent, so to speak, and in this respect, I assume that we can certainly deliver innovations for […] electrification and digitalisation, but [our parent company, author] also provides us with innovations." (CS_pump_4)[3]

CS_pump is a company that prioritises digital innovation and can collaborate on the development of digital services on equal terms. In some cooperations, however, the Chinese side expresses criticism regarding the slow application process of digital technologies at their German locations and demonstrates great confidence in their own approach. For instance, the investor of CS_seat views the digitalisation of CS_seat's manufacturing process as slow and expensive. They believe this approach comes with the risk of perpetually lagging behind because "you're still in that old project, but the trend is different. We have more innovative ideas in the market" (CS_seat_c_2). The perception of slow development in Germany is particularly succinct when compared to the digital business model developed by CS_seat's parent company in a short timeframe: "For us in China to realise this kind of innovative supply chain is only one or two years" (CS_seat_c_2).

Aside from the new distribution of capabilities and expertise for developing digital products and services between the Chinese and German companies that alter their relationship, other factors also influence their cooperation on digitalisation projects, particularly the level of trust between both sides and the market and political environment. CS_pump and CS_robot demonstrate how trust matters. Both companies and their Chinese investors are pursuing ambitious digitalisation strategies. While CS_pump and its parent company are actively developing synergies (CS_punp_c_2), CS_robot and its parent company are following their independent strategies (CS_robot_c_1; CS_robot_1). Instead of cooperating with its investor, CS_robot is partnering with a German technology provider to create digital products (CS_robot_5), while the investor is pursuing a domestic strategy for the digital services it develops (CS_robot_c_1). CS_robot's strategy to pursue digital business model development independently is likely also a result of its specific market environment. Working closely with German automotive OEMs, which view their production process data as competition-relevant and sensitive (CS_robot_2), the works council of CS_robot negotiated a ring-fence agreement on data, as part of the investor agreement. It prevents the parent company from accessing data collected by CS_robot on machines operated in the field at their customers' locations. The works council perceives this agreement as crucial to maintain customers' trust in their products. Here, the political environment might function as a hindrance to cooperation in digital business model development. CS_locomotive and CS_robot, two companies pursuing digital business models independently of their Chinese investors, are also the two acquisitions in recent years that sparked a political debate on both the national and EU levels regarding reforms of industrial policy and investment regulations to better oversee Chinese investment (Schmalz et al. 2024a, 2024b). The political sensitivity surrounding these acquisitions and surrounding data may deter these investors from becoming directly involved in their Germany subsidiaries' digitalisation projects.

5 Conclusions

The findings from 15 case studies show that ambitions of the Chinese Government for leadership in digital technologies do not directly translate into specific strategies on the shopfloor of German manufacturing companies. The case studies demonstrate a large variety of digitalisation projects involving different actor constellations that are pursued with varying priorities and ambitions. However, in some cases, the relationship between acquired German companies and their Chinese parent companies or subsidiaries is changing through digitalisation. Digitalisation projects, particularly digital business model development, create reverse innovation opportunities. Digital capabilities, infrastructures, and products developed by parent companies or subsidiaries in China are considered for application in Germany, signalling the start of Chinese companies' involvement in the digitalisation of traditional industries in Europe.

In accordance with the theoretical discussion on the role of local institutions in shaping digitalisation processes in section two of this paper, the case studies show that Chinese parent companies opt for the area that is characterised by fewer path dependencies and less regulated through company-level co-determination provisions and other institutions to engage in the digitalisation of their subsidiaries: business model development. Digitalisation of processes remains in the hands of the German companies.

These findings indicate that the hypothesis of a variety of digitalisation, viewing local institutions as a decisive factor, is valid when looking at company internal processes and should be reassessed regarding digital business models.

The (digital) business model is also an attractive entry point for investors to increase their influence on acquired German companies because it shapes all areas of a company's activities that are involved in creating, delivering and capturing value (Osterwalder et al., 2010), including the production process. Chinese parent companies and subsidiaries also choose the more relevant, scalable and 'data-rich' field to get involved. Through offering digital services, the providers collect data from thousands of forklifts, robots or pumping equipment operated by customers in the field. Having access to large amounts of operational data is competition-relevant, it helps to understand customers' needs, improve their user experience and inform further product innovation to maintain and improve the companies' market position. In contrast, process digitalisation generates data on the operations of a single company and creates transparency regarding bottlenecks and improvement potential in internal processes as the basis for process upgrading and cost saving.

The observed cooperation projects on digital business models show that Chinese parent companies are developing capabilities in this area, designing and executing digitalisation projects. This is welcomed and supported by industrial policy initiatives by the Chinese Government but particularly in the automotive industry also driven by emerging Chinese OEMs that confront suppliers with new requirements for component functionalities and supply chain transparency.

As the case studies show, cooperation on digital business models does not lead to the substitution of initiatives by the German companies but develops when the German company can cost-effectively leverage capabilities already developed by the Chinese parent company (CS_pump) or when the Chinese side offers an innovative service at low cost that the German company does not yet have in its portfolio (CS_seat; CS_forklift). Such collaboration can lead to high-road or low-road scenarios for the German company in the long-term. If the German companies manage to remain innovative in the digital domain, building upon or complementing what the Chinese parent companies or subsidiaries offer, synergy effects can develop between both companies by pooling their capabilities and expertise, resulting in a high-road scenario of digital innovation for both sides. The low-road scenario is a possibility if digitalisation is not established as a strategic field of development within the German company and if the Chinese parent company or subsidiary develops innovative strength in the digital domain and successfully introduces its products to the European market. This could result in locating digital R&D in China with the German company keeping certain expertise for product adaptation to the EU market (e.g. regarding regulative requirements such as data protection) but otherwise losing the development of know-how in this field to China. For the Chinese parent companies and subsidiaries, the development of innovative digital capabilities could strengthen their position and relevance within the company network and lead to the growth of digital R&D and software development departments and associated jobs in China. For the envisioned highroad scenario to materialise for the German companies, they need to engage in strategy building for the long-term sustainability of their business models and product portfolios amidst the challenges posed by the ecological and digital transformation. Even though works councils are not provided with concrete co-determination rights regarding strategy building, they should urge local management to engage in this field and also take an active role themselves. In the long run, business model and product transformation also affect the work process and employees and, consequently, the core domain of works council responsibilities.

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Notes

1 CS_battery is still in the process of setting up the new production equipment. Whether they will implement further software for comprehensive data collection is likely but not sure at the time of writing. According to CS_battery's plant manger, the machineries software is equipped with APIs for an MES system through which data can be analysed and there are ideas to use machine learning for efficient maintenance cycles, energy use etc. (CS_battery_2).

2 Translated from German to English by the author.

3 Translated from German to English by the author.

Appendix

Table A1 Overview of case studies and interviews

Table A1 Overview of case studies and interviews

	Interviews Germany			Interviews China				Company visits		
ID	*Interviewee group*[1]	*Interviews*	*Focus group*	*ID*	*Interviewee group*	*Chinese parent company*	*Chinese subsidiaries*	*Germany*	*Chinese parent company*	*Chinese subsidiary*
CS1 – CS_HMI										
CS1_2	WC		02.11.2021					02.11.2021		
CS1_3	M	14.12.2021								
CS1_4	TU	16.12.2021								
CS1_5	EM	02.11.2021								
CS2 – CS_locomotive										
CS2_1	WC		02.11.2021	CS2c_1	M	20.04.2022		02.11.2021	09.06.2023	
CS2_5	M	26.01.2022		CS2c_3	M	09.06.2023		16.05.2022		
CS2_9	M	07.04.2022		CS2c_4	EM	09.06.2023				
CS2_11	M	04.04.2022								
CS2_13	WC		16.05.2022							
CS2_14	M	04.07.2022								
CS2_15	WC	19.07.2022								
CS2_16	WC	27.01.2023								
CS3										
CS3_1	WC	19.10.2021						31.08.2022		
CS3_2	M		31.08.2022							
CS3_3	M	31.08.2022								
CS4										
CS4_1	WC	24.11.2021		CS4c_13c_1	M	07.12.2023				
CS4_2	M	14.01.2022								
CS5										
CS5_1	WC	14.12.2021		CS5c_1	M	12.06.2023		15.02.2022		
CS5_2	WC	15.02.2022								
CS5_3	WC		15.02.2022							
CS5_4	M	16.03.2022								

Note: [1]WC = works council; M = management; TU = Trade Union; EM = employee.

Table A1 Overview of case studies and interviews

Interviews Germany				*Interviews China*				*Company visits*		
ID	*Interviewee group*[1]	*Interviews*	*Focus group*	*ID*	*Interviewee group*	*Chinese parent company*	*Chinese subsidiaries*	*Germany*	*Chinese parent company*	*Chinese subsidiary*
CS6 – CS_car seat										
CS6_1	WC, TU		16.08.2022	CS6c_1	EM		14.06.2023	16.08.2022		
CS6_2	M	13.03.2023		CS6c_2	EM	15.11.2023			15.11.2023	
				CS6c_3	M		14.12.2023			
CS7										
CS7_1	WC	22.08.2022						22.08.2022		
CS8 – CS_machine										
CS8_1	WC	08.09.2022		CS8c_1	EM	03.01.2024		08.09.2022		
CS8_2	M	12.01.2023		CS8c_2	EM	03.01.2024		24.04.2023	03.01.2023	
CS8_3	WC, TU		24.04.2023							
CS8_4	M	25.10.2024								
CS9 – CS_battery										
CS9_1	WC		26.09.2022	CS9c_1		15.06.2023		26.09.2022	15.06.2023	
CS9_2	M	13.06.2023						02.02.2024		
CS9_3	WC		02.02.2024							
CS10 – CS_pump										
CS10_1	WC	16.09.2022		CS10c_1	EM		11.12.2023	22.11.2022	11.12.2023	
CS10_2	WC		22.11.2022	CS10c_2	M		11.12.2023		12.12.2023	
CS10_3	WC	02.02.2023		CS10c_3	M	11.12.2023			13.12.2023	
CS10_4	M	10.03.2023		CS10c_4	M	11.12.2023				
CS10_5	M	25.04.2023		CS10c_9	M	06.06.2023				
CS10_7	M	03.05.2022								
CS10_8	M	22.11.2022								
CS11										
CS11_1	WC	16.01.2023						16.01.2023		
CS12										
CS12_1	WC	24.01.2023		CS12c_1			19.06.2023	24.01.2023		19.06.2023
CS12_2	M	24.01.2023								

Note: [1]WC = works council; M = management; TU = Trade Union; EM = employee.

Table A1 Overview of case studies and interviews

	Interviews Germany			*Interviews China*				*Company visits*		
ID	*Interviewee group*[1]	*Interviews*	*Focus group*	*ID*	*Interviewee group*	*Chinese parent company*	*Chinese subsidiaries*	*Germany*	*Chinese parent company*	*Chinese subsidiary*
CS13 – CS_folklift										
CS13_1	WC		22.02.2023	CS13c_1	M		02.11.2023	22.06.2023		02.11.2023
CS13_2	WC	22.06.2023		CS13c_2	M		04.12.2023			
CS13_3	TU	19.09.2023								
CS13_4	M	05.12.2023								
CS13_5	WC	09.04.2024								
CS14										
CS14_1	WC	14.02.2023						14.02.2023		
CS14_2	M	15.12.2023								
CS15 – CS_robot										
CS15_1	M	17.03.2023		CS15c_1	M	18.12.2023		17.03.2023		
CS15_2	WC	17.03.2023								
CS15_3	M	17.03.2023								
CS15_4	TU	17.03.2023								
CS15_5	WC	17.06.2024								

Note: [1]WC = works council; M = management; TU = Trade Union; EM = employee.