The Impact of the Covid-19 Pandemic on Industrial Policy in Germany and the European Union – The case of the automotive industry

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Abstract

The European Union (EU) and Germany were already being confronted with rapidly changing dynamics on the economic, ecological, and technological terrains prior to the Covid-19 crisis. The pandemic however has fully exposed critical global value chain (GVC) dependencies, jeopardising the already troubled automotive industry. By employing a historical-institutional and a pre-and post- Covid-19 industrial policy analysis, this article finds that in spite of previous attempts, it was during the height of the pandemic that the implementation of green and digital industrial policy gained significant political support in Germany and the EU. In this context, there is an increased relevance of vertical industrial policy, which is geared towards the 'twin transition', partly altering the primarily horizontal industrial policy framework manifested in the post-Maastricht period.

Key words: Vertical Industrial Policy, Automotive industry, Covid-19, Geopoliticised Competition, 'Twin Transition'

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Introduction

During the Covid-19 pandemic, the so-called 'twin transition' (green and digital transition) has gained momentum both in Germany and the EU. Massive Covid-19 state programs not only entailed immediate economic relief, but also directly supported long-term goals such as achieving more sustainable ways of production and reducing external dependencies in key technological and industrial areas. In this context, industrial policy and more interventionist policymaking received renewed attention as a policy instrument. Nonetheless, preceding challenges, which contributed to a 'return of industrial policy' (Wade 2012) in Germany and the EU, were decisive. The 2007-2008 Global Financial Crisis triggered a series of reviving debates on the necessity of industrial policy in Western countries as the European economy faces deindustrialisation dynamics and increasing polarisation of industrial production within the EU. Furthermore, geopolitical competition has intensified, in particular with Chinese and American competitors in core segments of the *Modell Deutschland*, such as the automotive industry. In addition, the pressure for the 'twin transition' had already existed: digital frontrunners such as the USA and strong players in East Asia have seriously challenged both Germany's and the EU's international competitiveness giving a leeway to state-driven initiatives such as GAIA-X and IPCEI-CIS. Competition with China in particular has spurred policy debates prior to the pandemic, seeking within the EU to support European champions, and boosting local battery cell production for an ecological industrial transition[1]. Lately, the Covid-19 pandemic as well as the realisation of increased GVC dependencies have reinforced debates on industrial policy and exacerbated the necessity of state interventions (Eder/ Schneider 2018; Gräf/ Schmalz 2023; Pianta et al. 2020).

While some academic literature stipulates that industrial policy has returned to the European agenda (Wade 2012; Weiss 2016), others argue that it has never left (Chang et al. 2013; Eder et al. 2018; Naqvi et al. 2018). This is due to the fact that industrial policy is mostly distinguished between *horizontal* or 'functional' and *vertical* or 'selective' industrial policy[2] (Weiss 2016; Pianta et al. 2020; Otsubo/ Otchia 2021), classifying vertical incentives as strategically more important. Drawing on Henry Ergas (1987), Kattel and Mazzucato (2018) suggest that *mission-oriented* (emphasis on inducing radical technology breakthroughs / disruptive technologies) rather than *diffusion-oriented* (emphasis on delivering technology-related public goods, education and research in line with the horizontal paradigm) industrial and innovation policies have a capacity to achieve greater societal goals.

At the current conjuncture of events, the automotive industry, one of the most important German and European sectors, is going through a critical structural transformation, shaped by

[1] Transition refers to an ecological modernisation reflecting a switch to e-mobility whereas a transformation includes more profound changes such as changed mobility concepts.

[2] In Weiss (2016:138-139) horizontal industrial policy refers to broad regulatory reforms or investments covering wide range of sectors, general educational or research and development (R&D) funding. Vertical industrial policy entails sector-specific infrastructure investments, skills training, selective import protection, selective credit guarantees.

deeper structural conflicts. On one hand, the industry is switching from internal combustion engines (ICE) to electric vehicles (EVs). On the other hand, software technologies and the IT industry – especially high-skilled software developers and engineers – are becoming integral parts of electric mobility. Thus, there has been a shift in the understanding of cars as 'products' to 'mobility services' (Krpata 2021). This entails the increasing importance of digital data collection and exchange (e.g., for navigation, connectivity, or maintenance) which in turn, requires a sizeable cloud infrastructure. Additionally, battery cell production will restructure traditional forms of manufacturing as electric car engineering needs fewer components and is less labour-intensive (VDA 2020). Hence, more state involvement support via industrial policy may be required. This article contributes to the debate about industrial policy in Germany by analysing the nature of current industrial policy in the automotive industry, with a special focus on the impact of the Covid-19 pandemic, and in the context of the EU. Importantly, we aim to understand the on-going paradigm shift of industrial policy and pinpoint the driving forces behind changing dynamics and adjustments, including those predating the Covid-19 pandemic. Thereby, we explore how the role of the state is affected, and how sectoral challenges in the automotive industry (such as the switch to e-mobility and the convergence with IT services) are dealt with by means of industrial policy.

Against this backdrop, the paper proceeds as follows: To understand policy changes during the pandemic, Chapter 2 explores industrial policy in the German post-war model and its relevance for the automotive industry and the impact of developments at the EU-level. Chapter 3 demonstrates industrial policy programs introduced during the pandemic both in Germany and the EU. Chapter 4 analyses the roots of the policy re-orientation and their implications for industrial policy and the role of the state, followed by concluding remarks in chapter 5.

2. Pre- Covid-19 Realities vis-à-vis Industrial Policy in Germany and the EU

The nature of industrial policy has changed over time, corresponding to manifold institutional, ideological, political, and geo-economic dynamics. This chapter pinpoints some of the most important factors that shaped industrial policy in post-WWII Germany and its role within *Modell Deutschland* (2.1) followed by the shift to a horizontal paradigm during the post-Maastricht period at the EU-level (2.2). Chapter 2.3 reviews the automotive industry in the context of altering *Modell Deutschland* and the challenges the industry faces.

2.1. *Modell Deutschland* and its Institutional Framework

The export oriented economic model and high-skilled, high value-added manufacturing were distinctive characteristics of 'German Capitalism'[3] in the post-WWII period. This allowed

[3] Streeck (1995). Also referred to as 'Rhenish capitalism' (Albert, 1993), or ordoliberalism (in Hassel 2015).

Germany to maintain its international competitiveness for decades. However, this did not occur organically. In fact, the model only materialised because of carefully chosen industrial policies. Chang et al. (2013:25) argue that a set of industrial policies executed both at federal and regional levels were an integral part of *Modell Deutschland*. Kattel et al. (2020) note that the main challenge in post-war Germany was to rebuild previously competitive manufacturing industries, hence innovation and industrial policies were predominantly focused on that. A historically grounded approach to comparative political economy literature (Streeck 2009) argues that *Modell Deutschland* has been disintegrating in the wake of neoliberal globalisation. Nevertheless, it is important to identify those central features that generated Germany's post-war economic prosperity.

On one hand, the state supported heavy investments targeted towards key industries and technological innovations. On the other hand, a combination of multiple institutional factors – such as cheap and long-term financing, a dual vocational training system, effective work councils and trade unions, as well as the participation of research institutions in the decentralised cluster creation (see below) – contributed to economic success. Additionally, institutions such as the German development bank (KfW) played a crucial role in shaping the country's industrial policy (Dünhaupt/Herr 2020). Since its establishment in 1948, the state-owned bank has fostered German exports and, among others, provided continuous assistance to small and medium-sized enterprises (SMEs), or *Mittelstand*[4]. It also played a key role in building up heavy industries such as airplanes, ships or "risky new markets where the large private sector banks were unwilling to lend" (Harries 1998, in Naqvi et al. 2018:677). KfW tied a small but important group of German firms to export financing, outward foreign direct investment (FDI) and development aid (ibid).

The power of the German economy rests on two main pillars: SMEs[5] and big industries. Herr and Nettekoven (2017) show the important economic position of around 1300 'hidden champions'[6] of the SME sector in Germany. Hall (2015) notes that the institutional ecosystem in which German SMEs operate is especially important for the manufacturing sector. For instance, the dual vocational training model[7] based on theoretical and practical education resulted in a "workforce with high levels of industry-specific skills" (Busemeyer/ Trampusch 2012, in Hall, 2015: 46). Other significant features characterising the German model include 'non-market coordination'[8] (Hall/Soskice 2001) and 'cross-shareholding' (Goyer 2012, in Hall 2015) between firms, allowing them to monitor each other and support corporate networks. This combination of competition and cooperation - or the 'cooperative competition' – boosts innovation, productivity, and competitiveness among companies (Herr / Nettekoven 2017).

[4] Many companies that exceed the SME threshold of the EU still define themselves as *Mittelstand* in Germany (BDI March 2021). Some of the most important features of *Mittelstand* are family ownership and coordinated networks.

[5] Based on several statistical data, Herr and Nettekoven (2017) show that 99.6% of all German firms were SMEs in 2015, contributing around 60% of all jobs and generating 47.0 % of gross value added in the same year.

[6] Herr and Nettekoven (2017: 6) characterize hidden champions as "companies that are among the top three companies in their field worldwide, with around 70 to 90 per cent of the global market share, and that have highly specialised products or services, strong innovative power and strong export performance, yet are largely unknown to the public".

[7] A dual model as explained by Herr and Nettekoven (2017) combines theoretical education at a state-run vocational school and an apprenticeship at a company.

[8] Reliance on collaboration rather than competition

Germany's extensive science and research ecosystem[9] has also been an integral part of industrial production. For instance, since its establishment in 1949, the Fraunhofer Society has been closely linked to *Mittelstand* in the manufacturing sector, benefiting companies' "growth in turnover and productivity" (Kattel et. al 2020:21). As such, Germany's innovation and industrial policies are characterised by close regional alliances between industries and public research institutions "oriented towards generating new knowledge and diffusing it among stakeholders" (decentralised cluster creation) (ibid).

2.2. Green and digital industrial policy in the post-Maastricht horizontal industrial policy paradigm at the EU-level

Industrial policy has a long yet changing execution at the EU level, both impacting and limiting initiatives at the member state level (Landesmann/ Stöllinger 2020: 4). Since the 1970s, there was a shift away from interventionist policies towards more regulatory modes of economic governance, turning the EU primarily into a 'regulatory state' (Majone 1997: 123). Hence, the policy space for vertical industrial policy and government involvement decreased, as exemplified by the conceptual basis of most EU programs. There was a new consensus that the state should refrain from taking on the role as a 'producer' through 'selective policies' in support of specific sectors or firms. Instead, the market was assigned the role as the more efficient producer. This consensus was anchored in new or transformed European policies and institutions such as the Maastricht Treaty (Pianta et al. 2020: 780-782). As stipulated in Article 173 of the Treaty on the Functioning of the European Union (TFEU)[10], *horizontal* industrial policy became the dominant paradigm (Polluveer 2022) with a focus on cohesion policy in the form of European Structural and Investment Funds (ESIF) (Landesmann/ Stöllinger 2020: 2). Industrial policy further remained subordinate to other policy objectives such as strict compliance to EU fiscal rules and competition policy, which limits in particular extensive and selective state aids for firms and sectors in the EU. Following a general principle in EU legislation, the state and stfate funds must not selectively support a specific firm or sector to avoid an 'unfair' competitive advantage (Pianta et al. 2020: 781; Pichler et al. 2021: 143). Yet, Landesmann and Stöllinger (2020: 1) conceptualise the tradition of EU industrial policy to have followed a *mixed approach*, which includes both horizontal and vertical policies. Exceptions to the prevailing horizontal industrial policy paradigm encompass initiatives linked to Industry 4.0 such as 'Digitizing European Industry' and 'European Digital Innovation Hubs' (Pianta et al. 2020: 782). However, vertical policies represented overall a significant lower share (3% of total industrial policy spending for space, aircraft, and electronics at the EU level and 7% of total industrial policy spending for bailouts aid and restructuring at national levels) between 2014 and 2017 (Landesmann/ Stöllinger 2020: 6). In the decades prior to the pandemic, EU

[9] Max Planck Society, Helmholtz Association, Leibniz Association, Fraunhofer Society, etc.

[10] The Treaty of Rome (1957) laid out exemptions and limitations to state aid (Article 81-89) which were revised by the Lisbon Treaty in 2008 (Article 101-109). Article 107 establishes that any form of direct state aid is per se prohibited, yet allows for certain exceptions to be compatible with TFEU Article 107 and 108 as laid down in the General Block Exception Regulations (see Pianta et al. 2020: 787).

industrial policy was overall characterised by a lack of applying additional (public financial) resources and a focus on cohesion funds and regional levels. Joint and large-scale supranational industrial policy projects to support the development of European champions were notably lacking[11] (Pianta et al. 2020: 781-782).

Considering the *shared* competence of industrial policy between the EU and member states, this requires distinguishing between industrial policy in form of EU *spending at the supranational level* (via the central EU budget or the ESIF) or *state aid spent by member states*, in accordance with EU competition regulation. At the supranational level, the thematic focus of industrial policy relied on research, development, and innovation and regional industrial policy. In contrast, spending on green industrial policy prevailed among member states with Germany having contributed the highest share due to the energy transition (*Energiewende*) (Landesmann/ Stöllinger 2020: 4-6). This shows that recurring priorities such as supporting SMEs and innovation, which are key to EU programs such as Horizon2020, have been particularly expanded by green industrial policies (cf. Pianta et al. 2020).

In the last decade, '*green industrial policy*' (Rodrik 2014) increasingly gained political support in the EU as exemplified by the 2020 Energy and Climate Package, the European Commission (EC)'s 2015 Investment Plan for Europe ('Juncker Plan') and, in particular, the European Green Deal (EGD) including its main investment pillar 'European Green Deal Investment Plan' and a 'Just Transition Mechanism'. The Von der Leyen Commission (since 2019) has been a key actor driving this green agenda, centring on the EGD (cf. Belitz et al. 2021: 10). Under this plan, financial resources are channelled into climate-friendly policies, with the European Investment Bank (EIB) assuming a key role in distributing various sources of funding. For the coming decade, the European Commission (EC) intends to transform the EIB into a 'climate bank' (Pianta et al. 2020: 783-785).

Simultaneously to green industrial policy, *digital industrial policy* gained political support driven by new generations of digital technologies and Europe's rather small and fragmented digital sector lacking behind in competition. However, traditional industrial policy such as subsidies from regional development funds for strategic digital infrastructure remained incapable of targeting increasingly key sectors responsible for the production of intangible goods, services, or knowledge. Furthermore, traditional competition policy including merger control and state aid, often remains ineffective when it comes to competition in digital markets, resulting in disproportionately high market shares for one actor. Arguing that some issues such as standardisation and volume of investment can only be dealt with at the EU-level, the EC reclaimed regulatory competence and aimed at scaling up national or regional initiatives such as *Industrie 4.0* in Germany. As a result, European digital industrial policy expanded its focus to digital services which led to several industrial policy initiatives for the digital economy, most prominently the 2016 EC Communication 'Digitising European Industry' (Gruber 2019). While digital services still lack a broader strategy targeting for example wide-reaching upgrading of digital capabilities (Pianta et al. 2020: 790), Pichler et al. (2021: 149) criticise a "reliance on innovation rather than exnovation policy" in the automotive industry and an "ecological modernization through efficiency and low-emission technologies" instead of transformative industrial policies.

[11] Airbus is probably the only exception (Pichler et al. 2021: 143).

2.3. German Automotive Industry: A 'Golden Child Syndrome'?

The importance of the position held by the automotive industry[12] within the German economic and institutional set-up cannot be overemphasised. The remarkable success of the industry, prevalent even after the 2007 financial crisis - as described by Krpata (2021) - was accomplished through three strategies: leveraging of the European single market[13], utilisation of economic globalisation and re-orientation on emerging markets, namely China, and the protection of high value-added activities in Germany. It is rather important to embed the understanding of the industry's success in the context of a) the German Model, which – among other features - was based on a continuous provision of the high value-added manufacturing at home; and b) to contemplate broader institutional dynamics that characterised the post-war Fordist period: active industrial policies, heavy and targeted investments in Research and Development (R&D), and technological advancement (Chang et al. 2013). These institutional, socio-economic, geopolitical and historical peculiarities provide an ample framework to comprehend the special position acquired by the auto industry. Nevertheless, looking through the prism of critical state theory, a strand in the academic literature (Germann 2022; Schneider 2023) suggests that powerful sector-related actors, lobbyists and associations have also played an increasingly important role in shaping, influencing and maintaining the strong position of the auto industry in Germany.

It has further been argued that the post-war export oriented German economic model is reaching its limits (Schneider 2023) and new policy priorities are emerging against a backdrop of shifting geopolitical and economic dynamics. This leads us to the question, how are these adjustments reflected in the automotive industry?

Currently, the German auto industry is confronted with a multifaceted crisis, as a) the re-orientation and expansion of the industry into China after the global financial crisis – through perhaps lucrative and strategic - has also intensified dependence on the Chinese market; and b) increasing demands for clean and green production altering traditional industrial automotive production, and c) semiconductor and microchip shortages created by the coronavirus lockdown. Pressure is especially high because, as Krzywdzinski et al. (2022) and Meckling / Nahm (2017) show, the industry has neglected the development of alternative drive technologies for a long time, instead focusing on optimizing the ICEs. Considering these trends, the following trajectories can be observed: 1) German car manufacturers are faced with the inevitability to shift to electric mobility; this is induced by the government, civil society as well as foreign competitors such as Tesla. Though demand for battery cells is rising, battery

[12] Germany is home to 43 Original Equipment Manufacturer (OEM) plants (in the car industry final producers) with a car supply industry consisting of almost 900 companies. Together they employ around 809,000 people with a turnover of more than EUR 80 billion per year (VDA 2020). 85% of the total suppliers are medium-sized, family-owned SMEs providing 75% of value-added domestically. In 2019, 75% of cars produced in the country were destined for exports (VDA 2020).

[13] Including the relocation of cost-cutting, low value-added activates to Central and Eastern European countries.

cell production is currently lacking behind in Germany[14]. Rather, most of the production happens in China - currently leading the race in lithium-ion cell manufacturing, and accounting for around 70% of total production worldwide (Coelho 2021). 2) The volatility of global supply chains, now fully unveiled by the pandemic, poses a serious challenge to the pre-Covid structures of production and the previously existing forms of OEM-supplier interactions. German car manufacturers are seeking ways to reduce external dependencies; for instance, by reshoring activities domestically and realising in-house production of battery cells. Transition to the new forms of car production and the initial uncertainties accompanied by it will be predominantly felt by the smaller suppliers and lower-tier subcontractors, as they are highly specialised in niche areas of the ICE cars. In September 2020, Deutsche Welle was reporting that the SMEs and car-parts suppliers were worst hit by the pandemic; this came in addition to the existing complications caused by the shift to electro mobility production.[15] For their part, SMEs have called for more time to adapt to technological changes and more state aid in R&D. Last but not least, 3) the contemporary automotive industry is no longer imaginable without digital and IT software technologies. German car manufacturers are therefore dependent on international firms for data management and are experiencing an increasing pressure as: "Some companies, such as the GAFAM[16], have an advantage in data processing" (Krpata 2021: 19). Furthermore, the European Investment Bank's study (2021) shows that Germany's Corporate Digitalisation Index is only moderate. The IT sector is a slow mover in disruptive innovations and is highly dependent on global players[17] in cloud manufacturing. This trend demands a rather shrewd approach considering that international counterparts such as the USA or China are ahead in terms of implementing industry-wide digitalisation processes. Interestingly, the fact that the German Agency for Disruptive Innovation (SPRIN-D)[18] was launched only in 2019, whereas the US counterpart has existed since 1958, speaks volumes.

3. Changes to industrial policy in the wake of the Covid-19 pandemic and the 'Twin Transition'

As part of the crisis management, industrial policy experienced several changes in Germany and at the EU-level elaborated in the following sub-chapters.

[14] Chinese CATL started EV battery cell production in Thuringia in 2022.
[15] Market leader Bosch announced that it will cut thousands of jobs, while Germany's second-largest parts maker Continental plans to save EUR 1 billion every year by reducing its headcount by 13,000 beginning in 2023. At ZF Friedrichshafen, the third-largest German auto supplier, some 15,000 jobs are in danger (DW 2020).
[16] Google, Amazon, Facebook, Apple, Microsoft
[17] Amazon (Amazon Web Services), Microsoft (Azure), Google (Google Cloud Platform) and Alibaba held the largest share in 2019.
[18] It was created as part of the innovation policy in fields of AI and healthcare. It aims to develop a European Super Cloud (cloud infrastructure).

3.1. EU crisis management and industrial policies – Providing leeway for German policies

As part of the Covid-19 crisis management, the EU initiated massive state intervention into economic processes amidst geo-politicised competition (Meunier/ Mickus 2020: 1077). Thereby, EU spending was geared to a 'digital transformation' and a 'green transition' (European Commission 2023a) – aimed at the 'Twin Transition' of Europe's industry. The EU's main recovery instrument New Generation EU (NGEU)[19], totalling EUR 750 billion (2021-2026) in addition to the regular 2021-2027 budget (ibid.), prescribed member states to contribute 20% of its RRF funds to the digital transformation (European Commission 2023b). On the other hand, NGEU funds can be used according to own national preferences, yet under the condition that these are compatible with the decarbonisation goals set out by the EGD (see chapter 2.2.) (Lechowski et al. 2021). Following the EU's approval of Germany's RRF plans in 2021 and 2023, thus far RRF grants worth EUR 2.25 billion were disbursed to Germany from which 47% were channelled to green transition and 53% to digital transformation (European Commission 2023a). One main beneficiary was the German automotive industry (Lechowski et al. 2021). Further investment programs targeting the 'twin transition' and the newly proclaimed goal of 'open strategic autonomy' include InvestEU (2021-2027), whose funding for the policy area 'Sustainable Infrastructure' was doubled up to EUR 20 billion (Belitz et al. 2021: 10); and the Digital Europe Programme (DIGITAL) (2021-2027) with a budget worth EUR 1.3 billion (European Commission 2023c).

This utilisation of NGEU funds adds to pro-environmental policies set by the EC in support of already ongoing sectoral transformation processes within the automotive industry accelerating the transition to electro mobility. The mandatory and increasingly stringentvehicle emission standards concern the 'Euro' tailpipe-emission norms (since 1992) and the CO_2 fleet-wide emission targets (since 1998) (Lechowski et al. 2021). As part of the 'Fit for 55' package, a set of legislative proposals to reduce the EU's greenhouse gas emissions by at least 55% by 2030, the EU decided that new cars and light commercial vehicles must reduce their CO_2 emissions by 55% by 2030, and new vans by 50%. By 2035, reduction targets are 100% compared to 2021. This implies a de facto ban of the conventional ICE (Council of the EU and the European Council 2022b). Furthermore, the 2021 EC Communication 'Path to the Digital Decade' sets out digital targets by 2030 and initiates multi-country (funding) projects on for example low power processors. Similarly to the EGD, the EC has started to embrace 'Europe's Digital Decade', reflecting increasing political support for the IT services industry (European Commission 2023b).
Next to these increased financial resources and changes in thematic focus, there were novel changes in competition policy such as the temporary suspension of state aid controls and the adoption of the 'State Aid Temporary Framework'. Among others, this enabled massive state aids in forms of direct grants, selective tax advantages, and guarantees on loans (Meunier/

[19] The NGEU's main program is the Recovery and Resilience Facility (RRF) worth EUR 672.5 billion (Council of the EU and the European Council 2022a).

Mickus 2020: 1077-1080). Moreover, competition rules are subject to a major long-term review process with implications for industrial policy beyond the Covid-19 crisis (European Commission 2021).

In support of the crisis management, the EC presented the updated new 2020 Industrial Strategy in May 2021. This was preceded by demands by members of the EP to design industrial policy in support of the recovery. The updated strategy focuses on the 'twin transition' and the additional component of 'global competitiveness', aiming as less GVC dependencies in future markets and strengthening Europe's 'strategic autonomy' for critical infrastructure and future technologies (see Belitz et al. 2021: 9-10) through an ecosystem-based monitoring approach of 14 industrial ecosystems (European Commission 2021). This updated 2020 Industrial Strategy marks a new phase in industrial policy. While continuing to support new industrial alliances in areas of market failure such as the Alliance on Processors and Semiconductor Technologies and the Alliance for Industrial Data, Edge and Cloud (European Commission 2021), the so-called Important Projects of Common European Interest (IPCEI) became the key strategic instruments for its implementation (Belitz et al. 2021: 9-10). IPCEIs are cross-country industrial policy projects carried out and co-financed by national governments and participating firms in accordance with EU state aid law. The focus lies on investments in disruptive research developing new technologies up to first industrial deployment.[20] Reflecting the EU's in-depth review of strategic dependencies, six IPCEIs have been implemented relevant to the German automotive industry: Microelectronics I and II (Semiconductors), Batteries I and II (EuBatIn), Next Generation Cloud Infrastructure and Services (IPCEI-CIS) and Hydrogen (IPCEI Hy2Tech). Thereby, IPCEIs make maximum use of current EU competition policy, and bypass limiting EU state aid regulation, in line with the horizontal industrial policy post-Maastricht paradigm, while addressing competition policy concerns[21] (Gräf/ Schmalz 2023). In contrast to temporarily limited crisis management programs, IPCEIs will have a duration outlasting the Covid-19 pandemic.

3.2. German State Funds Targeting 'Twin Transition' - Embedding Automotive Industry

The exigency of cleaner mobility and digitalisation existed in Germany in the pre-Covid period. Covid-19, however, intensified the urgency of the change. The dependence on GVC, strategic raw materials, and foreign digital players was fully problematised in the aftermath of the pandemic. Against this backdrop, more targeted policies were included in the funds provided during the pandemic (Table 1).

[20] This refers to upscaling pilot facilities following the pilot line and R&D phase before mass production or commercial activities.

[21] IPCEIs must among others contribute to the strategic objectives of the EU (see Article 107(3)(b) TFEU) which include the goals of the twin transition since 2021 (COM/2014/C 188/02).

Table 1: Policies implemented during the Covid-19 pandemic

In accordance with EU state aid rules and enabled by the EU State Aid Temporary Framework				
Selected Programmes and Initiatives	**Targets**	**Measures**	**Amount**	**Timeframe**
Temporary Aid Programmes (Phases: I, II, III, III Plus, IV) ***Überbrückungshilfe***	companies, self-employed persons and freelancers in all sectors	Immediate aid	Case-by-case	Various phases
The Economic Stabilisation Fund (ESF) ***Wirtschaftsstabilisierungsfonds (WSF)***	companies whose insolvency would have a significant adverse impact on the German economy or labour market	Federal guarantees for loans, including credit lines, and capital market products (borrowed capital)	originally had a total volume of €600 billion. As part of the WSF extension, the total size was adjusted to €250 billion as of 1 January 2022.	March 2020 - June 2022
Economic Stimulus Package (ESP, ***Konjunkturpaket)*** **and Future Package** ***(Zukunftspaket)***	Companies, households, municipalities	Tax reductions, Bridging aid program (up to € 25 billion) for SMEs	€130 billion	From June 2020 onwards
	particular investment in research, environmental protection, mobility, digitalization and healthcare	Support for mobility, AI, Digitalisation. Sector-specific		
Multiple KfW programmes	Instant loans to SME's. Expanding its credit offerings and guarantees for all sizes of firms, credit insurers and non-profit institutions	KfW was key to the Government's strategy, particularly in terms of the ESF	€757 billion (IMF 2020)	From March 2020

Source: authors' own illustration based on the data by Deutsche Finanzagentur, BMWK, BMBF, KfW

Initiatives such as the Economic Stabilisation Fund and Economic Stimulus Package (ESP) included bridging aid programs, targeting immediate recoveries of the companies, among which were car manufacturers and perhaps more importantly, suppliers. For example, according to Deutsche Finanzagentur, car-parts supplier A-Kaiser GmbH received state aid in the amount of EUR 12.5 million in January 2021. In April 2020 Reuters reported that among others, auto supplier Leoni was going to obtain a multi-million-euro loan, 90% of which would be guaranteed by the federal government and the state of Bavaria. 'Automotive Industry Future Fund' that was created as part of the stimulus package (Krzywdzinski et al. 2022: 14) focuses on the sectoral SMEs supporting them in the areas of digitalization, battery cell and electric motor production. The fund also entails adaptation and training mechanisms for the employees. Important instruments included in the ESP and Future Package go beyond recovery goals and pursue 'twin transition'. There are 57 individual measures integrated in the package (Dorn et al. 2020). For instance, Lechowski et al (2023:8 *forthcoming*) note that around 8 billion euros mobilised for the automotive industry 'intended to stimulate the "structural change" towards environmentally friendlier technologies in the sector'. This included an 'environmental bonus' for EVs and plug-in hybrids[22] (VDA 2020). Krzywdzinski et al. (2022: 3) note that while the 'dieselgate' scandal was a turning point, the Covid-19 pandemic created a window of opportunity for the automotive industry to reorient its strategies and 'the state responded with a massive economic stimulus program to promote and facilitate the transition to electric mobility'.

Some of the additional measures and subsidies entailed in the ESP and Future Package (Dorn et al. 2020) include:

- Fleet renewal of buses, trucks, aircraft and ships
- EUR 5 billion equity to railway modernisation, electrification, and expansion
- EUR 7 billion to develop hydrogen technologies
- R&D in the field of electro mobility, new charging points and battery cell production
- Tax reduction for companies in R&D and investment
- Trainee bonus program for SMEs to maintain the number of trainee places
- Energy-efficient building refurbishment

Funds mobilized under the Future Package will inevitably involve the digital sector too. For instance, the nationwide rollout of 5G- and 6G-technology, fibre-infrastructure, and investments in future technologies such as AI and quantum technology, will be supported with 16 billion EUR (Latham / Watkins 2020). Additionally, structural changes occurring in the German automotive industry will entail the increasing role of software technologies, hence the IT ecosystem. Krzywdzinski (2021:528) argues that a shift in the workforce structure is already happening "and the share of engineers and computer scientists is rising sharply'.

Taking overall developments into account, policy interventions introduced during the pandemic correspond to both the preceding and Covid-19 induced challenges (outlined in Section 2.3). Importantly, the measures are geared toward long-term goals in the context of

[22] Government incentives for plug-in hybrids ended in December 2022.

'twin transition'. Digitalisation trends are increasingly becoming an important element of German policymaking - therefore, being in the middle of a critical structural transformation, the automotive industry is a key area for these trends to be addressed at an institutional level.

4. Analysis

Industrial Policy in Germany: Between Covid-19 and Internal Conflicts of Interest

The highly competitive automotive industry holds a distinctive position in the German economic model for valid reasons. Yet it is vulnerable to technological change and global economic and trade dynamics. While traditionally it has received manifold state assistance and support, the interests of the industry-related actors have not always been in harmony with broader societal goals. For instance, Meckling and Nahm (2017:5) argue that the 'corporatist' character of the German institutional governance structures where "industry and government coordinate technological transformations in consensus-driven negotiations", can limit the capability of the tactical sectoral transformation. The authors note that the 'corporatist' model often prioritises needs of the incumbent firms - who benefit from the existing technological regime - over progressive policies. This became evident in the late 2000s when the urgency to revamp quintessential driving methods materialised. The German auto industry proved to be rigid to transform while the government continuously backed the industry and zealously argued against the EU's mandatory CO2 emissions regulations for the passenger cars (Meckilng / Nahm 2017). Krzywdzinski et al. (2022) show that the automotive industry has relied too long on its competitive advantage in the ICE technologies and has been reluctant to transition to EVs. Furthermore, the country's industrial policy aiming at R&D of hybrid and electric cars, and battery cell production has been rather marginal[23] during the 2000s. On the other hand, Germann (2022) shows that while the controversial 'National Industrial Strategy (NIS) 2030'[24] received fierce opposition from the industry in 2019, some of its central policies were nevertheless put forward. This demonstrates the state's ability to navigate different social interests while maintaining 'relative autonomy'- famously theorised by Poulantzas ([1978] 2000).

One of the central arguments suggests that the shift in German policymaking towards more vertical industrial policy unfolded before the pandemic. For instance, Germann (2022) and Schneider (2023) meticulously depict[25] that growing competition from China, China -US trade rivalry and Germany's excessive industrial and technological dependence in key areas led to the shift which can be traced back to the NIS 2030. Proposing tighter FDI controls, formation of 'national and European champions' and move away from "the horizontal, 'technology-

[23] For detailed analysis see Meckling and Nahm, 2017

[24] Initiated by minister Peter Altmaier in 2019, which in the wake of growing competition from China (and protectionist US) sought to reduce external dependencies, especially in the key fields of technology and battery cell production.

[25] Primary interest of both articles is the scrutiny of positions and interest that characterise different capital fractions of the German export 'power bloc'.

neutral' approach that has dominated German industrial policy to date" (Schneider 2023: 249), NIS 2030 embodies the beginning of the industrial policy re-formulation in Germany. Importantly, NIS 2030 is an attempt to confront "the long-standing tension between industrial policy and EU competition law – thereby challenging a key component of the EU's new-constitutionalist economic architecture as it emerged in the 1980s" (ibid.). Perhaps not surprisingly, yet interestingly, German export industries had opposing positions regarding the Strategy. Schneider (2023) argues that it was a division between the *Mittelstand* and industry giants over the question on how to deal with Chinese competition that created internal conflicts of interest. Germann (2022) depicts that SMEs in the electronics sector (the author includes IT software in this category), and big auto industry firms had contrasting approaches to the NIS 2030. Considering the 'protectionist' character of the document, the auto industry feared Chinese retaliation, which would imply the loss of the Chinese market access and its commercial benefits.

The Covid-19 pandemic - revealing and deepening the previously existing crisis - was used as a window of opportunity to institutionalise this policy re-orientation. While the attempt to execute more vertical industrial policies have been made previously (e.g. NIS 2030) the state was not able to achieve consensus between different industrial stakeholders[26]. NIS 2030 remained a politically highly contested initiative and was "partly 'defused' in a process of compromise building within the German power bloc" (Schneider 2023:254). It was only during the pandemic that the shift in policymaking became possible. Kattel et al. (2020:40) find that with the Covid-19 handling "Germany has taken another step; it is at the forefront of taking bold policy action reshaping the economy in the face of the pandemic". The authors (ibid) suggest that there is a momentum for the policymakers to retract from diffusion-oriented innovation policies characterising pre-pandemic period.

A green and digital transition through EU industrial policy – significant changes to competition policy and a more active-interventionist role of the state

This turn by the German government was an important pre-condition for triggering a paradigm shift of the predominantly horizontal and 'technology-neutral "paradigm leaning towards more vertical industrial policy at the EU-level" (Gräf/ Schmalz 2023). Considering the shared competence of industrial policy in the EU and member states, changes to EU industrial policy can be observed in two aspects in the wake of the pandemic impacting German industrial policy. First, there was massive state intervention in forms of (additional) financial resources, mainly dedicated to the 'twin transition' as illustrated by the usage of the NGEU funds, InvestEU and DIGITAL. Germany in particular channelled NGEU funds to the digital and green transition support for the automotive industry covered by the 'twin transition', adding to sector-specific regulatory approaches.

Second, there were significant changes within competition policy currently in line with the horizontal policy paradigm. State aid rules were suspended temporarily enabling massive

[26] For more detailed analysis, see Schneider (2023) and Germann (2022).

support programs by member state. In addition, IPCEIs were rediscovered as ‘a vertical loophole’ and introduced as key implementation mechanisms of the new EU Industrial Strategy. Furthermore, GVC dependencies and increased geopoliticized competition triggered debates on reforming competition policy beyond the crisis mode. This is exemplified by, for example, the EC’s ‘Green Deal Industrial Plan’ which foresees among others an amended ‘Temporary State aid Crisis and Transition Framework’ as direct response to the offensive US industrial policy ‘Inflation Reduction Act’ (European Commission 2023d).
As a result, there is a continuation of the EU’s ‘mixed approach’ (Landesmann/Stöllinger 2020:1) to industrial policy. Yet, the vertical dimension is increasing by means of more selective industry support, geared towards the ‘twin transition’ and a reconsideration of current competition policy. In addition, there is more political coordination of the market and steering of production processes at the (supra-) national level (e.g., IPCEIs) beyond regulatory approaches (e.g., CO2 emissions and digital targets). This implies a tendency towards a more active-interventionist role of the state in support of the digital and green transition via industrial policy. Indeed, Wade (2012) diagnosed an “emergence of new global norms in favour of a more developmental role of the state” and Staab and Piétron (2020) identify a decentralised development state in the field of AI in Germany. Overall, there is a trend of reshaping the horizontal post Maastricht paradigm. Yet, it remains open whether this trend will fully be realised.

Conclusion

Prior to the Covid-19 crisis, both Germany and the EU were confronted with quickly changing dynamics in the global economic, political, ecological and technological terrains. These tendencies have spurred active policy debates in line with more vertical industrial policy. Namely, in Germany, incentives such as NIS 2030 sought to reduce external dependencies, especially in the key fields of technology and battery cell production back in 2019. However, this highly controversial document was not able to attain intra-industrial consensus. The Covid-19 pandemic – divulging and intensifying existing conflicts - was used as a window of opportunity to institutionalise industrial policies that address external GVC dependencies, while tackling on-going domestic challenges, especially an industrial ‘twin transition’. The multilevel crisis affected the reshaping of EU industrial policy, leaning towards more vertically oriented green and digital industrial policies. As part of the crisis management, there were massive state interventions in the form of additional financial resources, most notably the NGEU, and significant changes within competition policy. State aid regulation, which is in line with the horizontally oriented post-Maastricht Treaty period, was temporarily suspended, triggering debates on reforming competition policy beyond the crisis. In the meantime, IPCEIs represent a ‘vertical loophole’ in the otherwise quite horizontal oriented treaties. These dynamics at the EU-level allowed member states more scope for action. In particular, Germany channelled these NGEU funds to the digital and green transition. Being in the middle of a deep structural transformation, the automotive industry received designated institutional attention.

Yet, policies within the ESP and Future Package also significantly affect wider digitalisation trends in Germany.

The recovery plans introduced by Germany were enabled by EU policies during the pandemic, and embody more targeted economic incentives that went beyond immediate relief. Both the EU and Germany initiated active-interventionist state measures, complemented by sector-specific approaches. Furthermore, the burgeoning focus on sustainability and the digital decade will entail major implications for a transformative potential of the automotive industry. However, whether the policies introduced in the context of the pandemic and the 'twin transition' are moving into the direction of a 'mission-oriented' (Mazzucato 2018) industrial policy, remains to be seen.

Literature

Belitz, H., Gornig, M., Kemfert, C., Löckener, R., Sundmacher, T. (2021): Prioritäten Setzen, Ressourcen bündeln, Wandel beschleunigen. Friedrich-Ebert-Stiftung, WISO Diskurs 02/2021, Bonn.

BDI (2021): The German Mittlestand: Data, Numbers, Facts. [Online] https://english.bdi.eu/publication/news/the-german-mittelstand

Chang, H-J., Andreoni, A., Kuan M.L. (2013): *International industrial policy experiences and the Lessons for the UK*. Government Office for Science, Future of Manufacturing Project: Evidence Paper 4.

Coelho, J. (2021): Europe's gigafactory boom – 25 by '25. [Online] https://www.pv-magazine.com/2021/07/13/europes-gigafactory-boom-25-by-25/.

Council of the EU and the European Council (2022a): Infographic - Next Generation EU – COVID-19 recovery package. [Online] https://www.consilium.europa.eu/en/infographics/ngeu-covid-19-recovery-package/.

Council of the EU and the European Council (2022b): First „Fit for 55" proposal agreed: the EU strengthens targets for CO2 emissions for new cars and vans. [Online] https://www.consilium.europa.eu/en/press/press-releases/2022/10/27/first-fit-for-55-proposal-agreed-the-eu-strengthens-targets-for-co2-emissions-for-new-cars-and-vans/.

Deutsche Finanzagentur (2022): Economic Stabilisation Fund.

Deutsche Welle (2020): Germany's car industry asks for coronavirus stimulus. [Online] https://www.dw.com/en/what-germanys-car-summit-hopes-to-achieve/a-54841263.

Dorn, F., Fuest, C., Neumeier, F. (2020): After the Great Economic Collapse: Germany's Stimulus Package to Recover the Economy in Times of Covid-19. *CESifo Forum*, 21(2), 38-46.

Dünhaupt, P., Herr, H. (2020): Trade, Global Value Chains and Development – What Role for National Development Banks? *Vierteljahrshefte zur Wirtschaftsforschung.* 89(3), 9-33.

Eder, J., Schneider, E. (2018): Progressive Industrial Policy – A Remedy for Europe!? *Journal für Entwicklungspolitik XXXIV*. 3(4), 108–142.

Eder, J., Schneider, E., Kulke, R., Konig, C.D. (2018): From Mainstream to Progressive Industrial Policy. *Journal für Entwicklungspolitik XXXIV*. 3(4), 4-14.

European Commission (2021): Updating the 2020 Industrial Strategy: towards a stronger Single Market for Europe's recovery. [Online] https://ec.europa.eu/commission/presscorner/detail/en/ip_21_1884.

European Commission (2023a): Recovery and Resilience Scoreboard. [Online] https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/index.html?lang=en.

European Commission (2023b): Europe's Digital Decade: digital targets for 2030 [Online] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en.

European Commission (2023c): €1.3 billion from the Digital Europe Programme for Europe's digital transition and cybersecurity. [Online] https://digital-strategy.ec.europa.eu/en/news/eu13-billion-digital-europe-programme-europes-digital-transition-and-cybersecurity-0.

European Commission (2023d): The Green Deal Industrial Plan. Putting Europe's net-zero industry in the lead. [Online] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/green-deal-industrial-plan_en.

European Investment Bank (2021): Digitalisation Index 2020/2021: Most EU countries are trailing the United States in digitalization.

Germann, J. (2022): Global rivalries, corporate interests and Germany's 'National Industrial Strategy 2030'. *Review of International Political Economy*. (Ahead-of-Print), 1-27.

Gräf, H., Schmalz, S. (2023): Avoiding the China Shock: How Chinese State-led Globalization Drives Changes in European Economic Governance (forthcoming).

Gruber, H. (2019): Proposals for a digital industrial policy for Europe. *Telecommunications Policy*, 43(2), 116-127.

Hall, PA. (2015): The Fate of the German Model, in: Unger, B. (ed), *The German Model – Seen by its Neighbour's,* SE Publishing, 43-63.

Hall, PA., Soskice, D. (2001): *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage*. Oxford University Press.

Hassel, A. (2015): The German Model in Transition, in: Unger, B. (ed), *The German Model – Seen by its Neighbour's,* SE Publishing, 105-135.

Herr, H. (2019): *Industrial Policy for Economic and Social Upgrading in Developing Countries.* [Online] https://www.fes-asia.org/news/industrial-policy-for-economic-and-social-upgrading-in-developing-countries/.

Herr, H., Nettekoven, Z. (2017): *The role of small and medium-sized enterprises in development: what can be learned from the German experience?* Berlin: Friedrich-Ebert-Stiftung.

Kattel, R., Mazzucato, M. (2018): Mission-oriented innovation policy and dynamic capabilities in the public sector. *Industrial and Corporate Change*, 27(5), 787-801.

Kattel, R., Mazzucato, M., Haverkamp, K., Ryan-Collins, J. (2020): *Challenge-driven economic policy: A new framework for Germany.* Berlin: Forum New Economy Working Papers, Nr 5.

Krpata, M. (2021): The Automotive Industry: The Achilles' Heel of German Economy? *Ifri*, Études de l'Ifri, March 2021.

Krzywdzinski, M. (2021): Automation, digitalization, and changes in occupational structures in the automobile industry in Germany, Japan, and the United States: a brief history from the early 1990s until 2018. *Industrial and Corporate Change*, 30(3), 499–535.

Krzywdzinski, M., Lechowski, G., Ferdinand, J., Schneiß, D. (2022): The German path to electric mobility and its impacts on automotive production and employment. Conference Paper, *ECF and ETUI.* [Online] https://www.etui.org/events/way-net-zero-mobility-what-does-mean-european-automobile-jobs.

Landesmann, M., Stöllinger R. (2020): The European Union's industrial policy: What are the main challenges? Policy Notes and Reports, No. 36, The Vienna Institute for International Economic Studies (wiiw), Vienna.

Latham & Watkins (2020): Covid19: What Public Finance Support (State Aid) is Available in the EU, EEA, and UK? [Online] https://www.lw.com/admin/upload/SiteAttachments/COVID-19-StateAidEUandUK_QandAndATable.pdf.

Lechowski, G., Krzywdzinski, M., Pardi, T. (2023): A government-driven sectoral transformation? French and German policy responses to the COVID-crisis in the automotive industry. *International Journal of Automotive Technology and Management* (forthcoming).

Majone, G. (1997): From the positive to the regulatory state: Causes and consequences of changes in the mode of governance. *Journal of Public Policy*, 17(2), 139-167.

Mazzucato, M. (2018): Mission-oriented innovation policies: Challenges and opportunities. *Industrial and Corporate Change*, 27(5), 803–815.

Meckling, J., Nahm, J. (2017): *When Do States Disrupt Industries? Electric Cars in Germany and the United States.* MIT Center for Energy and Environmental Policy Research. Working Paper Series, 2017-006.

Meunier, S., Mickus, J. (2020): Sizing up the competition: explaining reform of European Union competition policy in the Covid-19 era. *Journal of European Integration*, 42(8), 1077-1094.

Naqvi, N., Henow, A., Chang, HJ. (2018): Kicking away the financial ladder? German development banking under economic globalisation. *Review of International Political Economy.* 25(5), 672-698.

Otsubo, S.T., Otchia C.S. (2021): Introduction: Leading issues in industrial promotion in today's globalized world, in: S.T. Otsubo, C.S. Otchia (eds), *Designing Integrated Industrial Policies Volume II: For Inclusive Development in Africa and Asia*, London and New York: Routledge.

Pianta, M., Lucchese, M., Nascia, L. (2016): What is to Be Produced? The Making of a New Industrial Policy in Europe. Brussels: Rosa Luxembourg Stiftung.

Pianta, M., Lucchese, M., Nascia, L. (2020): The policy space for a novel industrial policy in Europe. In *Industrial and Corporate Change*, 29(3), 779-795.

Pichler, M., Krenmayr, N., Schneider, E., Brand, U. (2021): EU industrial policy: Between modernization and transformation of the automotive industry. *Environmental Innovation and Societal Transitions*, 38, 140-152.

Polluveer, K. (2022): General principles of EU industrial policy. European Parliament [Online] https://www.europarl.europa.eu/factsheets/en/sheet/61/allgemeine-grundsatze-der-industriepolitik-der-eu.

Poulantzas, N. ([1978] 2000): *State, Power, Socialism.* London: Verso.

Reuters (2020): Factbox: German companies seek state aid to cope with coronavirus. April 30, 2020 [Online] https://www.reuters.com/article/us-health-coronavirus-germany-aid-factbo-idUSKBN22C2CJ.

Rodrik, D. (2014): Green industrial policy. *Oxford review of economic policy*, 30(3), 469-491.

Schneider, E. (2023): Germany's Industrial strategy 2030, EU competition policy and the Crisis of New Constitutionalism. (Geo-) political economy of a contested paradigm shift. *New Political Economy*, 28(2), 1-18.

Staab, P., Piétron, D. (2020): Industriepolitik im Zeitalter künstlicher Intelligenz: Zur Renaissance interventionistischer Staatlichkeit. *BEHEMOTH - A Journal on Civilisation*, 13(1), 23-34.

Streeck, W. (2009): *Re-Forming Capitalism: Institutional Change in the German Political Economy.* Oxford: Oxford University Press.

VDA (2020): Annual Report 2020: The automotive industry in facts and figures.

Wade, R.H. (2012): Return of industrial policy? In *International Review of Applied Economics*, 26(2), 223-239.

Weiss, J. (2016): Industrial Policy: Back on the Agenda, in: J. Weiss, M. Tribe, (eds), *Routledge Handbook of Industry and Development*, London and New York: Routledge, 135-150.