
Editorial

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The automotive industry is undergoing a period of rapid transformation driven by technological innovation. While the combustion engine is slowly losing importance as a powertrain technology, the market share of electric drives has grown dynamically during the last three to five years. New digital vehicle technologies and autonomous driving are becoming increasingly important for customers (Alochet et al., 2021; Jetin, 2020). Furthermore, the architectural changes go hand in hand with the transformation of the sectoral innovation and manufacturing processes. Here, too, the topic of digitalisation is of central importance, and efforts to identify new opportunities to automate industrial production are intensifying (Krzywdzinski, 2021).

These technological developments entail various fundamental changes in inter-firm relations and organisational structures of the global automotive industry. For one thing, the rise of electric mobility has created entry opportunities for new car manufacturers. Tesla, in particular, has become a major competitor to traditional companies – although competition for dominance in the electric vehicle (EV) market remains open (MacDuffie and Fujimoto, 2010). Chinese EV producers, too, have challenged the position of European and North American manufacturers. In addition, sectoral global value chain structures are changing. Companies from China, South Korea and Japan currently dominate the development and production of EV batteries (Wang et al., 2022). With regard to the digital vehicle technologies, autonomous driving, industrial internet platforms, or the related cloud infrastructures, North American (and Chinese) companies have been at the forefront (cf. Fujimoto, 2019; Lechowski and Krzywdzinski, 2022).

While the aforementioned shifts were perceived as gradual just a few years ago, in the 2020s, some of them have gained new momentum due to the overlapping of several crises that affected the global economy. More specifically, an increasingly pro-active involvement of government actors has accelerated the ongoing technological changes in the automotive sector. This trend has been particularly visible in the European Union (EU) (cf. Bergsen, 2020). In the context of the climate crisis, the EU has dramatically tightened its emission standards for the transportation sector. Furthermore, while the

COVID-19 pandemic has led to a collapse in the domestic car sales, some member-state governments have used the crisis as an opportunity to introduce generous demand-side measures to stimulate the shift to electric mobility. While the USA has a long tradition of industrial-policy interventions (in particular, through enormous defence spending), and China's state-capitalist economy relies on direct government support for strategic industries and corporate champions, such an approach has long been unthinkable in the EU – not least due to the conflicting economic interests of individual member states (e.g., Pardi, 2020, 2021).

This special issue focuses on a comparative analysis of industrial policy responses to the COVID crisis in the global automotive industry. The collected empirical contributions examine how selected national governments (Germany, France, Italy, Japan, China and Mexico) have responded to the COVID-era sectoral downturn – and to what extent, in doing so, they have taken measures to influence the ongoing technological and structural change in the sector. The papers address the following set of research questions: have the crisis-era interventions by the different governments focused on protecting automotive companies in the short-term, or have they pursued rather long-term strategic goals? What problem areas have the employed policy measures prioritised – such as workforce-related issues, technological innovation, or supply-chain restructuring? Have the crisis-era policy interventions attempted to preserve the status quo in the domestic automotive sectors – or have they attempted to promote a deeper structural change?

In their paper, Lechowski, Krzywdzinski and Pardi examine the COVID-era sectoral stimulus programmes in France and Germany. Both countries introduced very generous and technologically transformative support packages, which relied on such measures as direct subsidies for innovating firms, infrastructure investments (e.g., in EV charging infrastructures), and demand-side incentives for buyers of electrified vehicles. At the same time, the authors observed some significant differences between the two crisis-era government interventions, related to the different country-specific structures of sectoral governance. In Germany, the COVID-era support programme was developed within a 'corporatist' governance framework, which included representatives of trade unions and allowed the latter to promote the interests of smaller supplier firms and regional production clusters. Many elements of the programme had a long-term focus and attempted to stimulate the development of new technological capabilities. In France, trade unions played virtually no role in the development of the governmental support package. In addition, the programme provided rather short-term support to selected companies – in particular, Renault, in which the French state owns a significant stake. The authors of the analysis conclude that both crisis-era government interventions indicate a rather path-dependent character of the 'transformative' industrial-policy strategies in the two countries.

The differences between the sectoral government interventions within the EU are further explored in the paper by Gaddi and Garbellini, which focuses on the Italian case. As the authors argue, in the context of EU competition policy, Italy had largely abandoned its earlier traditions of economic planning and active industrial policymaking. However, while the Italian economic policies of the 1990s and 2000s followed the pattern of 'horizontal' government intervention, during the COVID crisis, the policymakers seized the opportunity for a more active involvement into the transformation processes in the automotive industry and allocated significant funds to strategic areas such as battery manufacturing, charging infrastructures, and semiconductors. Nevertheless, Gaddi and Garbellini argue that the government intervention came too late and too hesitantly. With

the internationalisation of Fiat (and the emergence of Fiat Chrysler Automobiles), the centre of gravity of the Italian automotive industry has clearly shifted abroad. With the merger of FCA with PSA (Stellantis), Italian automotive locations have lost even more importance – and the recent government interventions have done little to prevent this from happening.

While many of the EU member states attempted to use the COVID crisis as an opportunity for a more active industrial policymaking in the automotive sector, countries outside Europe often followed entirely different objectives and strategies.

Alvarez-Medina examines the crisis-era developments in Mexico – a typical semi-peripheral automotive economy (cf. Carillo et al., 2022). The author emphasises that the overall political and economic situation in Mexico allowed the government to provide only very limited support for the industry during the COVID pandemic. As a matter of fact, no strategic industrial policy intervention has taken place in the Mexican automotive sector. In order to stabilise the sectoral employment levels in the short-term, automotive firms and unions negotiated reductions in working hours. In addition, the Mexican state introduced regulations restricting employee outsourcing. Nevertheless, despite the weak strategic response by the government, the deep integration of the domestic automotive sector in cross-border value chain structures helped Mexico recover from the crisis relatively quickly. Given the COVID-era disruptions of *global* supply networks, nearshoring to Mexico became an even more important strategy for US companies.

The paper by Bungsche uses the analysis of the sectoral policy interventions in Japan to reveal an interesting process of international policy diffusion in the automotive sector. The author argues that Japanese policymakers have long tried to stimulate the transition to environmentally friendly vehicles. However, prior to the COVID pandemic, their efforts were rather slow-paced and largely focused on hybrid vehicles. Hybrid vehicles have, in the meantime, become key products of many Japanese carmakers and have achieved a double-digit market share in Japan. But importantly: after the outbreak of the COVID pandemic, the rather conservative approach to sectoral change followed by the Japanese policymakers has been challenged by the intensive use of demand-side policies that stimulated the transition to EVs in the European market. Given the dynamically growing market share of battery electric vehicles (BEV) in the EU (and also in other regions, such as the USA), the Japanese industry has been forced to fundamentally revise its previous strategy.

The final case in this special issue is China. Lüthje, Wu and Zhao argue that the COVID crisis has reinforced the country's industrial-policy strategy for the automotive sector that had already been in place for some time. At present, China is a global leader in the EV market and EV production and has achieved this position largely due to a comprehensive strategic government involvement in the industry. The country has managed to develop strong domestic capabilities in the EV value chain, including battery production. The authors of the paper argue that already before the pandemic, the Chinese government has been increasingly shifting the focus of its sectoral policy from measures such as EV-production quota and buyer subsidies to a stronger focus on product quality and environmental impact.

Overall, the contributions to the special issue seem to indicate that the COVID-era sectoral government interventions varied in nature across regions. In the EU, we are observing a rather clear shift away from the previous competition policy-driven approach

toward a more active involvement of public policy actors in the ongoing transformation processes in the automotive industry. The success of such policy interventions (e.g., in terms of their possible impact on domestic technological upgrading) will, however, depend on the characteristics of the national sectoral governance structures and the specific priorities identified by member state governments. As the remaining case studies of the special issue indicate, different kinds of processes have shaped the crisis-era policy responses in the other regions. While the Chinese Government has largely maintained the course that had been set before the pandemic, significant changes have taken place in Japan, where the domestic industry has seen itself forced to adapt to the developments in the global automotive market (and in particular, to the rapid transition to EVs in the EU). Finally, in the sole semi-peripheral automotive country among our case studies – Mexico – the policy response of the government focused on short-term relief measures. The main crisis-era regulatory adjustments resulted not so much from a strategic industrial-policy vision of the government, but were rather a pragmatic reaction to regional value-chain dynamics.

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