Editorial

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1 Introduction

Over the past decade, automotive supply chains have been buffeted by a range of opportunities and challenges. The most evident of these adjustments are the consequence of a blend of societal emergencies, the introduction of disruptive technologies, and the onset of robust, new regulations (e.g., those related to climate change, electrification, and emission mandates). Throughout this period, a dominant theme in the literature affecting the industry has been the role that digital technologies have and will play in shaping current and future manufacturing products and processes.

Expressions such as 'emergency', 'disruptive', or 'robust' connote expeditious reactions, swift adaptations, and tumultuous adjustments by the industry and its principal stakeholders. Indeed, in the context of the automotive industry, the introduction or promise of connected, autonomous, shared, or electric vehicles (EVs) (often referred to by the acronym CASE) seems transformative, perhaps even radical. The reality, however, is that in the automotive industry, the development, implementation, and proliferation of innovation tends to occur over decades. Moreover, long timelines for developing new technology, retooling factories, or reshaping supply chains means that the process has tended to unfold via a series of smaller, successive changes that cumulatively lead to the transformations that have been assured or suggested.

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This special issue of the *International Journal of Automotive Technology and Management* offers a collection of papers that examine factors that influence and steer adjustments within global automotive supply chains. In it, we explore a selection of under-explored, but still significant, factors affecting those adjustments. Therefore, rather than restricting our exploration to the CASE-related engrossments that have dominated current literature and media, this issue looks at a multifaceted collection of processes, regions, inputs, and events that reflect a set of less conspicuous, more subtle, but nonetheless consequential, assemblage of factors influencing and directing the evolution of the automotive industry's global supply chains. They span a variety of topics and engage researchers from diverse disciplines and regions.

2 Organisation of articles in this special issue

The first article in the issue, 'Automotive alliances in times of technological uncertainty', is written by Jorge Carrillo, Bertha Vallejo and Redi Gomis. It provides an empirical analysis of automotive industry alliances that have occurred because of rapidly changing technological and environmental inputs. The authors find that conditions of technological uncertainty, including increasingly stringent environmental regulations, a growing focus on energy efficiency, and the transition to CASE vehicles, has resulted in a shift away from traditional automotive mergers and alliances towards more inter- and intra-sectoral partnerships. This includes elevated participation of non-automotive information and communication technology (ICT) firms. The study provides important insights, demonstrating that even though newly emergent original equipment manufacturers (or OEMs) like BYD or Tesla have gained increasing prominence, most alliances continue to be centred on traditional OEMs like Ford, Toyota, or BMW. Meanwhile, alliances with original equipment suppliers (OES) are present in almost all arrangements.

The second article in the issue is written by Andrea Szalavetz and is titled 'In-house software development for software-defined vehicles: major changes ahead in automotive value chains?' In it, Dr. Szalavetz explores aspects of the [re]configuration of the division of automotive labour and value chains that has occurred during the transition towards software-defined vehicles. The author analyses the software strategies of VW, Toyota, Mercedes-Benz, Volvo, GM, and Stellantis, exploring the implications of the internationalisation of software development. Szalavetz puts particular emphasis on the complex decisions that OEMs face in terms of the choices they confront related to 'make, buy, or ally', suggesting that even though increasing levels of digitalisation have posed challenges for incumbent automotive firms, the entry of new software providers, particularly those from sectors and firms previously unrelated to the automotive industry, has not diluted the status of OEMs in global value chains. The findings of Szalavetz' analysis indicate that OEMs are preventing the loss of control of their core products by expanding in-house vehicle-related software-development capabilities.

Together, these two articles expand knowledge of how OEMs have improved their capabilities in intangible areas like software-based vehicles and Industry 4.0 technologies. They also suggest that rising competition from existing firms and evolving technological trends have been pivotal in driving those adjustments. The writers agree that that, despite the considerable uncertainty present in the current automotive landscape, significant shifts in the existing industry structure have not yet occurred and

do not seem imminent. They show that despite the growing prominence of ICT firms, influence and power within automotive supply chains continues to be centred on OEMs.

The next two articles (by Mordue and Vallejo, and Schröder) assess how industrial policy is used as a tool to influence the development of their industries. Both draw from the core–semi-periphery-integrated periphery framework developed by Mordue and Sweeney (2020, 2024), Mordue and Sener (2022) and Pavlínek (2018, 2022), which categorises countries based on the nature of the automotive industry in those countries and their sources of competitive advantage.

In Greig Mordue and Bertha Vallejo's 'Industrial policy imitation: the perils of matching the US Inflation Reduction Act to attract battery plants', the authors explain that, over the course of 18 months in 2022 and 2023, Canada embarked on a CAD 42 billion plus exercise to sustain and, according to the federal and provincial governments, transform its automotive industry. By mimicking a key and costly feature of the US Inflation Reduction Act (IRA), Canada gained three foreign-owned greenfield battery plants. While the authors argue that Canada's decision to deploy some of the costliest aspects of the US IRA was necessary to secure the three battery plants, they question the propriety of doing so. In their analysis, Mordue and Vallejo demonstrate that mimicking a US policy will not yield the same results that US policymakers can anticipate when offering similar support to US-based global lead firms. Their conclusion is blunt: "Canada's expenditure of at least CAD 42 billion to attract three battery plants worth CAD 19 billion will yield just that: three battery plants worth CAD 19 billion and little, relative to the US, more."

The fourth article is written by Martin Schröder, titled 'Towards a new division of labour in Southeast Asia: Indonesian and Thai Industrial policy and the electric vehicle value chain in ASEAN'. In this article, the author uses case studies of Thailand and Indonesia to illustrate the role that national industrial policy is playing in reshaping those countries' automotive industries in the transition process from internal combustion engines (ICEs) to electric powertrains. Schröder presents the results of two types of industrial policies in the case study countries. On one hand, the focus of Thailand on product champions, as well as its well-established supply of automotive suppliers, has strengthened that country's position for EV assembly in Southeast Asia, a strategy that has supported its regional competitiveness as a location for automotive assembly. Schroeder's contribution also reinforces the fact that the disruptive nature of electrified mobility notwithstanding, the importance of Thailand's longstanding capabilities endures. In contrast, Indonesia's resource-cum-industrial policy is focused on nickel mining and has succeeded in attracting investment for EV battery cell production, making it the frontrunner in Southeast Asia.

The issue closes with an article by Laura Rehberg, titled 'Prototyping in motorsports: exploring manufacturer-supplier collaboration in Formula One'. In this article, the author explores the dynamics of suppliers and OEMs in the process of prototyping in Formula One (F1). It is well-understood that F1 operates in a dynamic and fiercely competitive environment. F1 teams and the automaker OEMs that sponsor them push the boundaries of technological advancement in domains that include aerodynamics (see Guerrero and Castilla, 2020), engine performance (see Maynes et al., 2002), and material science (see Savage, 2010). The rationale for automaker participation often includes the argument that research and development efforts conducted within the realm of F1 foster insights that are subsequently translated into conventional vehicles (see Dhand and Pullen, 2015; Kanal,

2019). Drawing from archival data and a survey of key F1 actors, Rehberg examines various facets of the prototyping process (which is essential to OEM-supplier collaboration), highlighting various facets of collaboration in the development of central components for F1 prototypes, elevating understanding of the complex interplay between suppliers and automakers during product development.

3 Concluding remarks

We believe that this edition of the *International Journal of Automotive Technology and Management* offers valuable insights into key factors shaping global automotive supply chains. From the exploration of prototyping in F1 to the examination of sourcing strategies in the digital era and the analysis of industrial policy responses to the transition to electric powertrains, each article offers valuable insights into different aspects of the industry's evolution. As technological advancements, regulatory changes, and shifting power dynamics continue to drive transformations in the automotive sector, a nuanced understanding of these complexities is essential for stakeholders navigating future challenges and opportunities. We hope you will agree that this edition advances understanding of some of the complex factors affecting the industry.

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