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Shifting Supply Chain Interdependencies Among Global Automakers*

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Abstract

Against the backdrop of electrification and supply chain resilience, the global automotive industry is in an era of great transformation. Using component supply information provided by MarkLines, this study investigated the impact on inter-firm dependencies among major global automakers from 2018 to 2024. Specifically, it analyzed changes in the community structure of the interdependency network between manufacturers, based on common suppliers for each model year and component category. The results revealed the impact of electrification: a halving of transactions for internal combustion engine (ICE) powertrains and an increase in electric powertrain transactions. Furthermore, the results of community detection also revealed a structural reorganization: while geographical clustering among manufacturers intensified for ICE components, new cross-border interdependencies formed for electric powertrain components, leading to the fragmentation of the traditionally integrated Japan-US-Europe bloc and the emergence of a China-centric ecosystem. This study provides new empirical evidence related to the strategic decoupling and realignment of the global automotive value chain, offering important implications for management strategy and industrial policy in an era of great technological and geopolitical change.

Keywords: Automotive industry, Supply chain, Inter-firm network, Community detection
JEL classification: L14, L64, D85, O33

*This study is conducted as a part of the Project “Dynamics of Price in Crypto Assets and Real Economy and Their Underlying Complex Networks” undertaken at the Research Institute of Economy, Trade and Industry (RIETI). The draft of this paper was presented at the RIETI DP seminar for the paper. This research was also supported by grant-in-aid for scientific research (KAKENHI) by JSPS Grant Numbers 22K04590, 23K13520. The author is grateful for helpful comments and suggestions by Hideaki Aoyama (Kyoto Univ.), Yoshi Fujiwara (Univ. Hyogo), Hiroshi Yoshikawa (Univ. Tokyo), Hiroshi Iyetommi (Rissho Univ.) and Discussion Paper seminar participants at RIETI.

I. Introduction

The global automotive industry is in the midst of a once-in-a-century paradigm shift, situated at the intersection of two powerful forces: the technological disruption of connected, autonomous, shared & service, electric (CASE) and a profound geopolitical realignment. The transition to electric vehicles (EVs) is not only redefining product architecture but also fundamentally reconfiguring the intricate web of production and supply that underpins the entire industry (Jagani et al., 2024; International Energy Agency, 2024). This transformation significantly impacts the structure of the automotive global value chain (GVC), which reshapes the industrial dynamics and regional configurations (Sturgeon et al., 2008; Ramos and Ruiz-Gálvez, 2024). Furthermore, recent disruptions such as the COVID-19 pandemic and semiconductor shortages exposed the vulnerabilities of global supply chains, elevating "resilience" from a corporate operational concern to a paramount national strategic imperative (Eldem et al., 2022; Mohammad et al., 2022; Seong et al., 2025).

Traditional hierarchical (Original equipment manufacturer (OEM) → Tier-1 → Tier-2) or linear supply chain models are insufficient for comprehending this complex environment. In recent years, the network analysis of interfirm transaction data has been increasingly recognized as a powerful tool for clarifying dynamic relationships within industrial structures (Inoue and Todo, 2019; Inoue et al., 2023). Research on the automotive industry revealed complex dependencies between suppliers and manufacturers (Veloso and Kumar, 2002; Brintrup et al., 2012; Kito et al., 2014). However, a considerable amount of this prior work has been limited to static structural analyses at specific points in time or in particular regions, or it has focused on the aggregate analysis of the industry. There remains a scarcity of research that tracks the dynamic evolution of structural changes for each component category over time. The horizontal, indirect network of interdependencies among OEMs mediated by their shared reliance on a common pool of suppliers, has gained increasing importance in the current context of economic security. This overlooked structure is crucial for revealing systemic risks, technological alliances, and competitive blocs.

Such discussions on the transformation of network structures have been prominent in Japan since the early 2000s. The concept of "modularization," as advanced by scholars such as Aoki et al. (2002) and debated in forums such as RIETI's "Economic Policy Review," challenged the traditional "integral" (or suriawase) architecture had long been a source of Japanese manufacturing strength. This theory suggested the necessity of moving away from fixed *keiretsu* systems toward a more open industrial architecture that can flexibly procure superior external technologies (modules) through standardized interfaces, and provide the intellectual foundation for the coming structural change.

Matous and Todo (2015) empirically demonstrated that the traditional *keiretsu* system within the Japanese domestic auto industry was gradually disassembling between 2006 and 2011, revealing a dynamic where OEMs achieved productivity gains by diversifying their supplier base (i.e., “opening” their procurement (Fujimoto, 2001)). However, this prior research primarily focused on “efficiency” dynamics within Japan’s “domestic” and “direct transaction” networks. How this “opened” market was subsequently reorganized on a “global” scale under the new mega-trends of electrification and geopolitical risk, and how “indirect interdependency” relationships among firms evolved, remains insufficiently explored. This paper aims to fill this critical research gap.

Therefore, this paper primarily aims to empirically map and analyze the structural evolution of the global automotive OEM interdependency network during the critical period of accelerated transformation from 2018–2024. We construct an OEM–OEM network where edge weights are defined by the number of common suppliers, using transaction data from the MarkLines information platform. Then, we apply community detection algorithms to trace the formation and dissolution of industrial blocs. Through this analysis, this paper provides novel, data-driven evidence of a fundamental realignment in the global production system, which is characterized by the fragmentation of the traditional Japan–US–Europe bloc and emergence of a China-centric ecosystem. Furthermore, it highlights starkly divergent evolutionary paths of supply chains for legacy internal combustion engine (ICE) technologies versus emerging e-powertrain technologies, isolating the specific effect of electrification on inter-firm relationships. These findings offer important implications to understand industrial evolution, corporate strategy, and public policy in an era of technological and geopolitical change.

The remainder of this paper is organized as follows. Section II describes the data source and provides a descriptive analysis of the changing supplier market. Section III outlines the analytical framework, which comprises the method for constructing the OEM interdependency network and identifying industrial blocs via community detection. Section IV presents the results and discusses the structural evolution of both aggregate and component-specific networks. Finally, Section V concludes the paper, discussing its implications and future research directions.

II. Data and Descriptive Analysis

A. *Data Source: MarkLines Information Platform*

The empirical foundation of this study is a comprehensive dataset of automotive supply chain relationships sourced from the MarkLines information platform (MarkLines Co., Ltd., 2025), a globally recognized database providing detailed industry information. MarkLines data systematically track the supplieries that provide the specific part for a given vehicle model and model year, making its granularity and global coverage an invaluable resource to map production networks. The component suppliers for a given vehicle model are fixed after the start of production and subject to few major changes, which makes model-year data a valid proxy for analyzing temporal shifts in the industrial structure. Further it has been utilized in other academic research to analyze the structure of the global automotive supply chain.

The dataset provider, MarkLines, collects this proprietary supply chain information through a multifaceted research methodology. This information is not aggregated or made public, and it is instead gathered via a multi-angle approach that includes direct sourcing from industry exhibitions, targeted hearings, and analysis of press releases. The firm maintains global research bases across Europe, the Americas, and Africa, which enables it to provide data on mass-production vehicles worldwide. A key feature is its "300 parts supply chain" content, that is updated daily (e.g., $\sim$ 48,000 updates in 2024), and possesses a high degree of currency, which includes information on models up to the 2027 model year. However, it is necessary to acknowledge the scope of data and the limitations. The research focuses on Tier-1 suppliers in the global market. As data are gathered through this diligent, ground-up investigation, there is no guaranteed that it would be comprehensive for every component across all models. The volume of available information may vary by part category and market.

For this analysis, we use a snapshot of the database comprising 277,157 unique supply linkages as of August 2025, focusing on the relationships of the top 25 global OEM groups and their Tier-1 suppliers from 2018–2024. Note that this data indicate the presence of a sourcing relationship but does not reflect the volume or monetary value of individual transactions. This study utilizes nine part classifications adopted in the MarkLines' component supply information as-is, conducting analysis across all categories.

Several preprocessing steps were performed on the raw data to ensure the consistency and accuracy required for rigorous network analysis. These included entity resolution to standardize firm names, OEM grouping to aggregate individual vehicle brands into their parent corporate groups as shown in Table 2, temporal slicing to create discrete annual datasets, and categorical filtering based on part categories in Table 1.

B. *Descriptive Analysis: Shifting Supplier Landscape (2018–2024)*

A preliminary descriptive analysis of the data reveals a profound and rapid transformation in the automotive supplier market between 2018 and 2024, which provides the quantitative context for the subsequent network analysis. The rise of electrification shows a dramatic technological substitution at the component level (see Fig. 1). The number of recorded supply relationships for ICE-powertrain components plummeted by nearly 50% from 2018–2024, with its share of total transactions falling from $\sim 35\%$ to under 20%. In stark contrast, relationships for e-powertrain components surged, demonstrating a clear and rapid reallocation of sourcing activity toward electrification.

The period under review is characterized by exceptionally high market fluidity, as shown by supplier churn (see Figs. 2 and 3). An analysis of year-over-year changes indicates a significant turnover in the supplier base. For example, in 2021, over half of the active suppliers were compared to the previous year, with this influx being most pronounced in the e-powertrain category. Concurrently, there is a high annual exit rate, with more than 30% of suppliers exiting the dataset each year, which is a trend particularly strong for suppliers in the ICE-powertrain category. This high rate of turnover suggests a destabilized competitive environment where the advantages of incumbent suppliers are being eroded, creating opportunities for new entrants, particularly those with expertise in electronics, software, and battery technology.

This market churn is reflected in a significant reordering of the major "hub" suppliers of the industry (compare Fig. 4 (2018) and Fig. 10 (2024)). A "hub" supplier refers to a firm with a high number of supply relationships in this dataset, and not one with a large transaction value. In 2018, the list of top suppliers was dominated by established European, Japanese, and American firms with deep roots in ICE technology, alongside their Chinese joint ventures. By 2024, the landscape shifted dramatically. Japan's Denso rose to the top, showcasing a stronger presence of Japanese firms that successfully pivoted to new technologies (e.g., Koito, Aisin) and notable rise of suppliers specializing in components for the entire vehicle architecture, not only the powertrain. The data highlights the strategic adaptation of incumbents and growing effect of Chinese suppliers in the global market.

C. *Descriptive Analysis: OEM Procurement Strategies and Positioning*

Although the preceding section focused on trends in the supplier market, it is also crucial to survey the procurement strategies of the OEMs to understand the subsequent network analysis. This methodology proposed in this study captures interdependencies through shared suppliers, but not all OEMs adopt strategies predicated on such sharing. Figures 11 through **??** show the total number of transactions and ratio of transactions with shared suppliers for each component category in 2018 and 2024. In these figures, the horizontal axis plots the total number of supplier transactions (logarithmic scale) of each OEM, whereas the vertical axis shows the ratio of transactions with shared suppliers. OEMs in the upper-right quadrant pursue a "horizontal collaboration" strategy, which engages with many suppliers, the majority of whom are shared with other OEMs. Conversely, OEMs in the lower-right quadrant, characterized by a large transaction volume but a low sharing ratio, may be pursuing a "vertical integration" strategy that emphasizes in-house production or exclusive supplier relationships.

Considering all component categories for 2024 (Fig. 12), traditional OEMs among the top 10 by transaction volume (blue dots), such as Toyota, Nissan, and Honda are positioned in the upper-right. In contrast, Tesla (red dot), which serves as a benchmark, already exhibited a relatively low sharing ratio in 2018 (Fig. 11), indicating an independent strategy. By 2024, BYD emerges in a highly distinctive position in the lower-right. Despite a very large number of supplier transactions, its sharing ratio is below 50%, clearly illustrating its strategy of strong vertical integration. This trend is pronounced in the e-powertrain category. In the 2024 e-powertrain scatter plot (Fig. **??**), the sharing ratio of the BYD drops to $\sim 35\%$, highlighting its unique strategy. Meanwhile, fellow Chinese OEMs Geely and Chery have a high number of transactions and a relatively high sharing ratio, which includes that they are adopting a more horizontal, collaborative approach similar to that of traditional OEMs.

This descriptive analysis reveals a tectonic shift at the supplier level and diverse strategic positioning on the part of OEMs. The move to electrification is not merely changing the type of parts sourced but is redefining the very structure of the supplier market (who supplies and who exits). These fundamental changes in the supplier market and the differing procurement strategies of firms have reshaped interdependencies among manufacturers, which are formed through these shared suppliers, namely, the OEM–OEM network that is the subject of our analysis.

III. Analytical Framework

A. *Constructing the OEM Interdependency Network*

We investigate the relational structure among global automakers. The analytical process begins by representing raw data as a bipartite network. This network, denoted as $G = (U, V, E)$ includes two disjoint sets of nodes and edges that connect them. $U = \{u_1, u_2, \cdots, u_m\}$ represents the set of m OEMs. $V = \{v_1, v_2, \cdots, v_n\}$ represents the set of n Tier-1 suppliers. An edge $e_{ij} \in E$ exists between an OEM $u_i \in U$ and a supplier $v_j \in V$ if a supply relationship between them is recorded in the MarkLines database for a given year and part category. A one-mode projection is performed on the set of OEM nodes U as the primary interest of this study lies in indirect relationships among the OEMs. This projection transforms the bipartite network G into a unipartite, weighted network $G' = (U, E', W)$. In this network, an edge exists between two OEMs if and only if they share at least one common supplier. This edge weight, $w(u_i, u_k)$, serves as a direct measure of the intensity of their supply chain interdependency.

B. *Identifying Industrial Blocs via Community Detection*

With the weighted OEM interdependency network G' constructed in this study, the next step is to uncover its underlying mesoscale structure; the organization of nodes into groups or clusters are more densely connected internally than they are to the rest of the network. This process is known as community detection, which aim to partition the nodes of network (OEMs) into a set of non-overlapping communities, revealing the de facto industrial blocs or ecosystems that exist within the global automotive industry. Therefore, this study employs a widely used heuristic method based on modularity maximization. Modularity is a quality metric that measures the strength of a network's division into communities. We utilize the Louvain method (Blondel et al., 2008), which is an efficient greedy optimization algorithm. The output of this process is a partition of the set of OEM nodes U into a set of communities $C = \{C_1, C_2, \cdots, C_k\}$. Each OEM is assigned to exactly one community. This analysis is performed independently for each of the constructed networks for each model year from 2018–2024 (e.g., All Parts 2018, All Parts 2019, $\cdots$, All Parts 2024, and similarly for each part category).

IV. Results: Evolving Structure of Global Automotive Supply Chains

This section examines the structural evolution of the aggregate interdependency network, encompassing all component categories from 2018–2024, and presents a comparative analysis of networks for legacy (ICE-powertrain) and emerging (e-powertrain) technologies for isolating the specific impact of electrification.

A. *Aggregate Network: Fragmentation and Realignment (2018–2024)*

The community detection analysis performed on the aggregate network reveals a dramatic structural transformation of the global automotive industry between 2018 and 2024, which is characterized by the fragmentation of the established industrial order and simultaneous consolidation of a new, powerful ecosystem.

In 2018, the OEM interdependency network exhibited a broadly bipolar structure, as detailed in Table 3. The largest group, Community 1, was a highly integrated bloc of 26 OEMs that included the majority of established Japanese, American, and European automakers such as Nissan, Ford, and Toyota, which represent the traditional core of the global industry. The second major group, Community 2, was distinctly Chinese-centric and composed of 20 firms led by joint ventures such as SAIC GM and domestic champions such as Geely. A third, smaller community (Community 3), centered on Chinese joint ventures of Japanese firms, acted as a bridge between the two larger blocs. This structure reflected an industry where a globalized incumbent core coexisted with a large but relatively distinct Chinese production system.

By 2024, this structure had undergone a radical realignment. The most significant finding, shown in Table 4, is the fragmentation of the formerly monolithic incumbent bloc, and the concurrent consolidation and expansion of the Chinese-centric ecosystem. The 2024 analysis identified three major communities with a fundamentally different composition. The Chinese-centric community (Community 1) grew significantly in size and internal cohesion, absorbing numerous players, with its composition now overwhelmingly Chinese, which indicates a move toward a more self-sufficient supply ecosystem. Meanwhile, the traditional incumbent bloc fractured into two distinct communities: one centered on European and Korean automakers (Community 2), including BMW, Renault, and Hyundai/Kia, and another composed of the major Japanese and American OEMs (Community 3), such as Nissan, Toyota, GM, and Ford.

This evolution from a bipolar to a tripolar world provides compelling, empirical evidence of a strategic "decoupling" or realignment of global automotive supply chains. The consolidation of the Chinese community into a more independent and dominant bloc reflects China's industrial policy success and emergence as a largely self-reliant automotive power in the EV domain. The fracturing of the incumbent bloc suggests that Western and Japanese firms actively reconfigure their supply networks, which is likely driven by a combination of factors: a strategic response to Chinese competition, an effort to build more resilient and regionalized supply chains in the face of geopolitical uncertainty, and divergent technological pathways being pursued by different regional actors. The network has reorganized itself along clearer geopolitical and corporate-strategic lines.

B. *Divergent Paths: Legacy Consolidation vs. New Ecosystem Formation*

To understand the primary drivers of this aggregate-level restructuring, the analysis was extended to individual component technologies. For each part category, this paper presents network visualizations for 2018 and 2024 (Fig. 32-40) and the corresponding tables of community characteristics (Tables 5-22). This granular category-specific analysis reveals diverse patterns of interdependence obscured in the aggregate network view. For example, mature components such as body and chassis tend to maintain relatively stable regional blocs, whereas electrical and electronic parts show new alliances based on technological partnerships, demonstrating that the nature of co-dependency varies by component type. However, the most striking divergence is observed between the legacy ICE-powertrain sector and emerging e-powertrain sector.

The comparative analysis for 2024 detailed in Tables 20 and 22 reveals starkly divergent evolutionary paths for the legacy ICE-powertrain sector and emerging e-powertrain sector. The shift in product architecture from mechanical to electrical systems is mirrored by a fundamental shift in the architecture of the corresponding supply networks.

The network of interdependencies for ICE-powertrain components indicates retrenchment and regional consolidation. By 2024, the ICE network reorganized into much more distinct, geographically defined communities. As shown in Table 20, this includes a clear Japanese community (Community 4) comprising firms such as Toyota, Nissan, and Honda; a European-centric community (Community 1) led by German luxury brands; and a Chinese community (Community 2) of domestic firms and their joint ventures. This evolution suggests a consolidation of legacy supply chains. As ICE technology reaches maturity and new investment is overwhelmingly directed toward electrification, automakers appear to be reinforcing their most established, efficient, and geographically proximate supply networks for these components. There is less incentive to forge new, complex global partnerships in a technologically stable but declining market segment.

In sharp contrast, the analysis of the e-powertrain network presents a dramatic narrative of the birth of an entirely new industrial ecosystem. A sparse and fragmented network in 2018 coalesced into a dense, highly interconnected global system by 2024. It has novel structure, as detailed in Table 22. First, a massive, dominant Chinese-centric community (Community 1) emerged; this community was far larger and more diverse than its ICE counterpart. This includes not only Chinese domestic giants but also the Chinese operations of global players such as Tesla, indicating China's central role as both a market and a production hub for EVs. Second, a distinct European-Korean community (Community 2) formed, led by firms such as BMW, Mercedes-Benz, and Hyundai/Kia, suggesting a strategic alignment in developing a non-Chinese EV supply base. Most strikingly, a new Japanese-led community (Community 3) appeared, anchored by Toyota, Nissan, Honda, and critically including the Chinese battery and EV behemoth, BYD.

Figure 41 and Table 23 detail the structure of Community 3 in the 2024 e-powertrain network. BYD's inclusion in this Japanese-centric cluster is driven by its specific ties with Toyota's Chinese joint ventures, rather than global integration. As BYD is highly vertically integrated with few shared suppliers, these specific links become structurally significant. The table reveals a sharp contrast: while Toyota (Global) shares only a standardized thermal management supplier (Zhejiang Sanhua) with BYD, its joint venture, FAW Toyota, sources core powertrain components directly from BYD's subsidiary, FinDreams. This indicates that Toyota maintains its proprietary technologies for key EV components globally and is compelled to deepen interdependence with BYD in its Chinese production (FAW Toyota) to meet local market demands and ensure competitiveness.

This structure signifies the creation of a new global supply chain order for EVs. The presence of BYD, which is a direct competitor to Japanese OEMs in the final vehicle market, within the Japanese e-powertrain community is a powerful testament to this new reality. This indicates a critical cross-national dependency of Japanese automakers on Chinese technology and production capacity for essential EV components, particularly batteries. This finding suggests a potential tension between the strategic imperative for individual firms to secure critical technology and the long-term national industrial policy goal of supply chain independence. In the e-powertrain domain, national and regional boundaries are far more porous, and technological leadership creates interdependencies that transcend traditional competitive lines.

V. Conclusion

This study empirically mapped the evolving structure of interdependencies among global automotive OEMs during a period of unprecedented technological and geopolitical change. The analysis of the aggregate OEM network confirms a significant structural realignment: the traditionally integrated automotive bloc of Japanese, American, and European firms has fragmented, while a large, cohesive, and increasingly self-sufficient Chinese-centric ecosystem has risen and consolidated. The structure of industry has shifted from a bipolar model to a more multipolar configuration. The study reveals that the evolutionary paths for legacy and emerging technologies are starkly different. For ICE-powertrain components, the network has evolved toward greater regional consolidation. In sharp contrast, the e-powertrain network has rapidly evolved from a fragmented state to a dense, globally interconnected system. The structure of this new e-powertrain ecosystem is defined by novel, cross-national alliances driven by access to critical technologies, and it is exemplified by the inclusion of the Chinese giant BYD within the Japanese-led community, highlighting a critical dependency that transcends traditional competitive and national boundaries.

These findings carry significant implications for both corporate strategists and public policymakers. For managers, they underscore the urgent requirement for a technology-specific supply chain strategy. For ICE components, the focus should be on regional efficiency, while for EVs, the imperative is to secure access to new technologies and manage complex global dependencies. The network maps presented here can serve as a strategic risk assessment tool for identifying hidden vulnerabilities. For policymakers, this research provides robust, empirical evidence to support concerns about geopolitical dependencies in new energy technology supply chains. The clear emergence of a dominant, Chinese-centric community in the global e-powertrain network highlights the formidable strategic challenge facing other nations and reinforces the rationale behind industrial policies aimed at building resilient, competitive, and diversified domestic supply chains for batteries, semiconductors, and other essential components.

This study has limitations that point toward promising avenues for future research. The network edge weights are based on the number of shared supply relationships not their economic value or strategic criticality. The analysis is confined to relationships between OEMs and their Tier-1 suppliers without capturing critical dependencies at lower tiers of the supply chain, such as for semiconductors and raw materials for batteries. Although this paper focused on a comparative statics analysis between 2018 and 2024, a more detailed dynamic analysis tracking the year-over-year evolution of network structure would specific trigger events (e.g., major alliances, policy shifts) for structural change. These limitations inform a clear agenda for future work. This includes developing more sophisticated weighted network analyses that incorporate data on transaction value or technological importance. Furthermore, as the transformation of the industry continues, future analysis must consider the rise of the software-defined vehicle. A critical future challenge will be to expand the network model to include the role of new entrants from the technology sector, such as software and platform providers like Google, and to analyze their effect on the established ecosystem.

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Table 1: Automotive part categories and descriptions

Part category	Description
Body	The main structural shell of the vehicle, including panels, doors, and windows.
Chassis	The frame, suspension, steering, and braking systems of a vehicle.
Driveline	Components that transmit power from the engine/motor to the wheels, excluding the powertrain itself.
Electrical and electronic	Vehicle electronics, wiring harnesses, sensors, ECUs, and infotainment systems.
Exterior	Non-structural external components such as bumpers, lights, and mirrors.
General small parts	Standardized components like fasteners, hoses, and brackets.
ICE-powertrain	Components related to the internal combustion engine, transmission, and fuel systems.
Interior	Components within the passenger cabin, including seats, dashboard, and trim.
e-powertrain	Components for electric vehicles, including motors, inverters, batteries, and charging systems.

Table 2: OEM Grouping.

Group (Group HQ Country)	Makers (Maker HQ Country)
Toyota Group (Japan)	Toyota (Japan), Hino (Japan), Daihatsu (Japan), FAW Toyota (China), Gac Toyota (China), GAC Toyota (China), Kuozui (Taiwan)
VW Group (Germany)	Volkswagen Anhui (China), SAIC Volkswagen (China), Audi (Germany), Bentley (UK), SEAT (Spain), Lamborghini (Italy), FAW-Volkswagen (China), Skoda (Czech Republic)
Hyundai Kia Automotive Group (South Korea)	Kia (South Korea), Beijing Hyundai (China), Dongfeng Yueda Kia (China), Yueda Kia (China), Hyundai (South Korea)
GM Group (USA)	GM (USA), Wuling (China), SAIC GM Wuling (China), SAIC GM (China), Shanghai GM (China)
Stellantis (Netherlands)	DS Automobiles (France), Dongfeng Peugeot Citroen (China), Alfa Romeo (Italy), Dodge (USA), Chrysler (USA), Opel (Germany), Maserati (Italy), Ram Trucks (USA), Baoneng (China), Lancia (Italy), Citroen (France), GAC Fiat Chrysler (China), Peugeot (France), Jeep (USA), Fiat (Italy)
BYD Auto (China)	BYD (China), BYD TRUCKS (China)
Ford Group (USA)	Ford (USA), Jiangling Motors (China), Changan Ford (China)
Geely Holding Group (China)	LEVC (UK), Polestar (Sweden), Geely (China), Fengsheng Automobile (China)
Honda (Japan)	Dongfeng Honda (China), GAC Honda (China), Honda (Japan)
Suzuki (Japan)	Changan Suzuki (China), Magyar Suzuki (Hungary), Changhe Suzuki (China), Suzuki (Japan)
Nissan (Japan)	Dongfeng Nissan (China), Zhengzhou Nissan (China), Nissan (Japan), Yulon (Taiwan)

Continued on next page

Table 2 – *Continued from previous page*

Group (Group HQ Country)	Makers (Maker HQ Country)
Chery Automobile (China)	JETOUR (China), Chery (China)
BMW Group (Germany)	BMW Brilliance (China), BMW (Germany), Rolls-Royce (UK)
Changan/Chana (Changan Automobile (Group)) (China)	Deepal (China), Changan (China)
Renault (France)	Dongfeng Renault (China), Renault Korea (South Korea), Renault Brilliance JINBEI (China), Renault (France), Dacia (Romania)
Mercedes-Benz Group (Germany)	Daimler (Germany), smart (Germany), Fujian Benz (China), Beijing Benz (China), Daimler Truck (Germany), Mercedes-Benz (Germany)
Tesla (USA)	Tesla China (China), Tesla (USA)
SAIC (Shanghai Automotive Industry Corporation (Group)) (China)	SAIC Passenger Vehicle (China), IM Motors (China), SAIC Maxus (China)
Mazda (Japan)	Changan Mazda (China), FAW (China), FAW Mazda (China), Mazda (Japan), FAW Car (China)
Tata Group (India)	Tata (India)
BAIC Group (China)	BAIC Zhenjiang (China), BAIC ORV (China), Beijing Automobile Works (China), Changhe Suzuki (China), Changhe (China), BAIC Motor (China), ARCFOX (China), Beiqi Foton (China), BAIC Foton (China)
Mahindra & Mahindra (India)	Mahindra & Mahindra (India)
FAW (China FAW Group Corp.) (China)	FAW (China), FAW Car (China)

(a) (b)

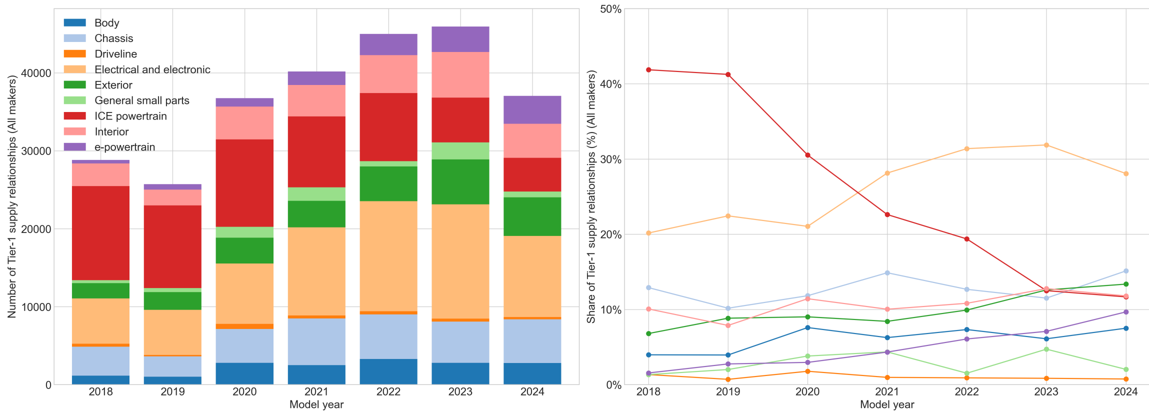

Figure 1: (a) Total number of Tier-1 supply relationships for all makers from model year 2018–2024, stacked by component category. (b) Corresponding percentage share of each component category, illustrating the changing composition of supply relationships over time.

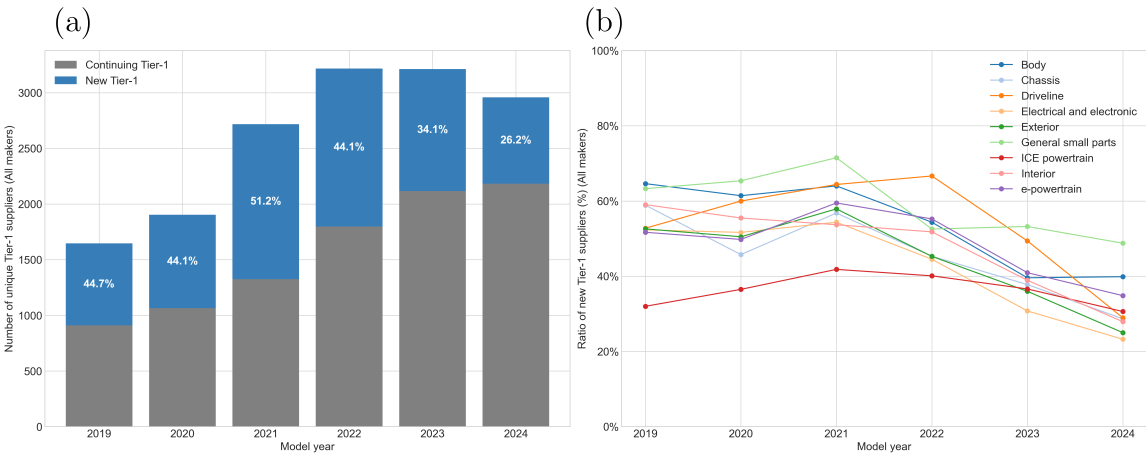

Figure 2: (a) Composition of the Tier-1 supplier base from 2019–2024, distinguishing between continuing suppliers and new entrants. The percentages indicate the proportion of new suppliers each year. (b) Ratio of new Tier-1 suppliers broken down by component category.

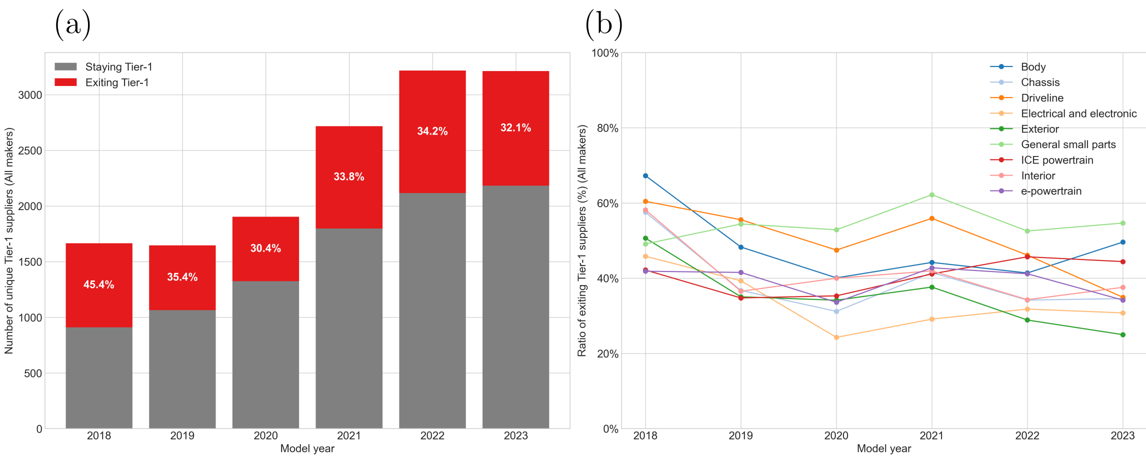

Figure 3: (a) Analysis of supplier exit from 2018–2023, showing the number of suppliers staying from the previous year versus those exiting the dataset. The percentages represent the annual exit rate. (b) Corresponding ratio of exiting Tier-1 suppliers for each component category.

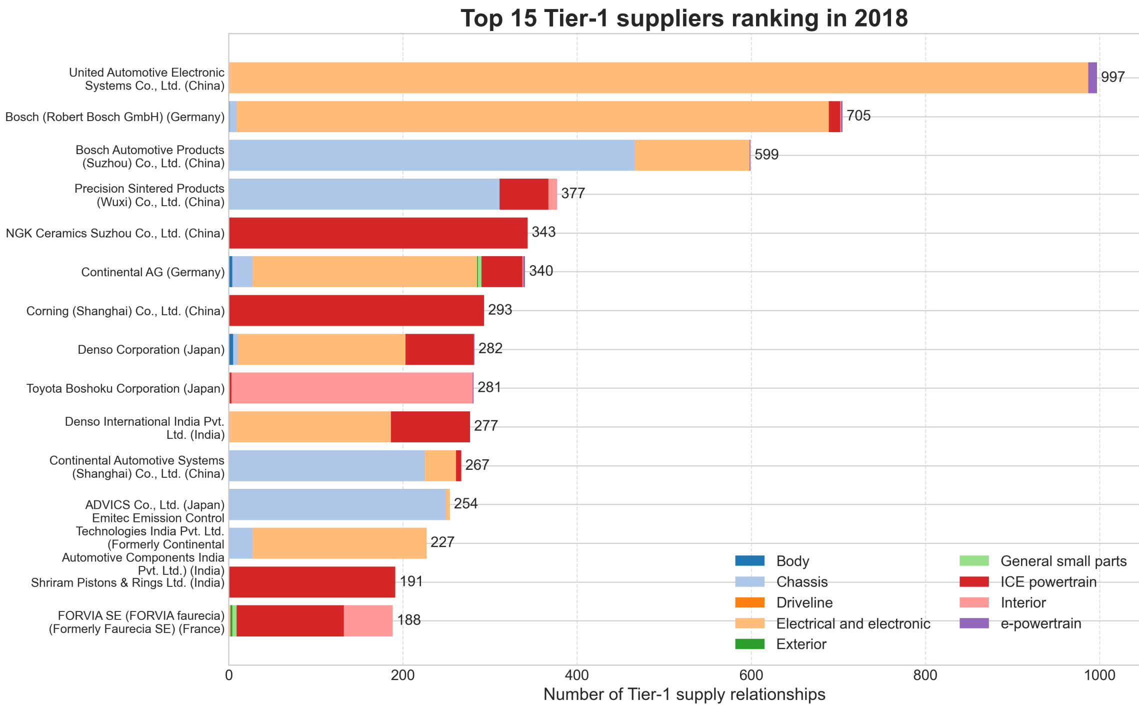

Figure 4: Top 15 Tier-1 suppliers ranking in 2018 based on the total number of supply relationships. The stacked bars illustrate the component portfolio for each supplier, indicating their primary areas of business.

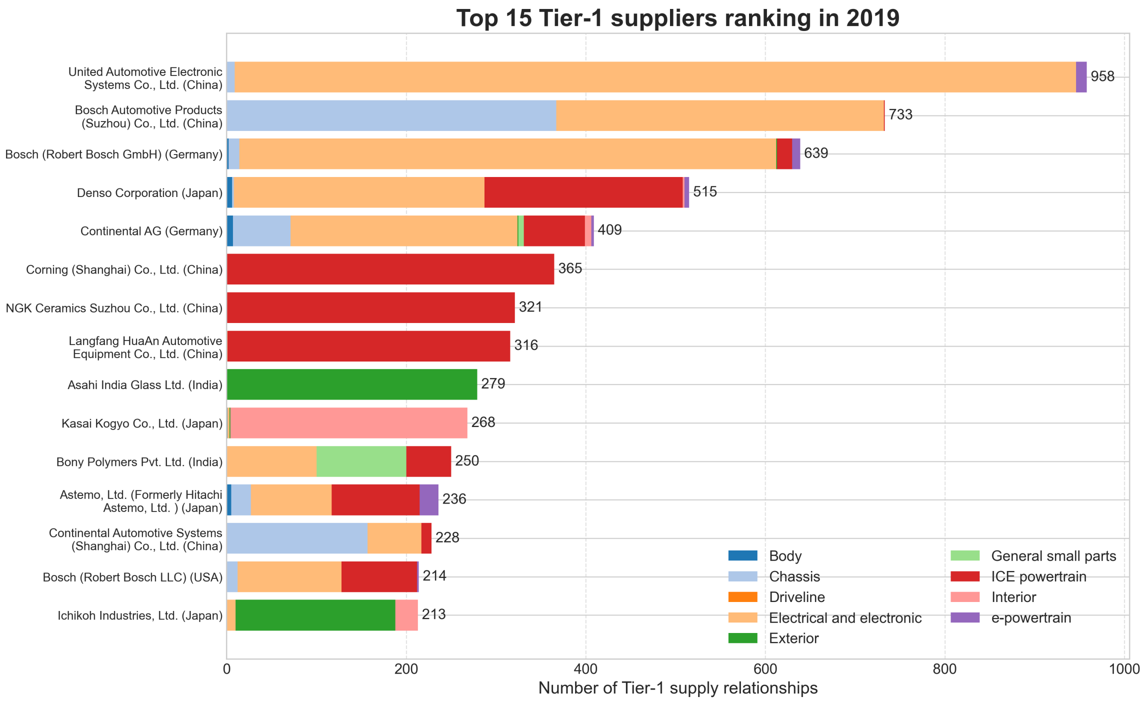

Figure 5: Top 15 Tier-1 suppliers ranking in 2019 based on the total number of supply relationships. The stacked bars illustrate the component portfolio for each supplier, indicating their primary areas of business.

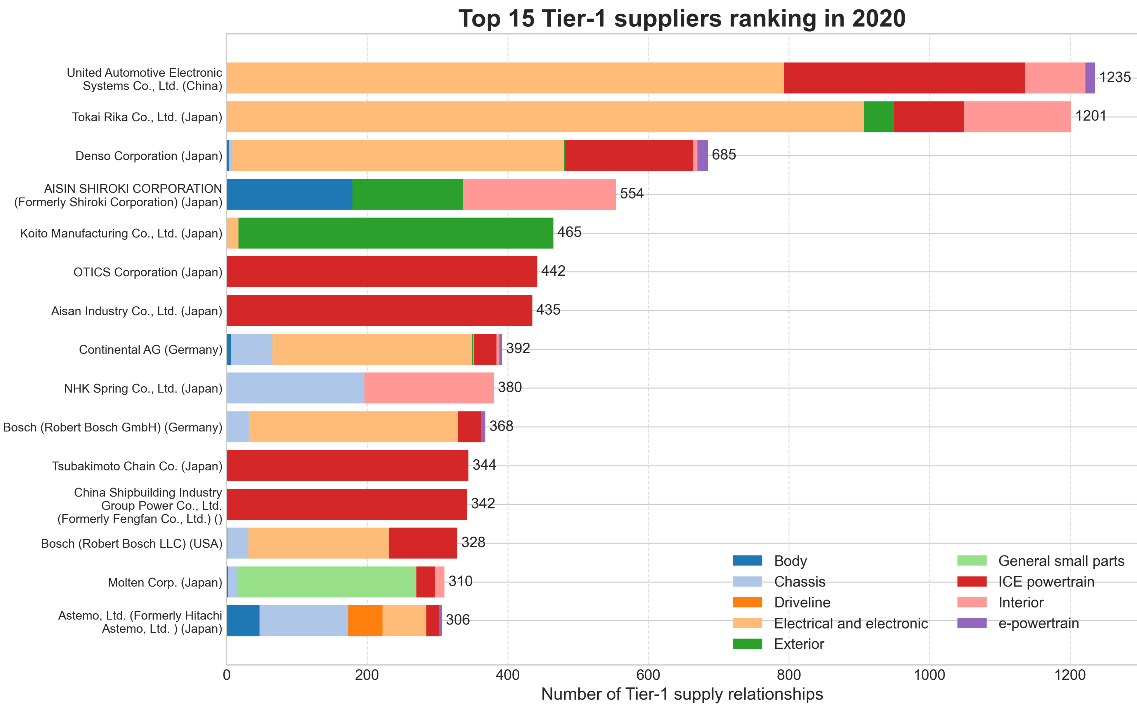

Figure 6: Top 15 Tier-1 suppliers ranking in 2020 based on the total number of supply relationships. The stacked bars illustrate the component portfolio for each supplier, indicating their primary areas of business.

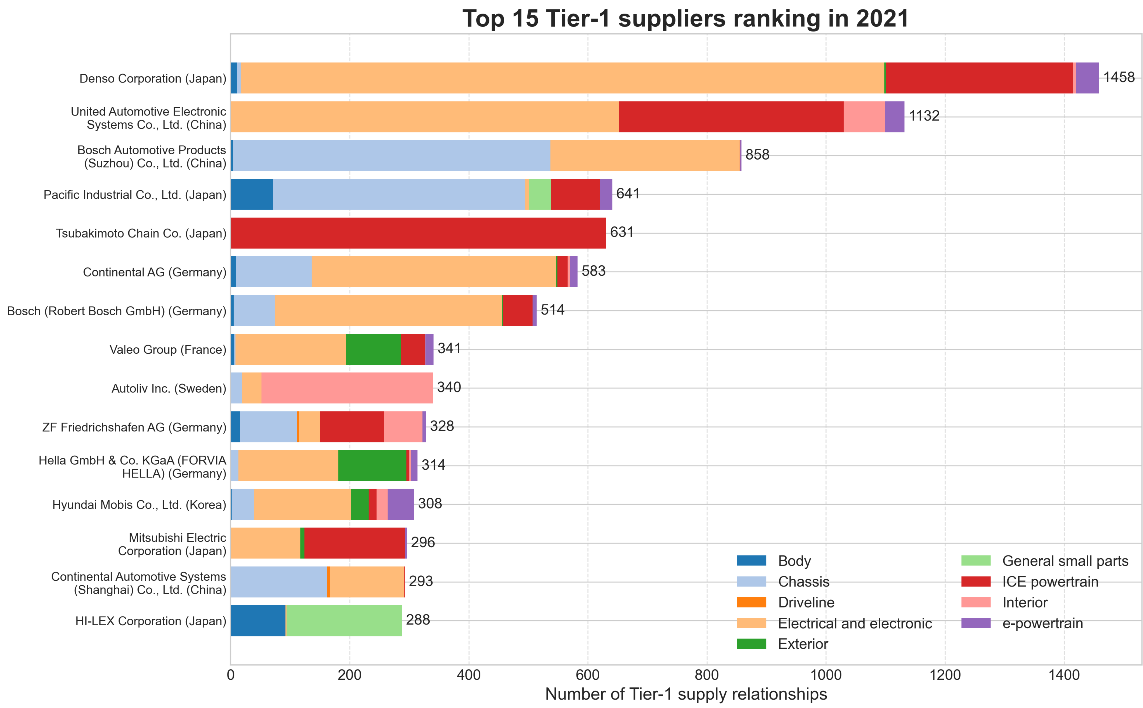

Figure 7: Top 15 Tier-1 suppliers ranking in 2021 based on the total number of supply relationships. The stacked bars illustrate the component portfolio for each supplier, indicating their primary areas of business.

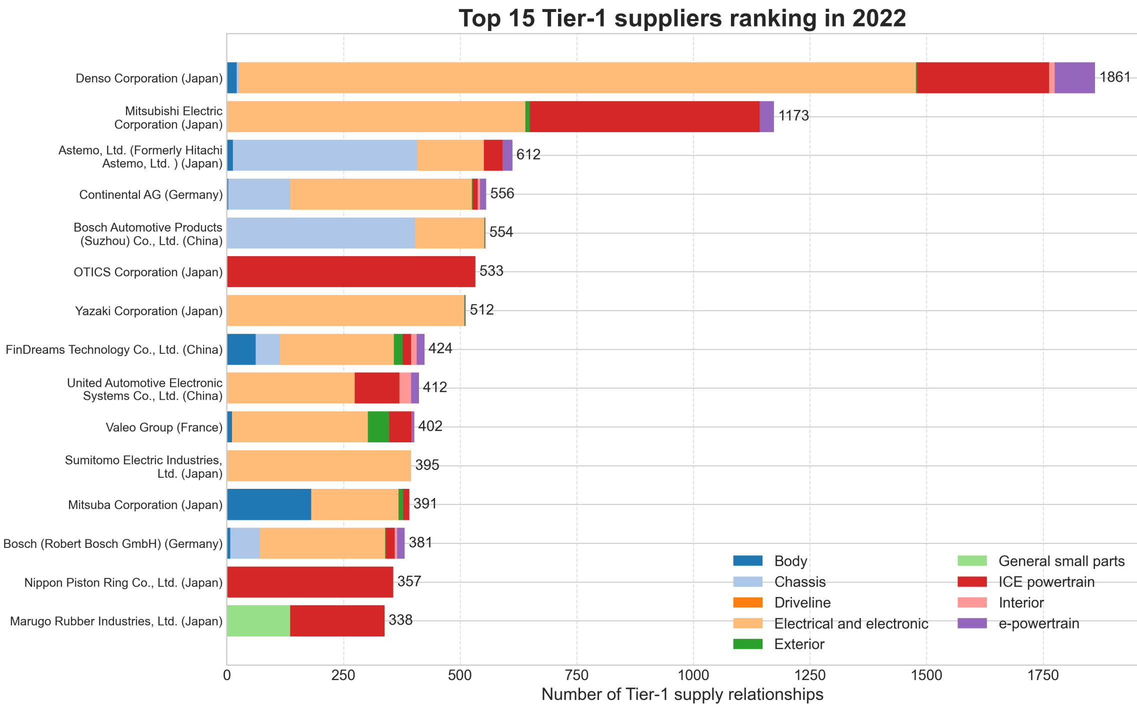

Figure 8: Top 15 Tier-1 suppliers ranking in 2022 based on the total number of supply relationships. The stacked bars illustrate the component portfolio for each supplier, indicating their primary areas of business.

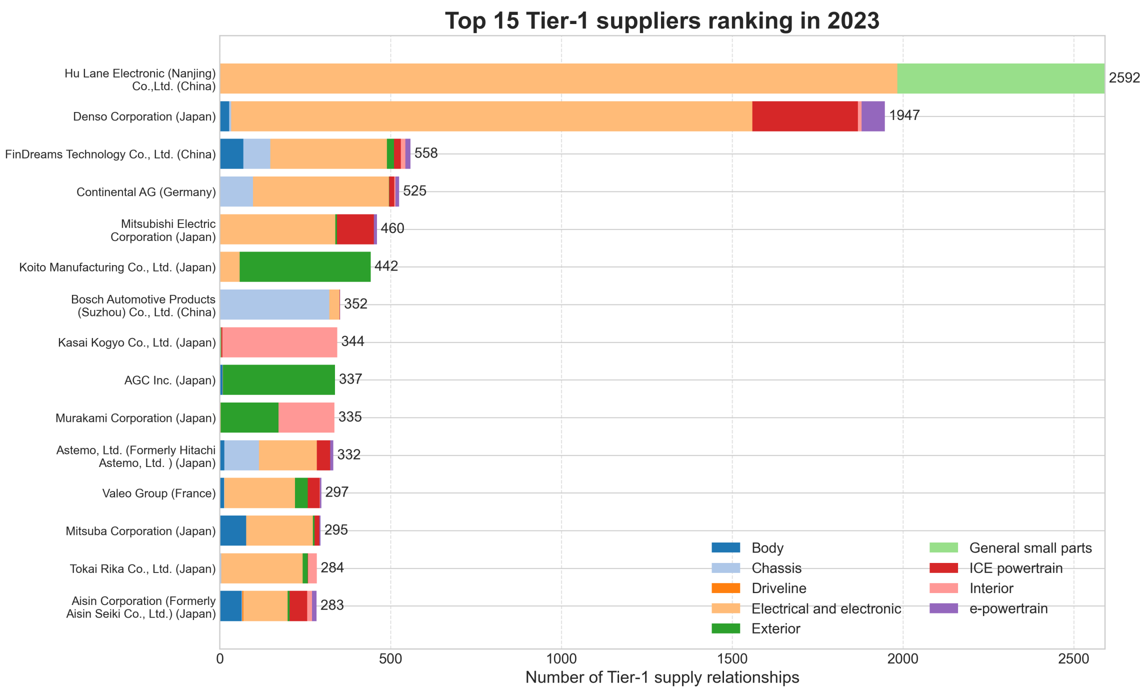

Figure 9: Top 15 Tier-1 suppliers ranking in 2023 based on the total number of supply relationships. The stacked bars illustrate the component portfolio for each supplier, indicating their primary areas of business.

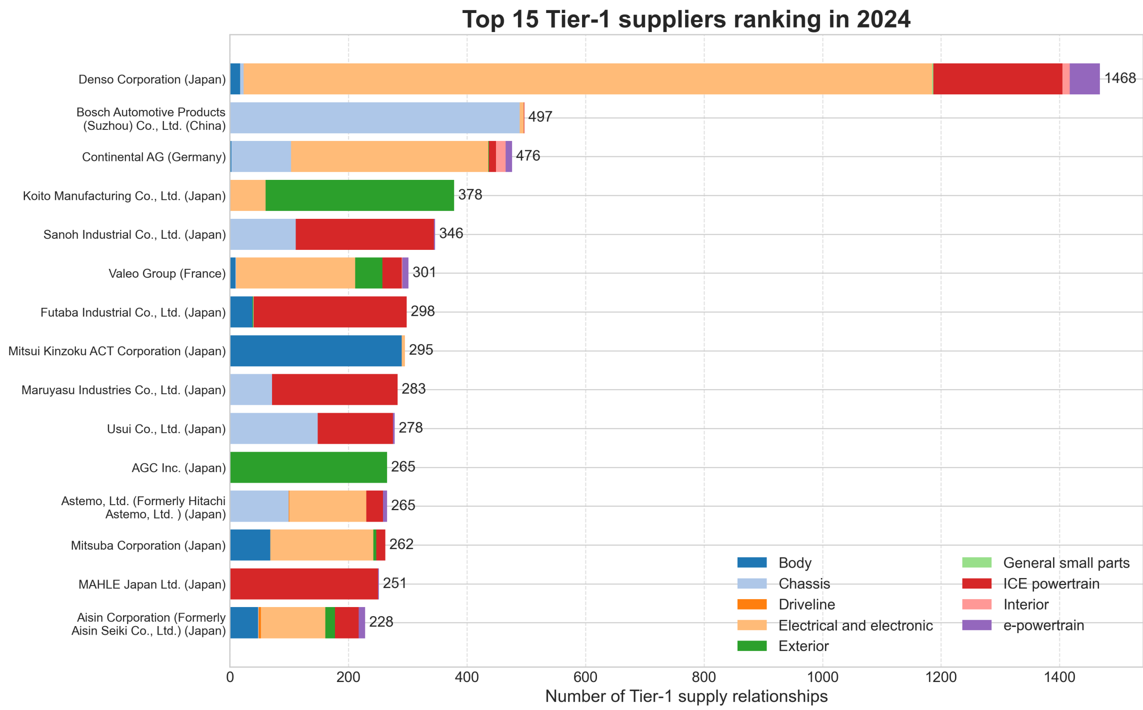

Figure 10: Top 15 Tier-1 suppliers ranking in 2024 based on the total number of supply relationships. The stacked bars illustrate the component portfolio for each supplier, indicating their primary areas of business.

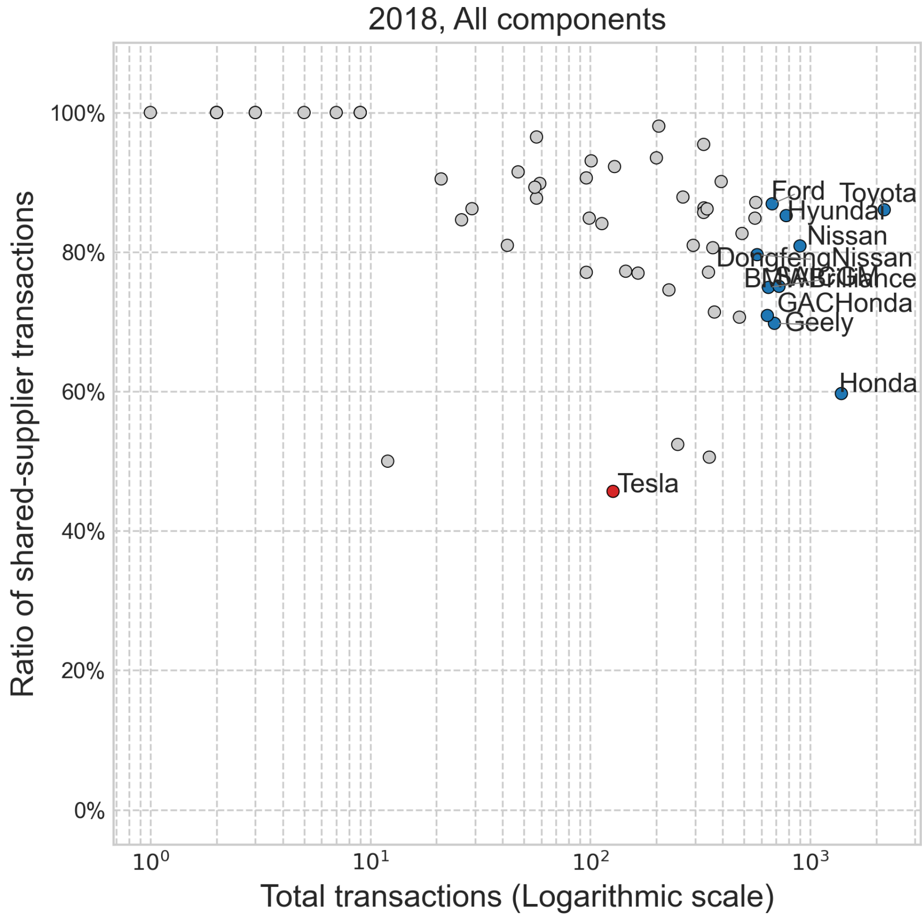

Figure 11: Scatter plot of OEM procurement strategies for all components in 2018. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

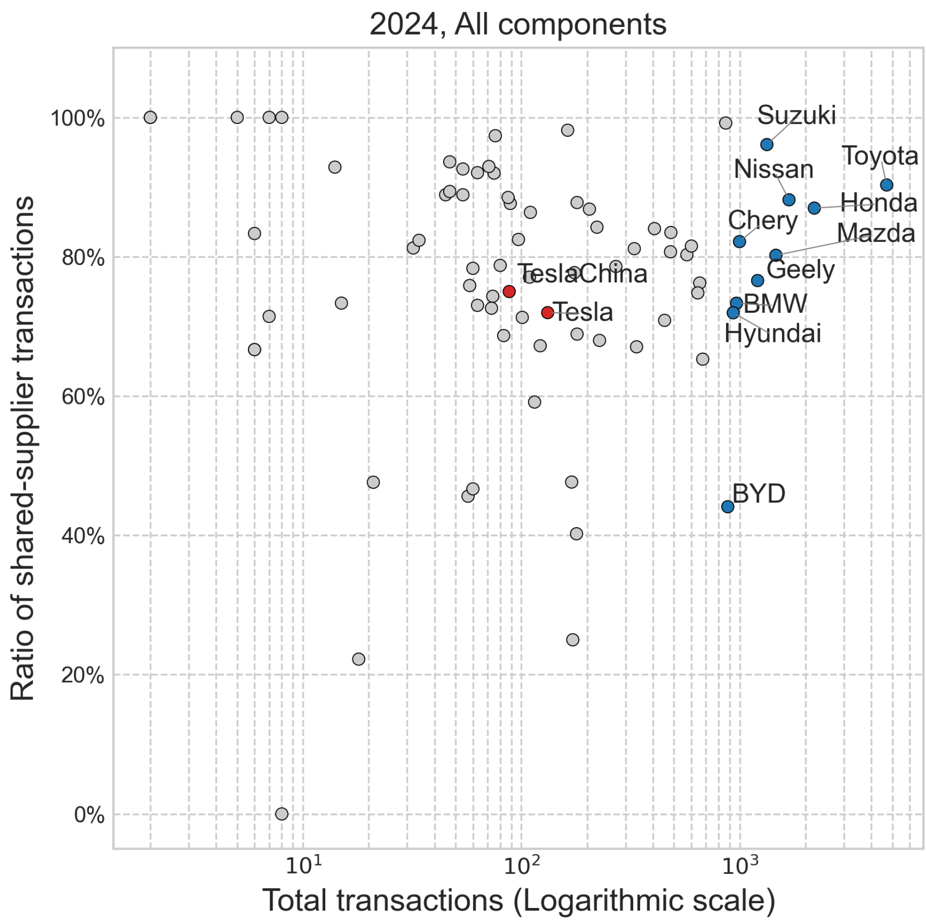

Figure 12: Scatter plot of OEM procurement strategies for all components in 2024. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

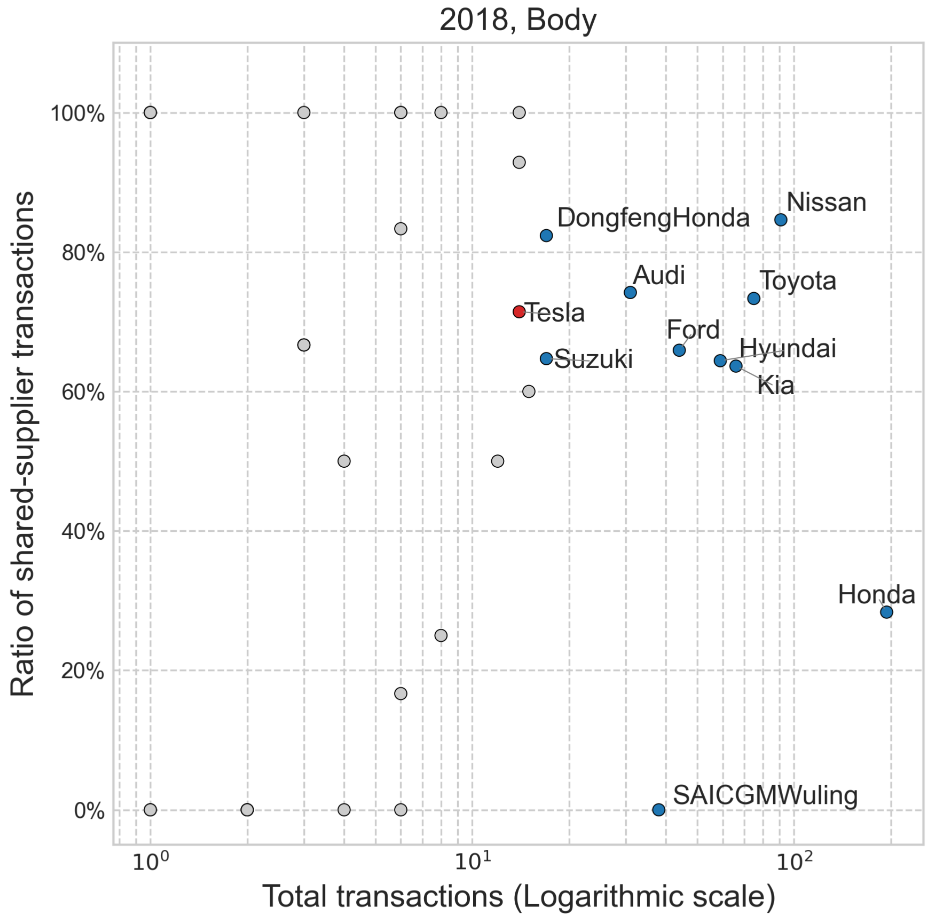

Figure 13: Scatter plot of OEM procurement strategies for body components in 2018. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

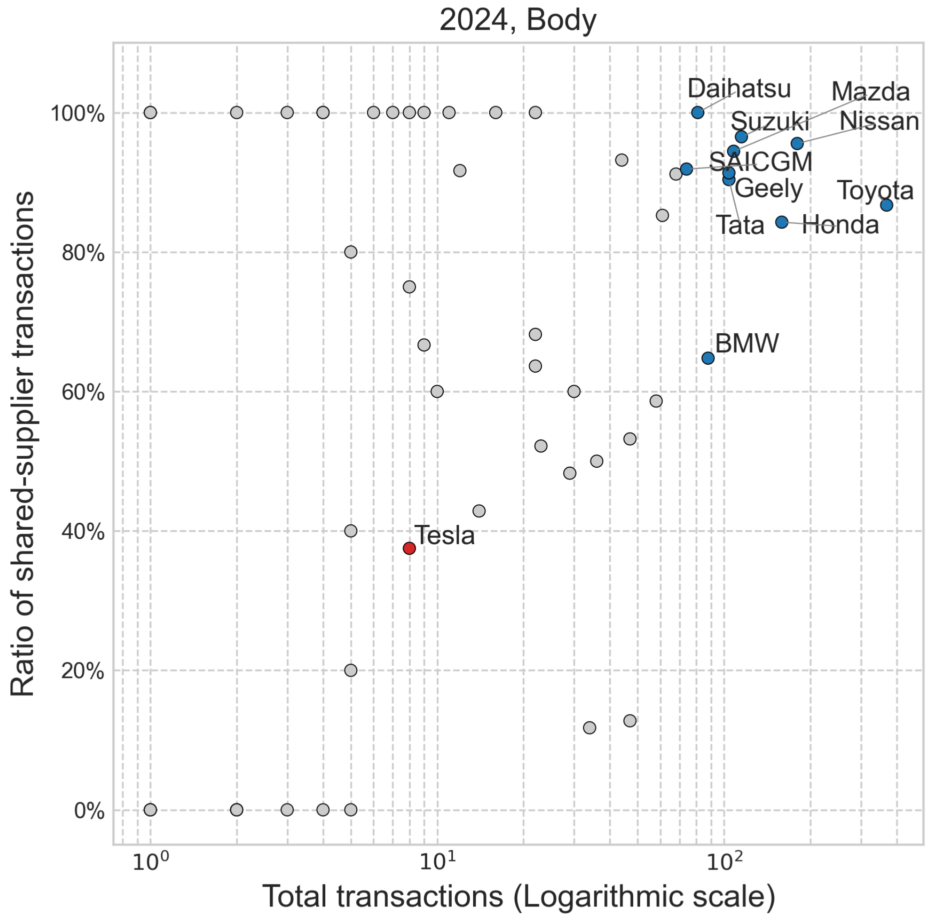

Figure 14: Scatter plot of OEM procurement strategies for body components in 2024. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

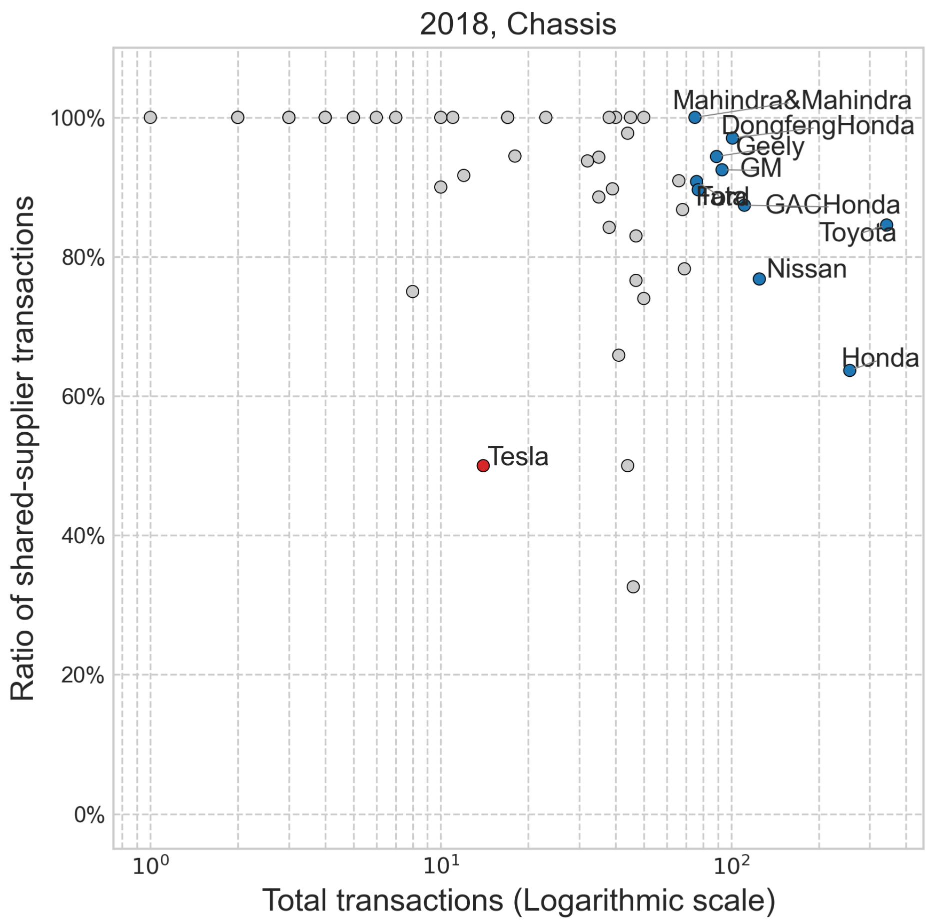

Figure 15: Scatter plot of OEM procurement strategies for Chassis components in 2018. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

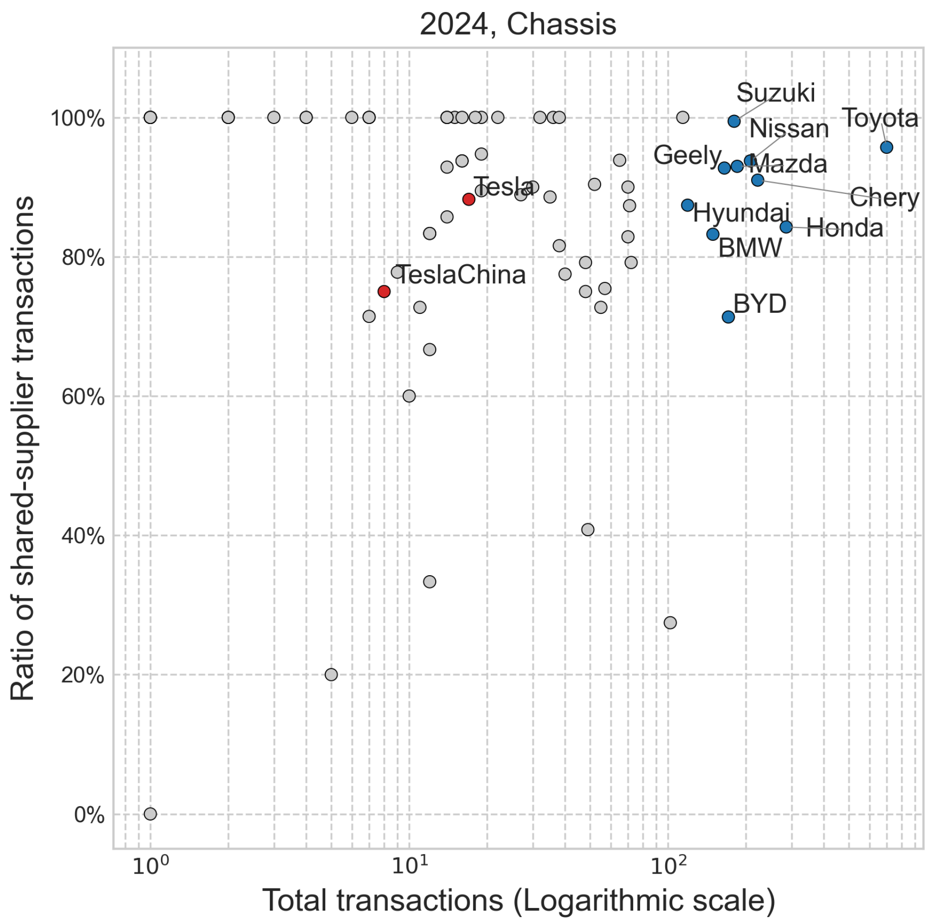

Figure 16: Scatter plot of OEM procurement strategies for Chassis components in 2024. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

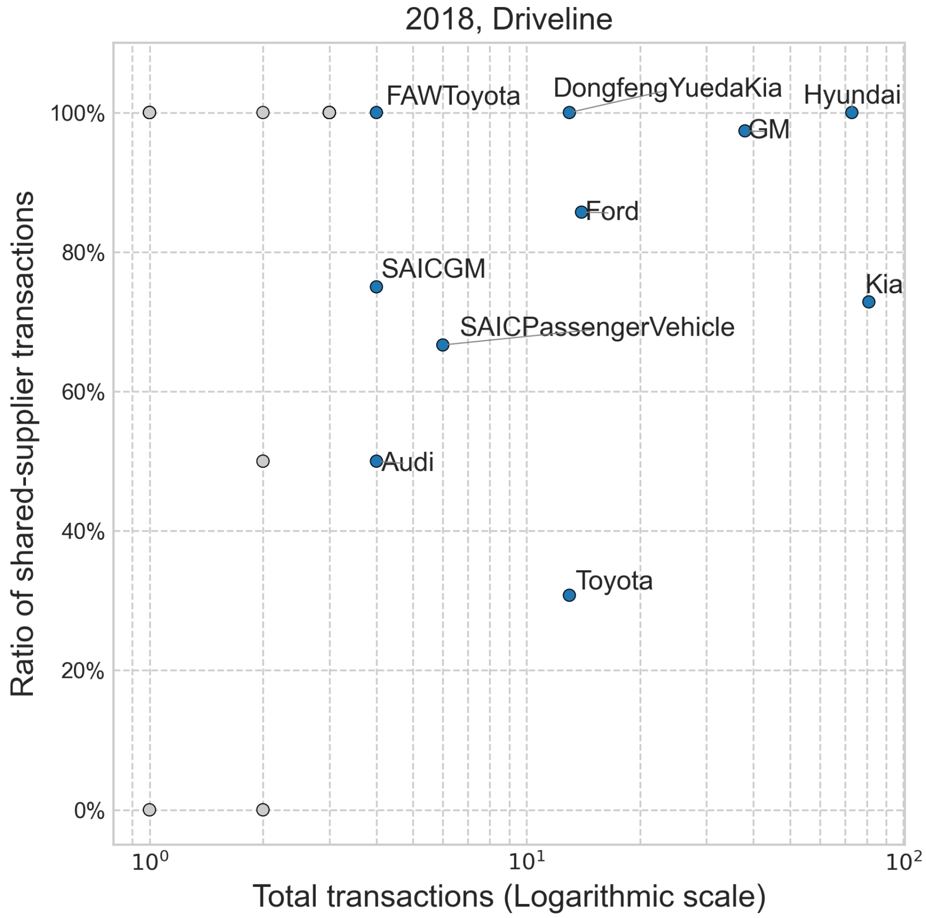

Figure 17: Scatter plot of OEM procurement strategies for Driveline components in 2018. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

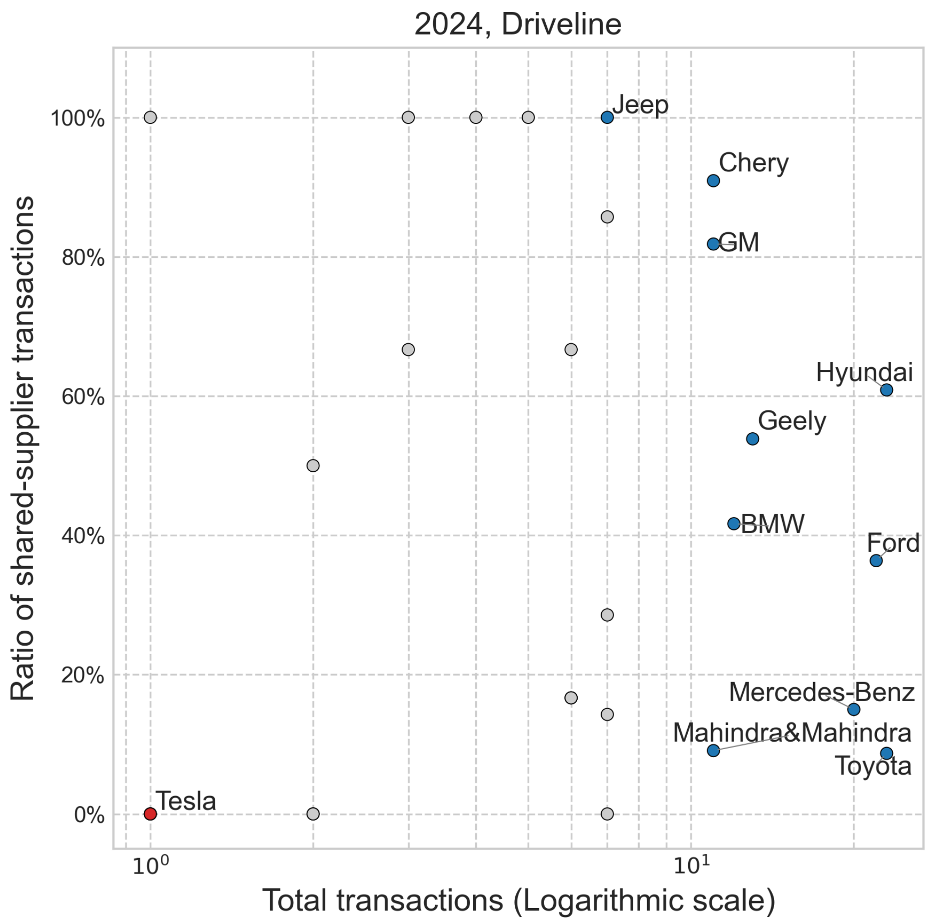

Figure 18: Scatter plot of OEM procurement strategies for Driveline components in 2024. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

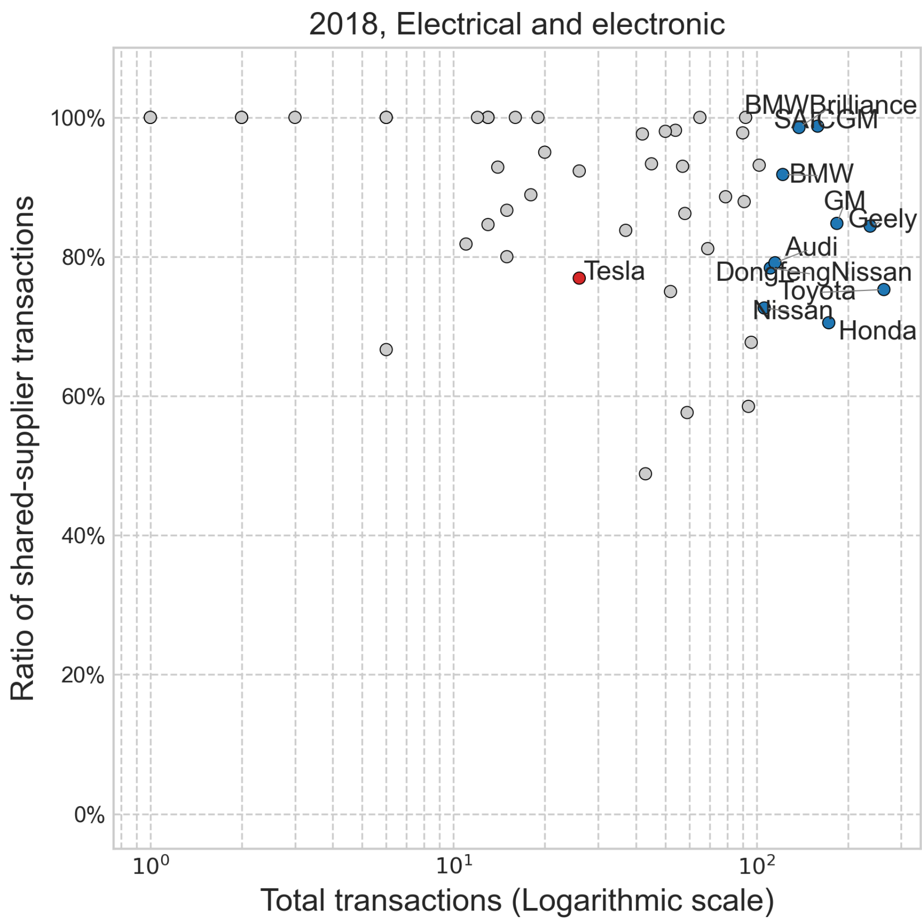

Figure 19: Scatter plot of OEM procurement strategies for Electrical and electronic components in 2018. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

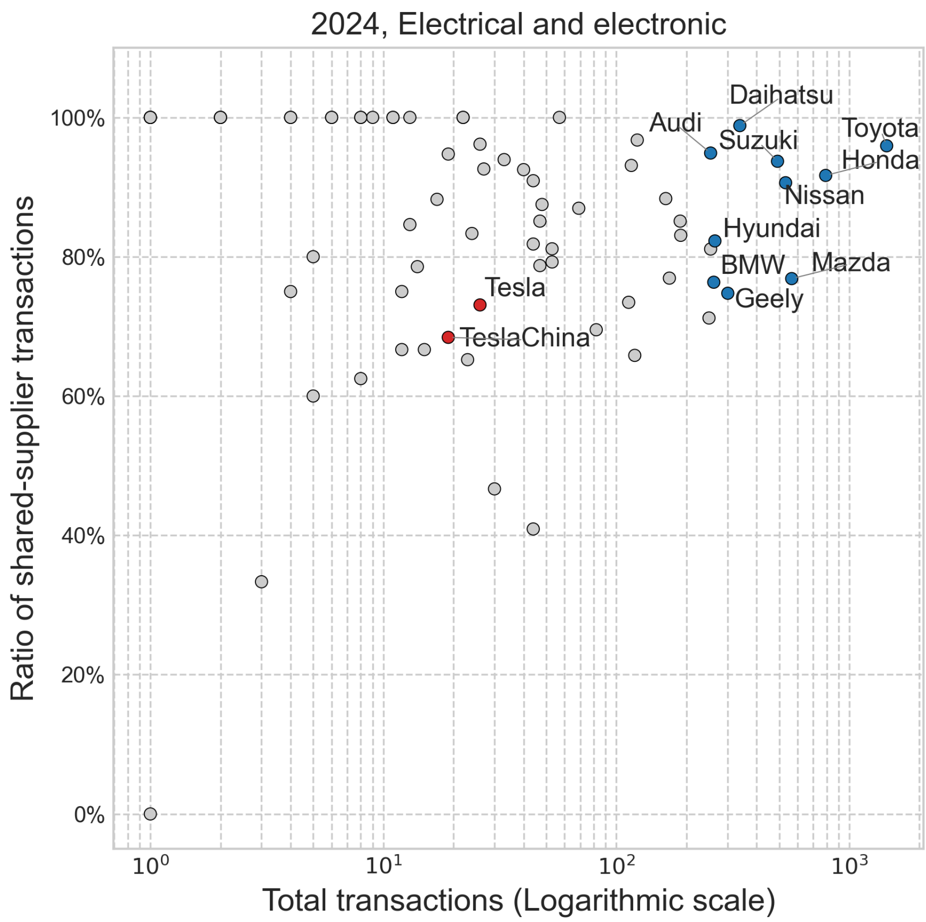

Figure 20: Scatter plot of OEM procurement strategies for Electrical and electronic components in 2024. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

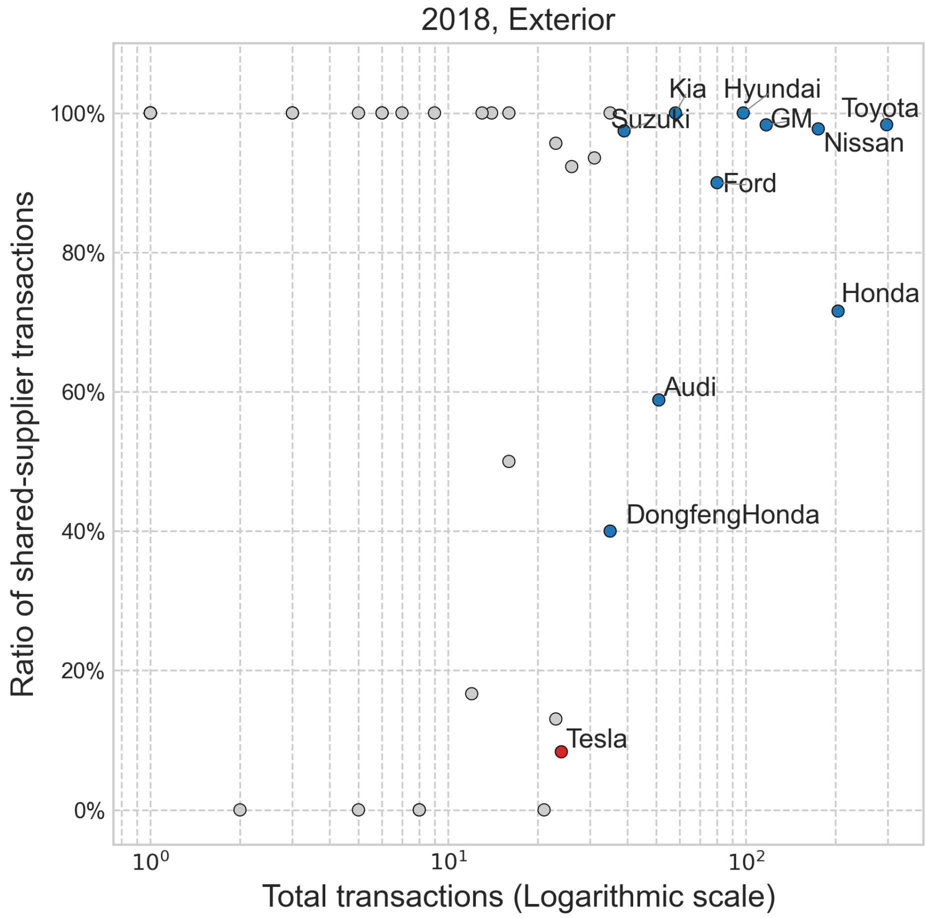

Figure 21: Scatter plot of OEM procurement strategies for Exterior components in 2018. The horizontal axis represents the total number of supplier transactions on a logarithmic scale, while the vertical axis shows the ratio of transactions involving shared suppliers. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

Figure 22: Scatter plot of OEM procurement strategies for Exterior components in 2024. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

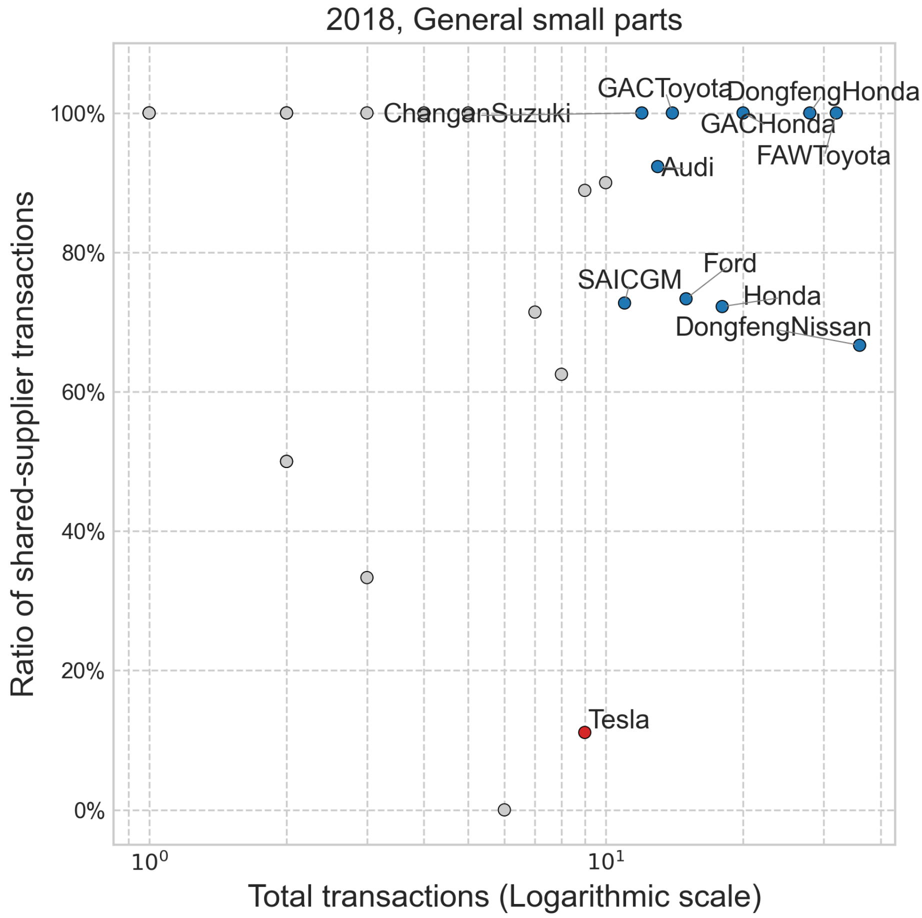

Figure 23: Scatter plot of OEM procurement strategies for General small parts components in 2018. The horizontal axis represents the total number of supplier transactions on a logarithmic scale, while the vertical axis shows the ratio of transactions involving shared suppliers. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

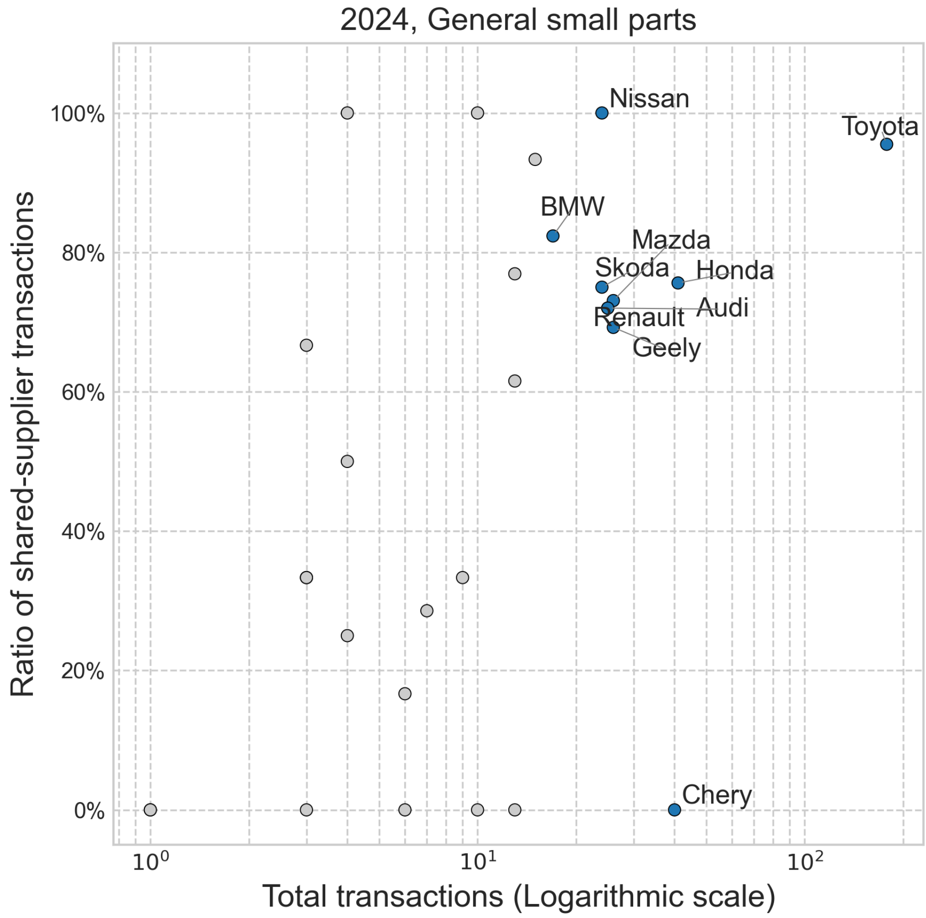

Figure 24: Scatter plot of OEM procurement strategies for General small parts components in 2024. The horizontal axis represents the total number of supplier transactions on a logarithmic scale, while the vertical axis shows the ratio of transactions involving shared suppliers. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

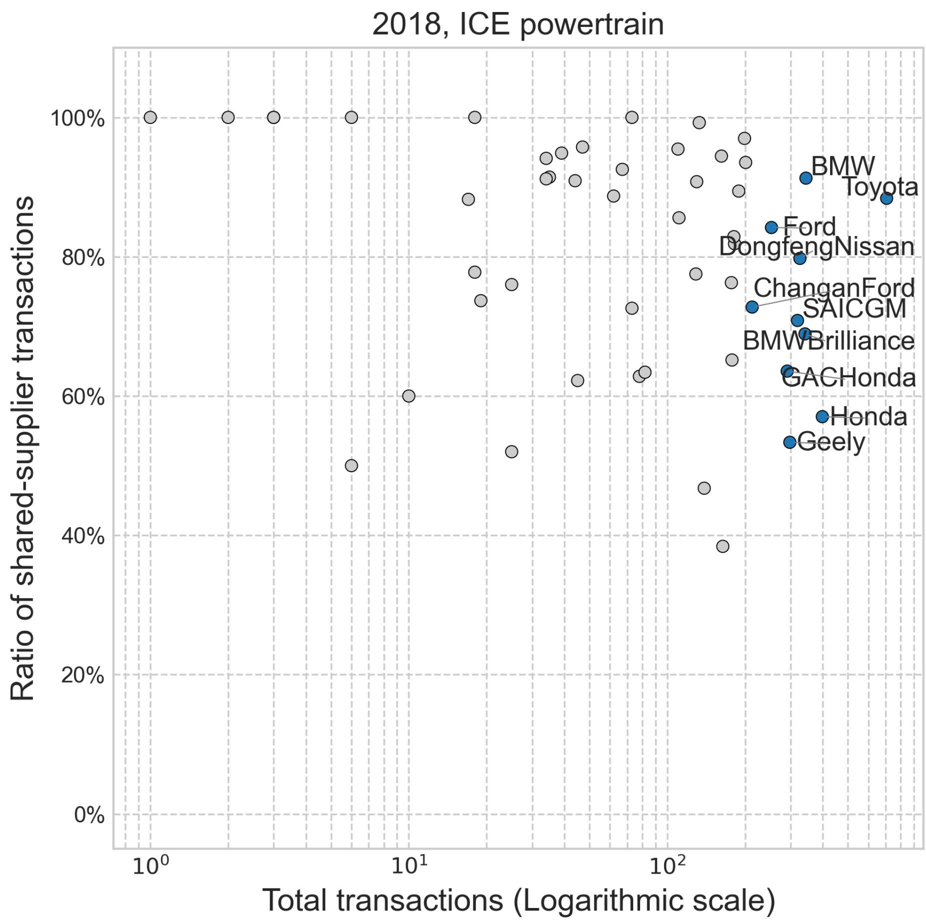

Figure 25: Scatter plot of OEM procurement strategies for ICE powertrain components in 2018. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

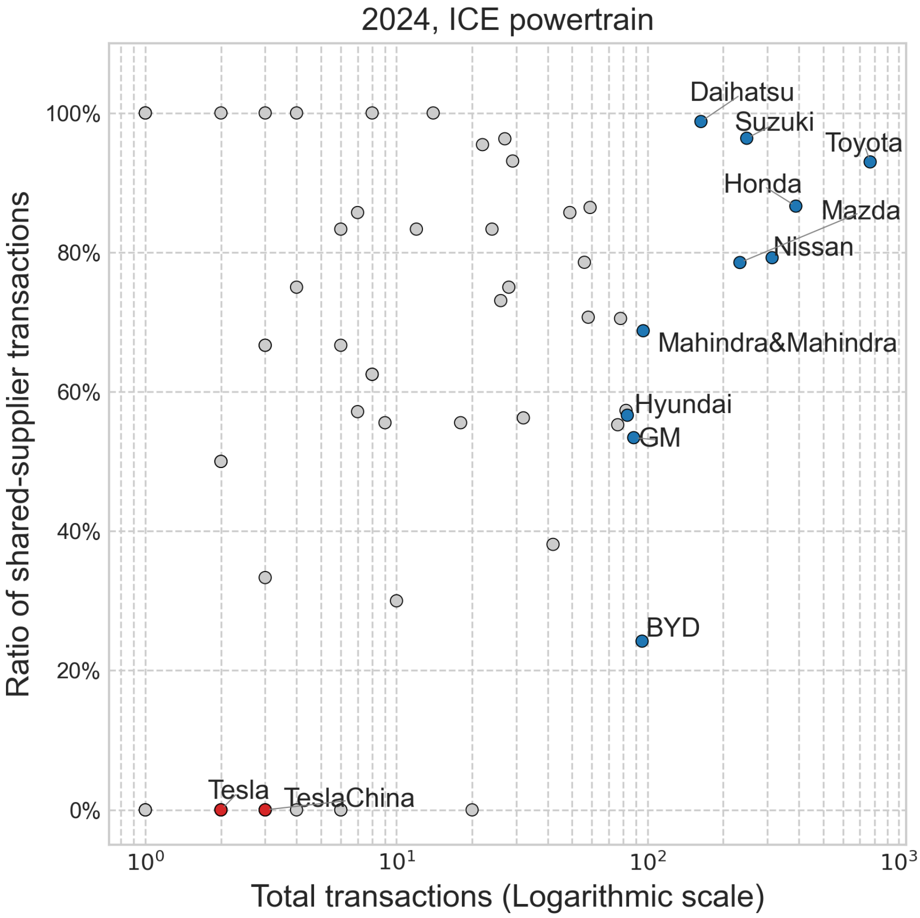

Figure 26: Scatter plot of OEM procurement strategies for ICE powertrain components in 2024. The horizontal axis represents the total number of supplier transactions on a logarithmic scale, while the vertical axis shows the ratio of transactions involving shared suppliers. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

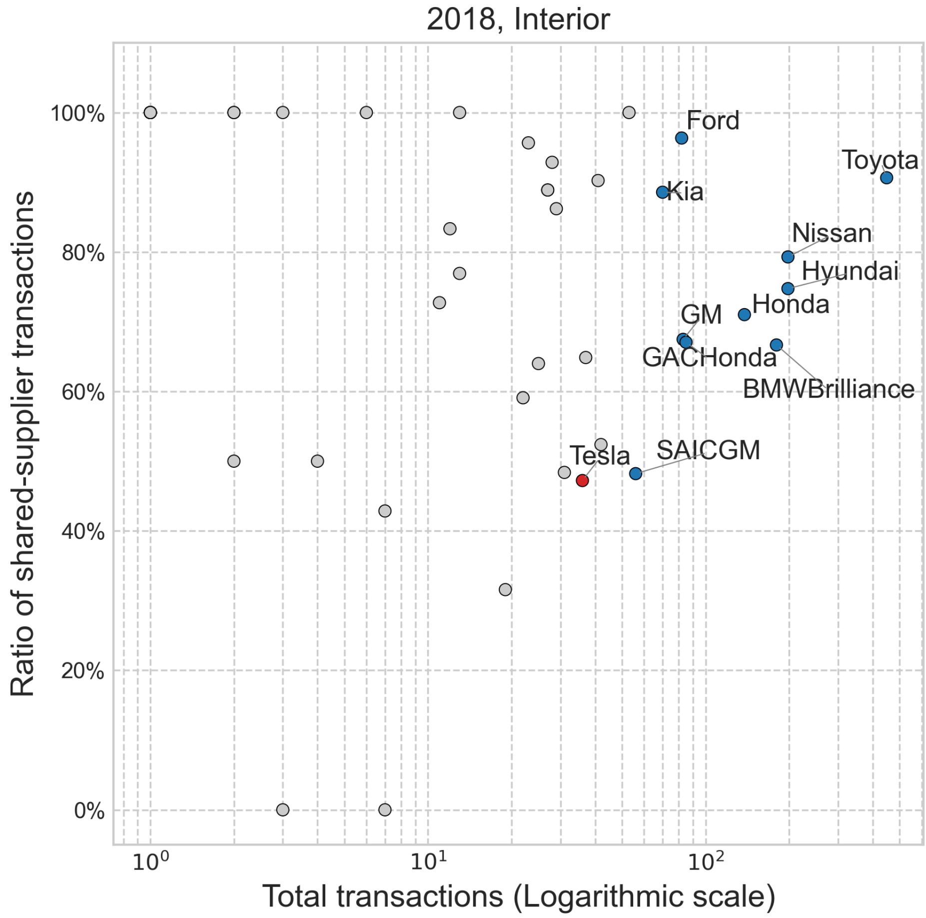

Figure 27: Scatter plot of OEM procurement strategies for Interior components in 2018. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

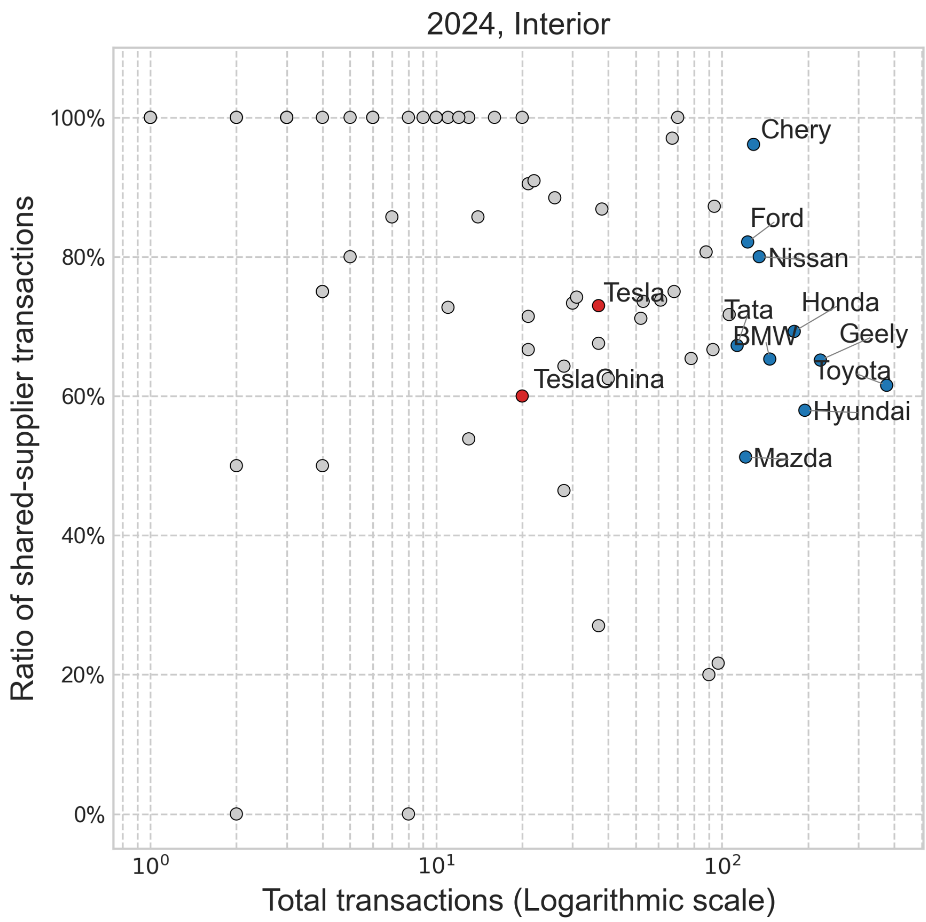

Figure 28: Scatter plot of OEM procurement strategies for Interior components in 2024. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

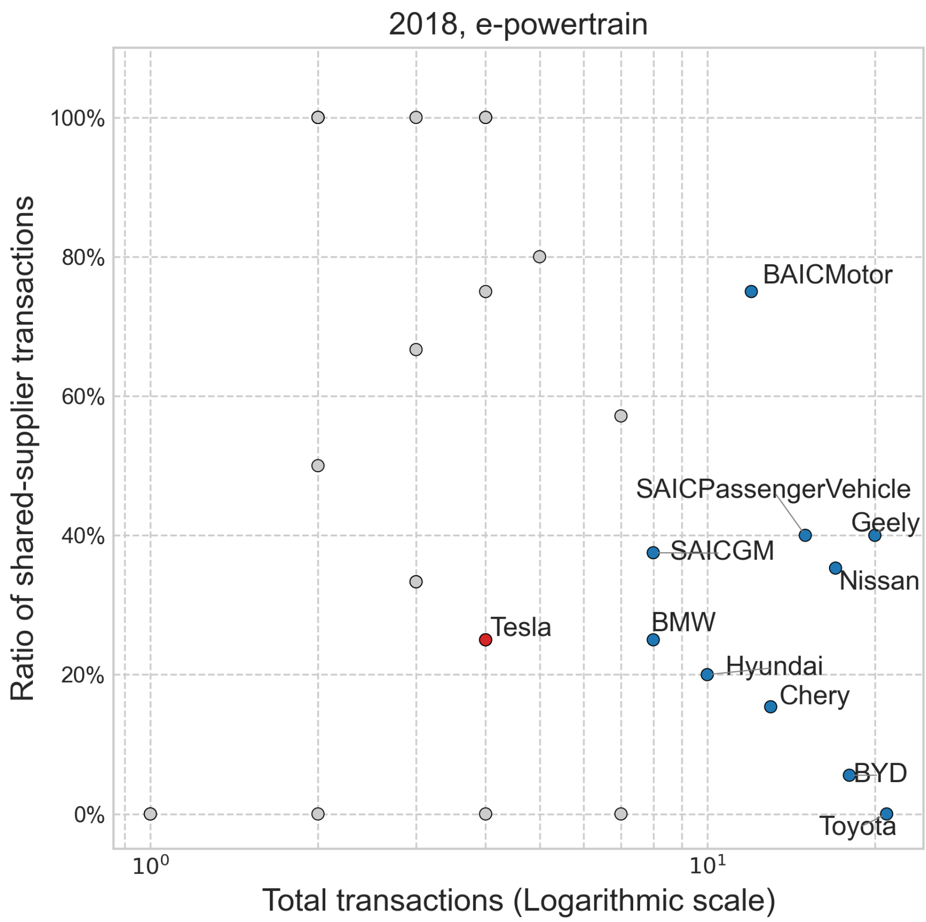

Figure 29: Scatter plot of OEM procurement strategies for e-powertrain components in 2018. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

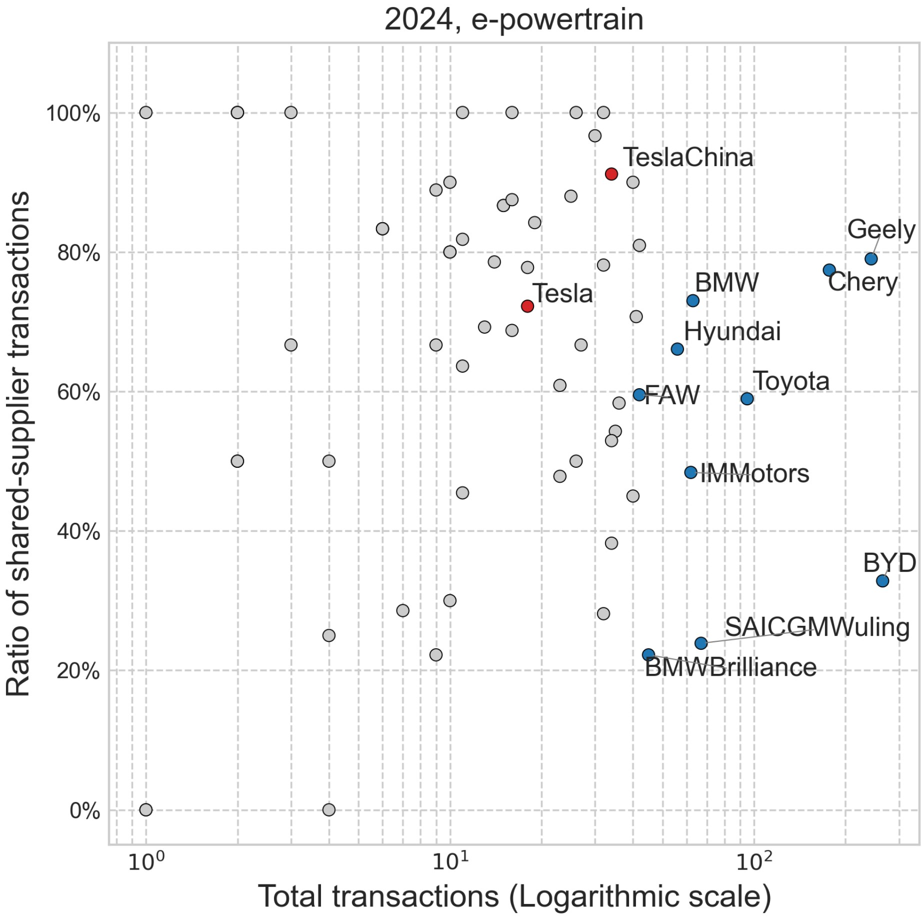

Figure 30: Scatter plot of OEM procurement strategies for e-powertrain components in 2024. OEMs are color-coded: the top 10 by total transaction volume are shown in blue, the Tesla group (Tesla, Tesla China) in red, and all other OEMs in gray.

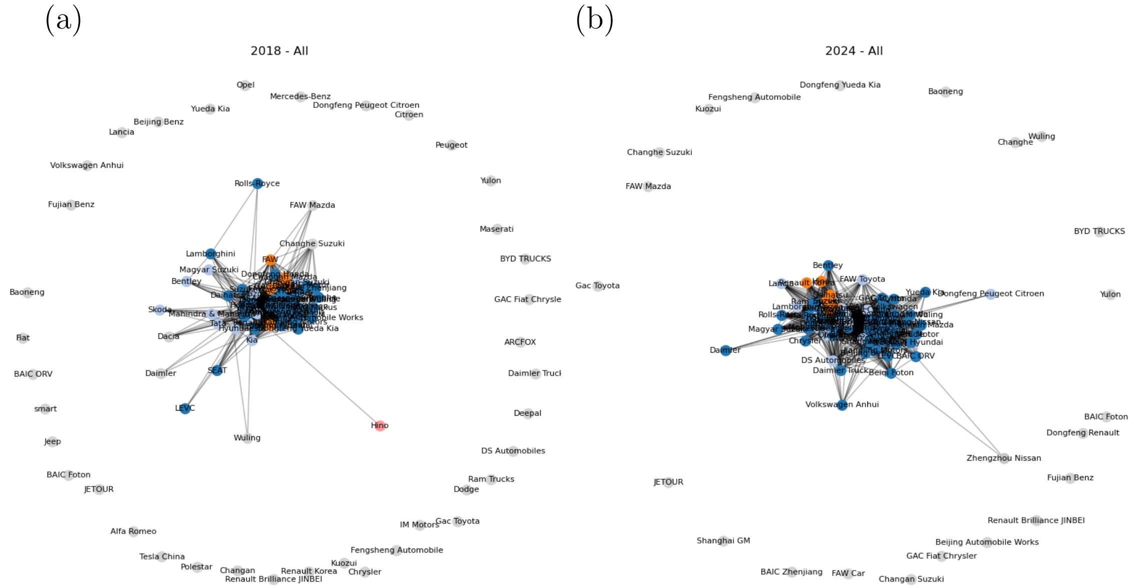

Figure 31: Interdependency networks among OEMs for all components in 2018 (a) and 2024 (b). Nodes represent OEMs, and edges indicate the presence of at least one shared Tier-1 supplier. Colors correspond to the community extraction results presented in Tables 3 (a) and 4 (b), respectively.

(a) (b)

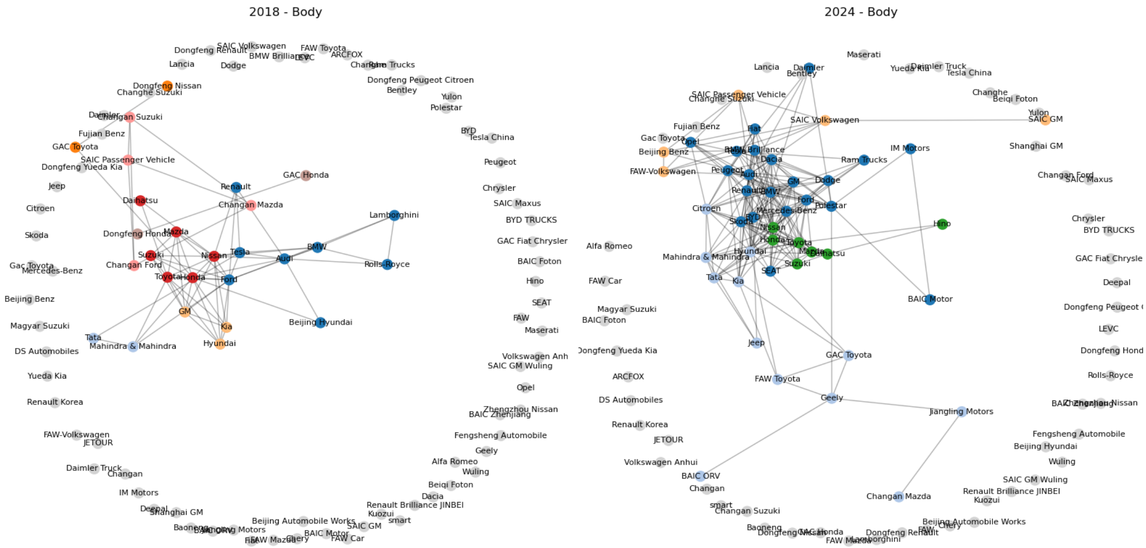

Figure 32: Interdependency networks among OEMs for body components in 2018 (a) and 2024 (b). Nodes represent OEMs, and edges indicate the presence of at least one shared Tier-1 supplier. Colors correspond to the community extraction results presented in Tables 5 (a and 14 (b), respectively.

Table 3: Community features for all components in 2018. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (26)	Nissan (484) Ford (462) Toyota (393) Honda (378) Audi (332)	Japan (0.31) Germany (0.27)	Japan (0.27)
2 (20)	SAIC GM (445) Geely (393) Changan Ford (319) FAW-Volkswagen (310) BMW Brilliance (301)	China (0.50) USA (0.25)	China (1.00)
3 (14)	Dongfeng Nissan (498) GAC Honda (331) FAW Toyota (273) GAC Toyota (258) FAW Car (246)	Japan (0.64) China (0.21)	China (0.93)

Table 4: Community features for all components in 2024. The table lists communities with a size of two or more. For Group HQ Country Ratio and Maker HQ Country Ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (36)	Polestar (553) Geely (534) Chery (464) BYD (362) SAIC GM (259)	China (0.42)	China (0.89)
2 (27)	BMW (1068) Audi (820) Mercedes-Benz (812) Renault (738) Skoda (719)	Germany (0.37) Netherlands (0.33)	–
3 (13)	Nissan (1335) Toyota (1211) Honda (1201) Mazda (883) GM (854)	Japan (0.54) USA (0.23) Netherlands (0.23)	Japan (0.54) USA (0.46)

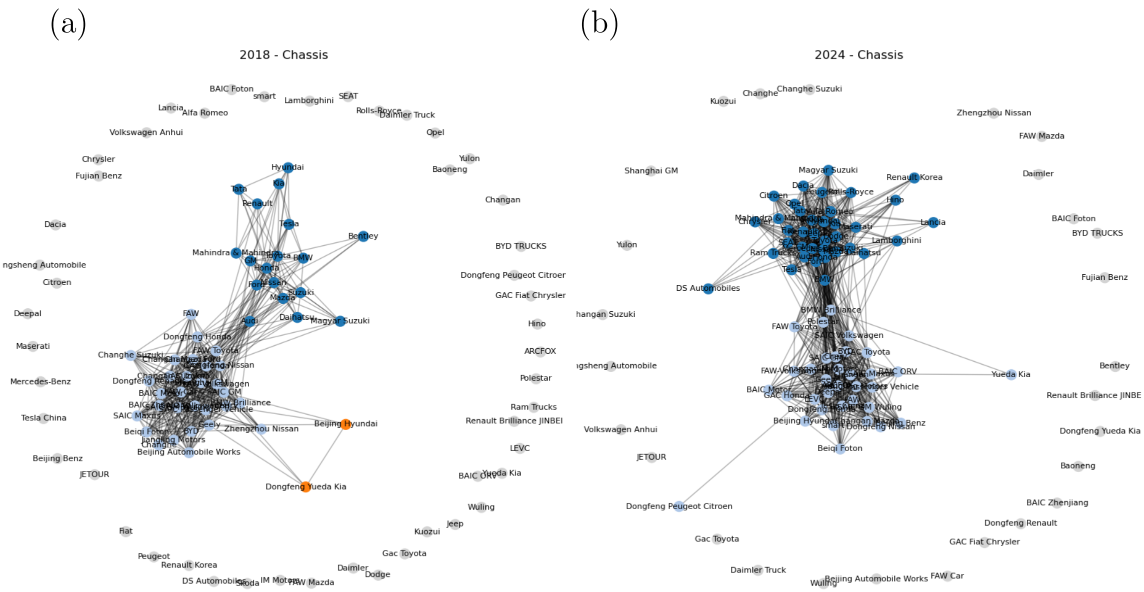

Figure 33: Interdependency networks among OEMs for chassis components in 2018 (a) and 2024 (b). Nodes represent OEMs, and edges indicate the presence of at least one shared Tier-1 supplier. Colors correspond to the community extraction results presented in Tables 6 (a) and 15 (b), respectively.

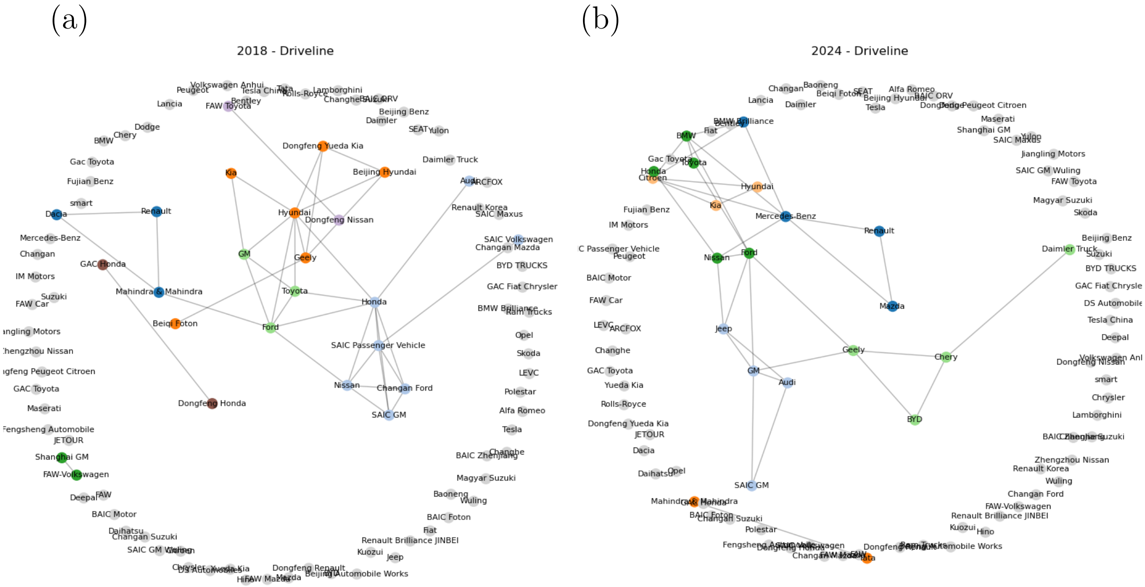

Figure 34: Interdependency networks among OEMs for Driveline components in 2018 (a) and 2024 (b). Nodes represent OEMs, and edges indicate the presence of at least one shared Tier-1 supplier. Colors correspond to the community extraction results presented in Tables 7 (a) and 16 (b), respectively.

(a) (b)

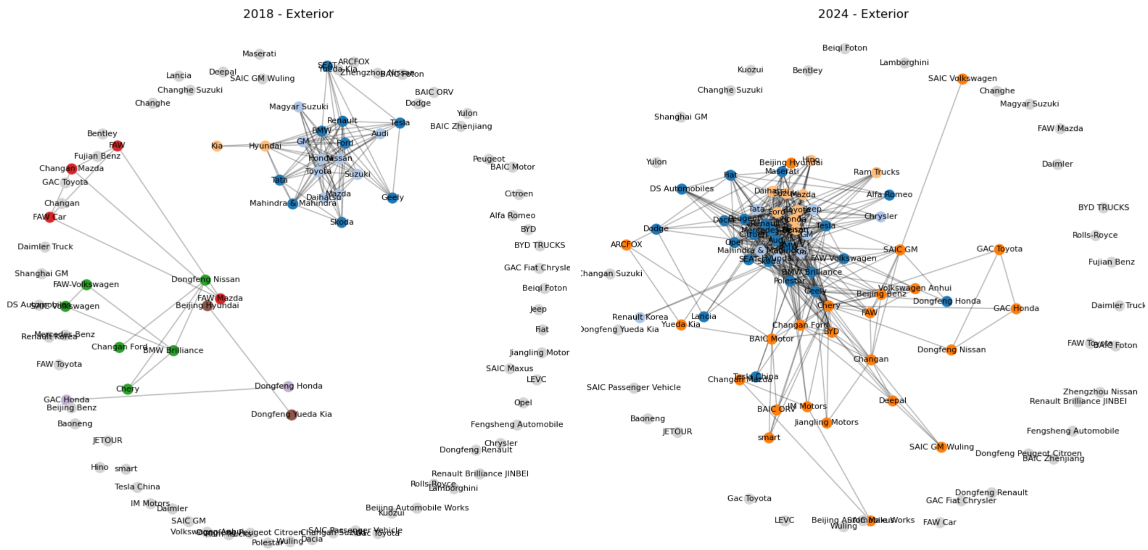

Figure 35: Interdependency networks among OEMs for Exterior components in 2018 (a) and 2024 (b). Nodes represent OEMs, and edges indicate the presence of at least one shared Tier-1 supplier. Colors correspond to the community extraction results presented in Tables 9 (a) and 18 (b), respectively.

(a) (b)

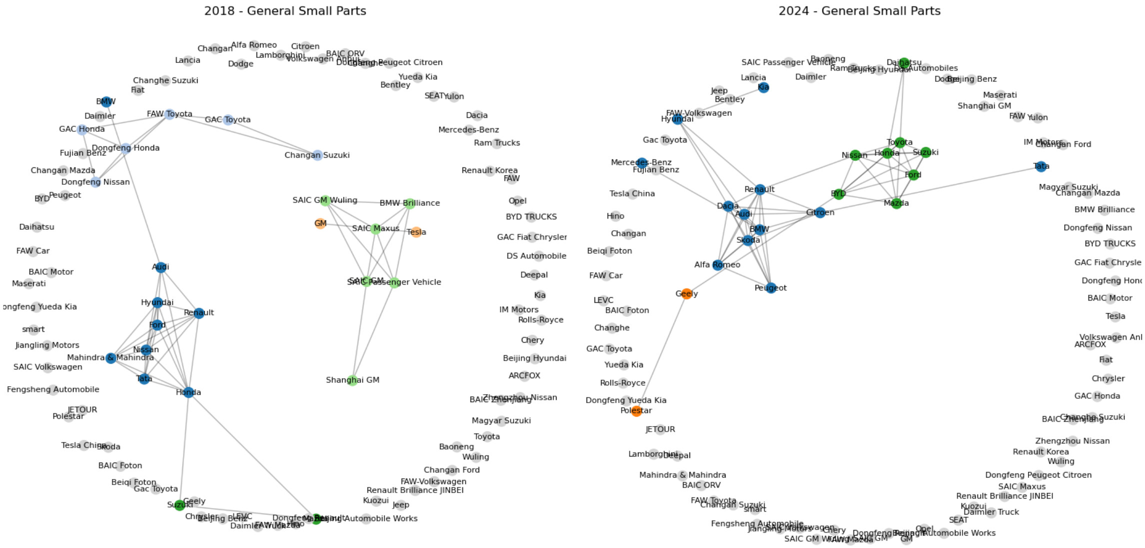

Figure 36: Interdependency networks among OEMs for general small parts components in 2018 (a) and 2024 (b). Nodes represent OEMs, and edges indicate the presence of at least one shared Tier-1 supplier. Colors correspond to the community extraction results presented in Tables 10 (a) and 19 (b), respectively.

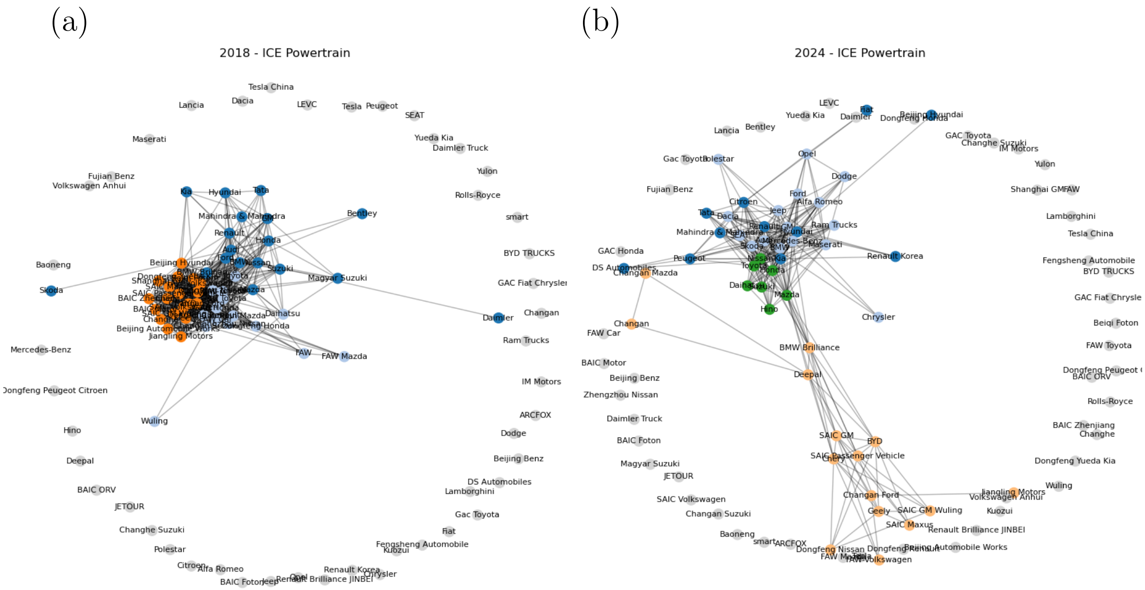

Figure 37: Interdependency networks among OEMs for ICE Powertrain components in 2018 (a) and 2024 (b). Nodes represent OEMs, and edges indicate the presence of at least one shared Tier-1 supplier. Colors correspond to the community extraction results presented in Tables 11 (a) and 20 (b), respectively.

(a) (b)

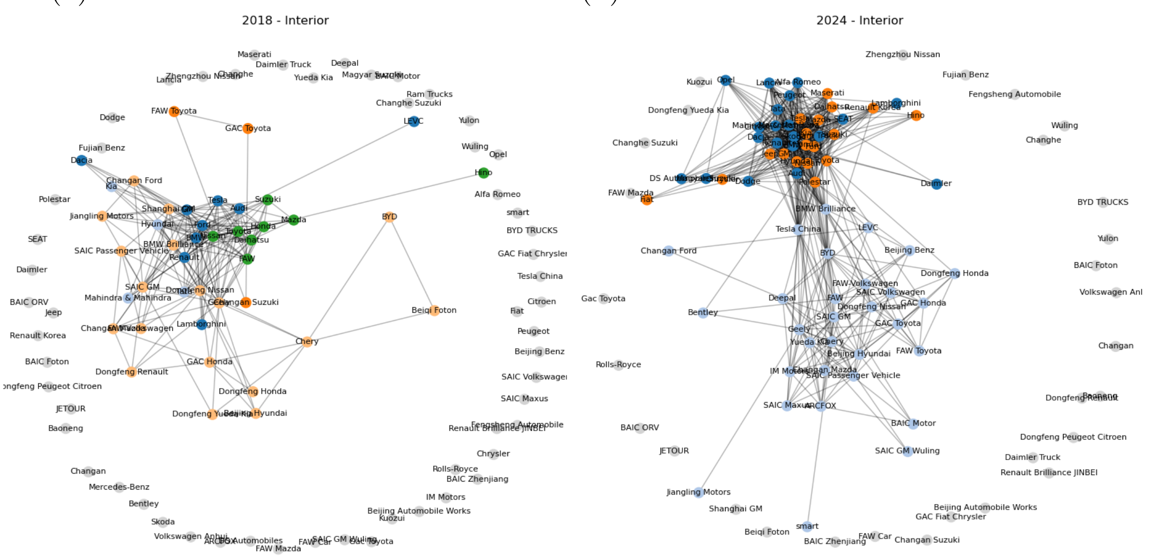

Figure 38: Interdependency networks among OEMs for Interior components in 2018 (a) and 2024 (b). Nodes represent OEMs, and edges indicate the presence of at least one shared Tier-1 supplier. Colors correspond to the community extraction results presented in Tables 12 (a) and 21 (b), respectively.

(a) (b)

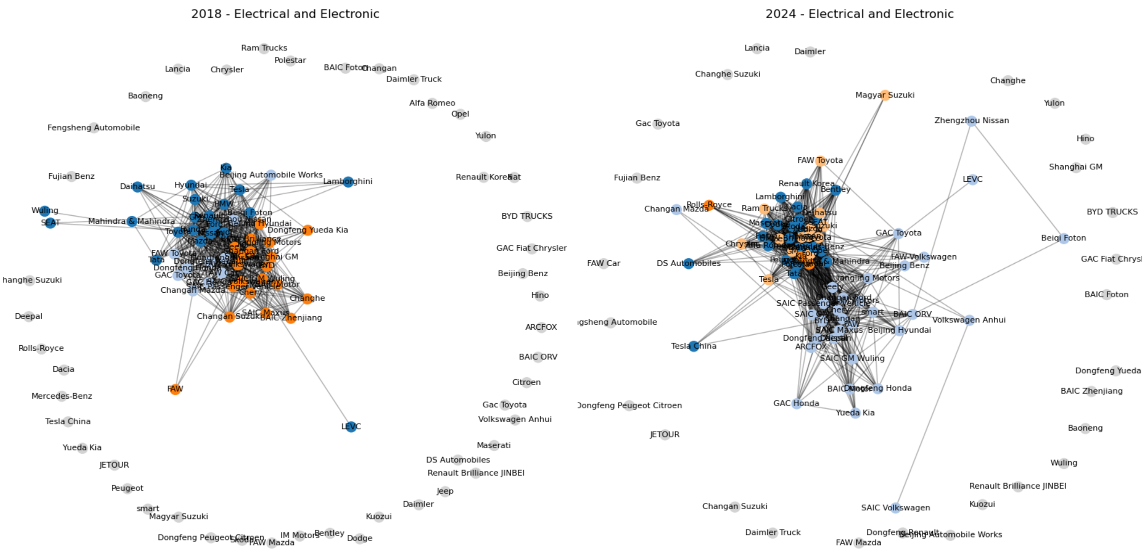

Figure 39: Interdependency networks among OEMs for electrical and electronic components in 2018 (a) and 2024 (b). Nodes represent OEMs, and edges indicate the presence of at least one shared Tier-1 supplier. Colors correspond to the community extraction results presented in Tables 8 (a) and 17 (b), respectively.

(a) (b)

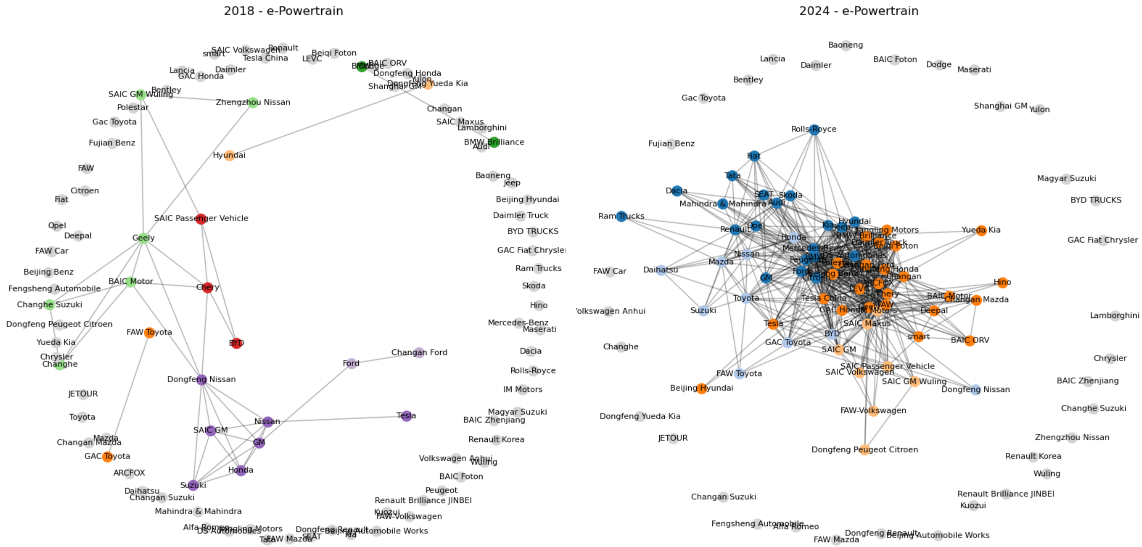

Figure 40: Interdependency networks among OEMs for e-powertrain components in 2018 (a) and 2024 (b). Nodes represent OEMs, and edges indicate the presence of at least one shared Tier-1 supplier. Colors correspond to the community extraction results presented in Tables 13 (a) and 22 (b), respectively.

Table 5: Community features for Body in 2018. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (8)	Ford (26) Audi (22) BMW (11) Tesla (10) Renault (5)	Germany (0.50) USA (0.25)	Germany (0.25) USA (0.25)
2 (6)	Nissan (25) Toyota (19) Honda (18) Mazda (8) Suzuki (7)	Japan (1.00)	Japan (1.00)
3 (4)	SAIC Passenger Vehicle (3) Changan Mazda (3) Changan Ford (3) Changan Suzuki (3)	Japan (0.50) China (0.25) USA (0.25)	China (1.00)
4 (3)	Hyundai (14) GM (14) Kia (14)	South Korea (0.67) USA (0.33)	South Korea (0.67) USA (0.33)
5 (2)	GAC Toyota (2) Dongfeng Nissan (1)	Japan (1.00)	China (1.00)
6 (2)	Mahindra & Mahindra (5) Tata (3)	India (1.00)	India (1.00)
7 (2)	GAC Honda (1) Dongfeng Honda (1)	Japan (1.00)	China (1.00)

Table 6: Community features for Chassis in 2018. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (30)	GAC Honda (72) SAIC GM (71) FAW Toyota (65) Dongfeng Nissan (65) FAW Car (61)	China (0.43) Japan (0.27)	China (1.00)
2 (18)	Nissan (68) Toyota (59) Honda (59) Ford (55) Mazda (36)	Japan (0.39)	Japan (0.33)
3 (2)	Beijing Hyundai (5) Dongfeng Yueda Kia (5)	South Korea (1.00)	China (1.00)

Table 7: Community features for Driveline in 2018. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (7)	Honda (8) Nissan (5) SAIC Passenger Vehicle (5) SAIC GM (4) Changan Ford (4)	Germany (0.29) Japan (0.29) USA (0.29)	China (0.57) Japan (0.29)
2 (6)	Hyundai (11) Geely (4) Kia (4) Dongfeng Yueda Kia (4) Beijing Hyundai (3)	South Korea (0.67) China (0.33)	China (0.67) South Korea (0.33)
3 (3)	Mahindra & Mahindra (3) Renault (2) Dacia (2)	France (0.67) India (0.33)	France (0.33) India (0.33) Romania (0.33)
4 (3)	Ford (8) Toyota (5) GM (5)	USA (0.67) Japan (0.33)	USA (0.67) Japan (0.33)
5 (2)	GAC Honda (1) Dongfeng Honda (1)	Japan (1.00)	China (1.00)
6 (2)	Dongfeng Nissan (1) FAW Toyota (1)	Japan (1.00)	China (1.00)
7 (2)	FAW-Volkswagen (1) Shanghai GM (1)	Germany (0.50) USA (0.50)	China (1.00)

Table 8: Community features for Electrical and electronic in 2018. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (21)	Nissan (128) Ford (118) Honda (114) Audi (101) BMW (81)	Japan (0.29)	Japan (0.29)
2 (20)	Geely (152) SAIC GM (131) Changan Ford (108) FAW-Volkswagen (98) SAIC GM Wuling (74)	China (0.45) USA (0.25)	China (1.00)
3 (10)	Dongfeng Nissan (134) GAC Honda (71) FAW Car (69) Dongfeng Renault (59) FAW Toyota (56)	Japan (0.70) China (0.20)	China (1.00)

Table 9: Community features for Exterior in 2018. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (9)	Honda (70) Nissan (61) Toyota (49) Mazda (35) GM (30)	Japan (0.78)	Japan (0.67)
2 (9)	Ford (30) BMW (21) Renault (19) Mahindra & Mahindra (13) Tata (13)	Germany (0.33) India (0.22) USA (0.22)	India (0.22) USA (0.22)
3 (6)	BMW Brilliance (4) Dongfeng Nissan (3) Chery (2) FAW-Volkswagen (2) SAIC Volkswagen (2)	Germany (0.50)	China (1.00)
4 (4)	FAW (3) Changan Mazda (3) FAW Car (3) FAW Mazda (3)	China (0.50) Japan (0.50)	China (1.00)
5 (2)	Hyundai (22) Kia (9)	South Korea (1.00)	South Korea (1.00)
6 (2)	GAC Honda (1) Dongfeng Honda (1)	Japan (1.00)	China (1.00)
7 (2)	Beijing Hyundai (1) Dongfeng Yueda Kia (1)	South Korea (1.00)	China (1.00)

Table 10: Community features for General small parts in 2018. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (9)	Ford (14) Honda (11) Audi (9) Nissan (9) Renault (8)	Germany (0.22) India (0.22) Japan (0.22)	Germany (0.22) India (0.22) Japan (0.22)
2 (6)	GAC Honda (5) FAW Toyota (5) Dongfeng Honda (5) Dongfeng Nissan (3) GAC Toyota (2)	Japan (1.00)	China (1.00)
3 (6)	SAIC Passenger Vehicle (6) SAIC GM (6) SAIC Maxus (4) SAIC GM Wuling (4) BMW Brilliance (4)	USA (0.50) China (0.33)	China (1.00)
4 (2)	Mazda (2) Suzuki (2)	Japan (1.00)	Japan (1.00)
5 (2)	GM (1) Tesla (1)	USA (1.00)	USA (1.00)

Table 11: Community features for ICE powertrain in 2018. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (19)	SAIC GM (202) FAW-Volkswagen (146) SAIC Passenger Vehicle (146) SAIC Volkswagen (143) Changan Ford (140)	China (0.53) USA (0.26)	China (1.00)
2 (18)	Ford (145) BMW Brilliance (141) Nissan (121) Audi (107) BMW (105)	Germany (0.33) Japan (0.28)	Japan (0.22)
3 (15)	Dongfeng Nissan (244) GAC Honda (159) GAC Toyota (158) FAW Toyota (155) Toyota (138)	Japan (0.73)	China (0.87)

Table 12: Community features for Interior in 2018. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (18)	Dongfeng Nissan (37) Geely (24) BMW Brilliance (20) SAIC GM (16) GAC Honda (15)	China (0.28) USA (0.22) Japan (0.22)	China (1.00)
2 (9)	Ford (60) GM (35) Audi (30) BMW (27) Tesla (26)	Germany (0.33) USA (0.33) France (0.22)	USA (0.33) Germany (0.22)
3 (8)	Nissan (65) Toyota (43) Honda (41) Daihatsu (32) Suzuki (18)	Japan (0.88)	Japan (0.88)
4 (4)	Hyundai (31) Tata (12) Kia (12) Mahindra & Mahindra (7)	India (0.50) South Korea (0.50)	India (0.50) South Korea (0.50)
5 (3)	GAC Toyota (2) FAW Toyota (2) Changan Suzuki (2)	Japan (1.00)	China (1.00)

Table 13: Community features for e-powertrain in 2018. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (7)	Dongfeng Nissan (10) Nissan (8) GM (6) SAIC GM (5) Honda (5)	Japan (0.57) USA (0.43)	Japan (0.43) USA (0.29) China (0.29)
2 (6)	Geely (7) BAIC Motor (6) Changhe Suzuki (5) Changhe (4) SAIC GM Wuling (3)	China (0.67)	China (1.00)
3 (3)	Chery (5) SAIC Passenger Vehicle (3) BYD (2)	China (1.00)	China (1.00)
4 (2)	GAC Toyota (1) FAW Toyota (1)	Japan (1.00)	China (1.00)
5 (2)	Hyundai (1) Dongfeng Yueda Kia (1)	South Korea (1.00)	South Korea (0.50) China (0.50)
6 (2)	Ford (3) Changan Ford (2)	USA (1.00)	USA (0.50) China (0.50)
7 (2)	BMW (1) BMW Brilliance (1)	Germany (1.00)	Germany (0.50) China (0.50)

Table 14: Community features for Body in 2024. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (21)	BMW (70) Renault (47) Audi (43) Skoda (36) Mercedes-Benz (35)	Germany (0.33) Netherlands (0.24)	Germany (0.24) USA (0.24)
2 (12)	Hyundai (34) Citroen (26) Mahindra & Mahindra (24) Tata (24) Kia (15)	Japan (0.25)	China (0.50)
3 (7)	Nissan (82) Toyota (61) Honda (52) Suzuki (42) Mazda (40)	Japan (1.00)	Japan (1.00)
4 (5)	SAIC Volkswagen (6) FAW-Volkswagen (5) SAIC Passenger Vehicle (5) Beijing Benz (5) SAIC GM (1)	Germany (0.60) China (0.20) USA (0.20)	China (1.00)

Table 15: Community features for Chassis in 2024. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (37)	Toyota (280) Nissan (261) BMW (260) Honda (257) Mazda (183)	Netherlands (0.32) Japan (0.22)	–
2 (34)	Chery (145) Geely (133) BYD (122) BMW Brilliance (106) Polestar (102)	China (0.44)	China (0.91)

Table 16: Community features for Driveline in 2024. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (5)	Ford (6) BMW (5) Nissan (4) Toyota (2) Honda (1)	Japan (0.60) Germany (0.20) USA (0.20)	Japan (0.60) Germany (0.20) USA (0.20)
2 (4)	Mercedes-Benz (6) BMW Brilliance (3) Renault (2) Mazda (2)	Germany (0.50) France (0.25) Japan (0.25)	France (0.25) Japan (0.25) Germany (0.25) China (0.25)
3 (4)	Geely (5) Chery (5) BYD (3) Daimler Truck (1)	China (0.75) Germany (0.25)	China (0.75) Germany (0.25)
4 (4)	GM (7) Jeep (5) Audi (4) SAIC GM (2)	USA (0.50) Germany (0.25) Netherlands (0.25)	USA (0.50) Germany (0.25) China (0.25)
5 (3)	Citroen (5) Hyundai (4) Kia (4)	South Korea (0.67) Netherlands (0.33)	South Korea (0.67) France (0.33)
6 (2)	Mahindra & Mahindra (1) Tata (1)	India (1.00)	India (1.00)

Table 17: Community features for Electrical and electronic in 2024. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (31)	Geely (154) Chery (99) BYD (94) Changan (93) Deepal (83)	China (0.45)	China (0.94)
2 (23)	Renault (338) BMW (338) Audi (333) Mercedes-Benz (326) Skoda (257)	Germany (0.35) Netherlands (0.35)	–
3 (14)	Honda (453) Nissan (426) Toyota (373) Mazda (349) GM (333)	Japan (0.57) USA (0.21) Netherlands (0.21)	Japan (0.43) USA (0.43)
4 (3)	Hyundai (274) Kia (254) Rolls-Royce (10)	South Korea (0.67) Germany (0.33)	South Korea (0.67) UK (0.33)

Table 18: Community features for Exterior in 2024. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (24)	Chery (45) BYD (23) Changan Ford (14) Changan (13) FAW (13)	China (0.42)	China (0.96)
2 (23)	BMW (132) Audi (96) Renault (91) Citroen (69) Skoda (67)	Netherlands (0.39) Germany (0.30)	China (0.22)
3 (9)	Nissan (205) Toyota (173) Honda (159) Mazda (102) Ford (80)	Japan (0.78)	Japan (0.78) USA (0.22)
4 (8)	GM (87) Jeep (64) Hyundai (63) Tata (52) Mahindra & Mahindra (48)	India (0.25) South Korea (0.25) Netherlands (0.25)	South Korea (0.38) USA (0.38) India (0.25)

Table 19: Community features for General small parts in 2024. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (12)	Audi (22) Dacia (19) Skoda (18) Renault (17) BMW (17)	Germany (0.33) Netherlands (0.25)	France (0.25) Germany (0.25)
2 (8)	Toyota (22) Honda (18) Mazda (15) Nissan (14) Suzuki (11)	Japan (0.75)	Japan (0.75)
3 (2)	Geely (2) Polestar (1)	China (1.00)	Sweden (0.50) China (0.50)

Table 20: Community features for ICE powertrain in 2024. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (16)	Audi (83) BMW (76) Skoda (75) Mercedes-Benz (72) GM (59)	Netherlands (0.44) Germany (0.31)	USA (0.38) Germany (0.25)
2 (15)	Chery (15) BYD (15) SAIC Passenger Vehicle (15) SAIC GM (13) BMW Brilliance (13)	China (0.47) USA (0.27)	China (1.00)
3 (11)	Kia (48) Renault (43) Mahindra & Mahindra (38) Hyundai (35) Citroen (34)	Netherlands (0.36) South Korea (0.27)	France (0.36) South Korea (0.27)
4 (7)	Toyota (161) Nissan (153) Honda (116) Mazda (90) Suzuki (84)	Japan (1.00)	Japan (1.00)

Table 21: Community features for Interior in 2024. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (30)	BYD (38) Tesla China (33) Geely (32) BMW Brilliance (31) SAIC GM (28)	China (0.37) Japan (0.20) Germany (0.20)	China (0.90)
2 (20)	BMW (123) Skoda (121) Mercedes-Benz (104) Renault (89) Mahindra & Mahindra (83)	Netherlands (0.40) Germany (0.35)	Germany (0.25) France (0.20)
3 (18)	Honda (165) Toyota (164) Ford (148) Hyundai (130) Nissan (121)	Japan (0.39) Netherlands (0.22)	Japan (0.39) USA (0.28)

Table 22: Community features for e-powertrain in 2024. The table lists communities with a size of two or more. For group HQ country ratio and maker HQ country ratio, only ratios of 20% or higher are displayed.

Index (Size)	Top five makers (by total shared suppliers)	Group HQ country ratio	Maker HQ country ratio
1 (25)	Geely (90) Chery (67) Tesla China (52) Polestar (51) Changan (48)	China (0.44)	China (0.76)
2 (21)	BMW (88) Mercedes-Benz (68) Peugeot (62) Ford (56) Citroen (51)	Netherlands (0.33) Germany (0.29)	–
3 (10)	Toyota (34) BYD (29) Mazda (26) Nissan (25) GAC Toyota (23)	Japan (0.90)	Japan (0.60) China (0.40)
4 (8)	IM Motors (51) SAIC Maxus (46) SAIC GM (37) SAIC Volkswagen (21) SAIC Passenger Vehicle (17)	China (0.38) Germany (0.25) USA (0.25)	China (1.00)

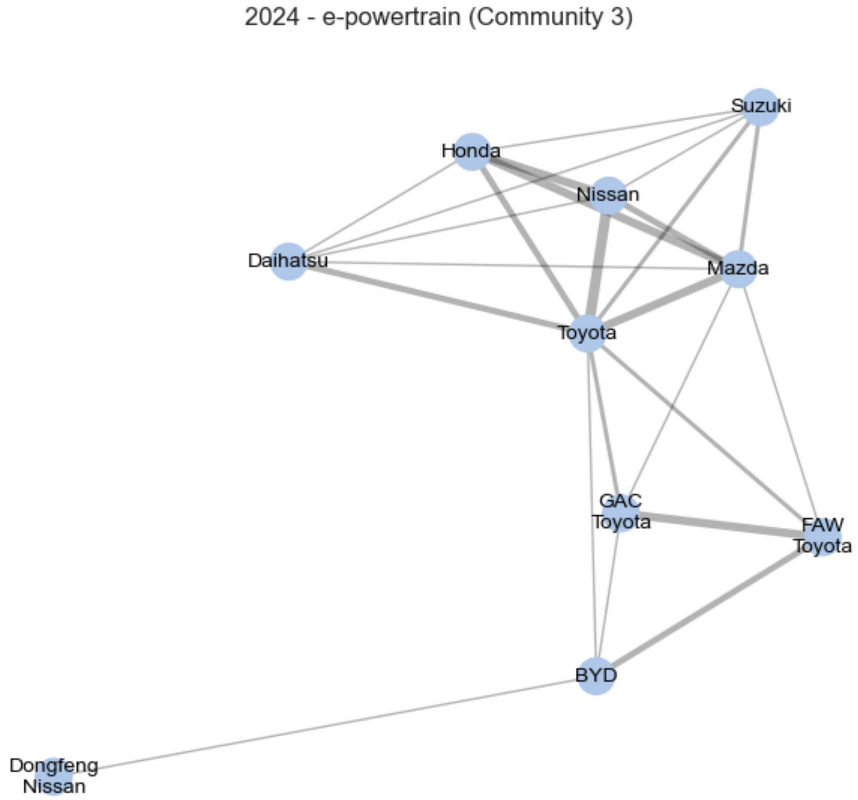

Figure 41: Interdependency network among OEMs for e-powertrain components in 2024 (Community 3). This network corresponds to Community 3 listed in Table 22 and extracted from Figure 40. Nodes represent OEMs, and edges indicate shared Tier-1 suppliers, with edge width proportional to the number of shared suppliers. Common suppliers and their products are listed in Table 23.

Table 23: Makers sharing common suppliers with BYD and their products in Community 3 (2024 e-powertrain). Community 3 is listed among the community characteristics shown in Table 22, and the network is shown in Figure 41.

Maker	Common supplier	Products
FAW Toyota	FinDreams Powertrain Co., Ltd. Changsha Branch	3-in-1 electric drive system (motor, inverter and reducer) (200kW), Traction motor (3-in-1 electric drive system) (200kW), 8-in-1 electric drive system (motor, inverter and reducer, etc.) (40kW), Front traction motor (e-Axle) (40kW)
FAW Toyota	Wuwei FinDreams Battery Co., Ltd.	Lithium iron phosphate battery cell (Blade), Lithium iron phosphate battery pack, Lithium iron phosphate battery cell
GAC Toyota	Zhejiang Sanhua Automotive Components Co., Ltd.	Battery cooling plate, Battery cooling system
Toyota	Zhejiang Sanhua Automotive Components Co., Ltd.	Battery cooling plate, Battery cooling system
Dongfeng Nissan	Xi'an FinDreams Battery Co., Ltd. (Formerly Xi'an Zhongdi Lithium Battery Co., Ltd.)	Lithium iron phosphate battery pack, Lithium iron phosphate battery cell