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I understand what is meant by plagiarism.

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Student no.	A	E	0	7	8	2	0

Module Title:	**Multinational Corporations and Global Value Chains**
Module Code: (e.g. 5AABC123)	**7AAON250**

Assignment: (may be abbreviated)	**Final essay**
Assignment tutor/group:	**Dr. Joseph Baines**
Deadline:	**19/01/2024**
Date Submitted:	**19/01/2024**
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YES ☑ NO ☐

19. In what ways has the governance of the automotive sector evolved in recent years? And what are the implications for upgrading prospects in this changing context?

Introduction

The automotive industry, valued at an astonishing $3 trillion (Harrison, 2021:123), not only fuels our vehicles but also play a vital role in the global economy, contributing to the overall growth of regions and countries. A large share of the pie is in the hands of an oligopoly of carmakers responsible for designing, assembling, selling, and certifying the safety of their vehicles. They are the primary companies that shape the structure of the industry and dictate how their supply chains are managed.

Around 23% of greenhouse gas emissions worldwide come from transportation, and within that sector, road transport constitutes 72% (PWC, 2019). As the world progresses towards decarbonization, automobiles are aligning with new technologies, with electric vehicles (EVs) emerging as the central solution. Governments around the world are driving this transformation; for instance, the EU has set a ban on the sale of new combustion engine cars as early as 2035 (Financial Times, 2023). The inevitable assimilation of EVs has far-reaching implications for the governance of the sector, as new crucial actors like battery suppliers and companies providing software have entered the value chain, and for the upgrading prospects of developing countries and traditional suppliers. This essay aims to unfold these developments through the lenses of the Global Value Chain (GVC) approach.

The first section provides a theoretical framework rooted in the Global Value Chain (GVC) theory, encompassing pertinent features and addressing its limitations. The second section examines how GVC scholars have conceived the automotive industry in terms of its input-output structure, its spatial configuration, and its governance. The third section examines how the rise of electric vehicles alters the supply chain and the actors involved. Lastly, upgrading prospects are investigated using a comparative approach. Emphasis is placed on the cases of Thailand and China, as their diverse patterns of development unveil the importance of institutional factors. The conclusions summarize the main findings from the discussion.

Theoretical framework

From the 1970s, the revolution in ICT technologies and the economic liberalization have contributed to create geographically dispersed Global Value Chains (GVCs), which have increasingly shaped global competition and the international division of labour (Gereffi, 2014:*9-11*). The GVC literature has provided a parsimonious framework to describe how these chains are structured, located geographically, and governed, with the ultimate objective to identify how firms and countries in the lower ranks can "climb up" the chain to higher value-added activities (Fernandez-Stark&Gereffi, 2019:*54-55*). Below are presented, for the purpose of this essay, the relevant features of the GVC approach.

A value chain is defined as "the full range of activities that firms and workers perform to bring a product from its conception to end use and beyond" (ibid.:*55*). Analysing a value chain through the GVC lenses means, as a starting point, delineating its input-output structure (the sequence of value-added segments) and its

territoriality (the spatial organization of the activities in the various countries) (Gereffi, 1994:*44*). To understand how chains are not only international in nature but also functionally integrated, the GVC framework employs the key concept of *governance*, which relates to how lead firms (the principal actors in the chain) control and coordinate functions and other actors within the chain. Initially, a conceptual distinction was made between *producer-driven* and *buyer-driven* value chains. The former are commanded by capital and technology intensive manufacturing lead firms, which exert extensive control on the production process, whereas the latter type is characteristic of big brand retailers which oriented their attention towards the customers outsourcing most of the production (ibid.:*46*).

As production became more fragmented and vertically disintegrated, researchers sought to explain how lead firms coordinated these activities. Governance, as such, was reconceptualised from "*as driving*" to "*as coordinating*", and a more nuanced typology emerged. *Market*, *modular*, *relational*, *captive*, and *hierarchical* modes of coordination were identified based on three factors: the complexity of transactions, the ability to codify them, and the capabilities of the supply base (Gereffi at al., 2005:*85-87*). Figure 1 shows this typology.

Governance type	Complexity of transactions	Ability to codify transactions	Capabilities in the supply-base	Degree of explicit coordination and power asymmetry
Market	Low	High	High	Low
Modular	High	High	High	↑
Relational	High	Low	High	↓
Captive	High	High	Low	
Hierarchy	High	Low	Low	High

Figure 1. From Gereffi et al. (2005:*87*)

Some clarifications need to be provided. Firstly, governance structures are dynamic. For example, technical standards can reduce the complexity of transactions within an industry and create modularity patterns, but at the same time they may become obsolete with the adoption new technologies, requiring relational links between lead firms and suppliers (ibid.:*96*). Moreover, this dynamism has been evident also in the consolidation of the supply base, with the rise of transnational first-tier suppliers and thus of more bipolar power structures (Raj-Reichert, 2019:*354*). Secondly, the framework concentrates mainly on the nature of inter-firm linkages and the power asymmetries derived from coordination, relegating extra-firm actors in the background. The GPN (Global Production Network) approach addresses this weakness, opposing a network-based understanding (rather than a linear chain) of economic processes actively shaped by and embedded in territorial and social contexts (Coe&Yeung, 2015:*32*).

Governance structures condition how firms and countries can "climb" the value chains in which they participate to benefit more from them. The GVC literature defines this process as *upgrading*. A useful typology distinguishes between *product, process, functional* and *interchain* types of upgrading trajectories (Humphrey&Schmitz, 2002:*1020*). The key challenge is to ascertain under which conditions these dynamics occur. The GVC framework has moved beyond local cluster-specific analyses to track down how longer

structures of economic activity enable or constraint local actors (Gereffi et al., 2008:*299-302*). It has also acknowledged how the institutional context at various levels (local, regional, national, and international) and the influence of industry stakeholders (employer associations, labour unions, universities, ecc.) play a role in development of domestic firms (Fernandez-Stark&Gereffi, 2019:*64-65*). Nevertheless, upgrading is neither an inevitable process nor necessarily translates into the capturing of additional value. In this regard, uneven geographies of upgrading have been more the focus of the Disarticulation Perspective, which is better suited to highlight patterns of inclusion and exclusion in development (Gereffi, 2019:*244*).

Automotive industry

The automotive industry is characterized by an extremely concentrated firm structure, in which only a dozen of automakers mainly from the US, Germany and Japan, sells approximately 70% of all the vehicles (as depicted in Figure 2). The tremendously high barriers to entry can be explained looking at the input-output structure of the sector. Firstly, carmakers are responsible for the initial design and the heavy engineering of vehicles, including, crucially, the specifications for the engine and the drivetrain, key to the driving experience (Murmann&Schuler, 2023:*130*). In doing so, they set proprietary specifications for components. Secondly, they are system integrators, the sole actors capable of combining all the parts together and assemble the final product (ibid.). And thirdly, unlike electronics firms, they shoulder most legal liabilities since they must assure the overall safety of the vehicle and its environmental impact (ibid.). These technical bottlenecks, coupled with gigantic economies of scale to stay profitable, give automakers extensive control over outputs, hinder the power of suppliers, and ultimately result in more value being captured. As such, in GVC language, automotive value chains are *producer-driven* (Sturgeon at al., 2009:*17*).

Figure 2. own rielaboration from F&I Tools (https://www.factorywarrantylist.com/car-sales-by-manufacturer.html)

From the 90s, the industry has experienced a sizeable growth in FDI (foreign direct investments) in Latin America, Eastern Europe, India and (especially) China, driven by the potential market growth and low labour

costs of these countries (see Figure 3). The growing level of global production was tied with the unbundling of many activities automakers previously carried out in-house. This outsourcing pattern enabled the rise of large first-tier suppliers, which increasingly took on roles in co-designing new vehicles and partially shifted the balance of power (Sturgeon et al., 2008:*304-307*).

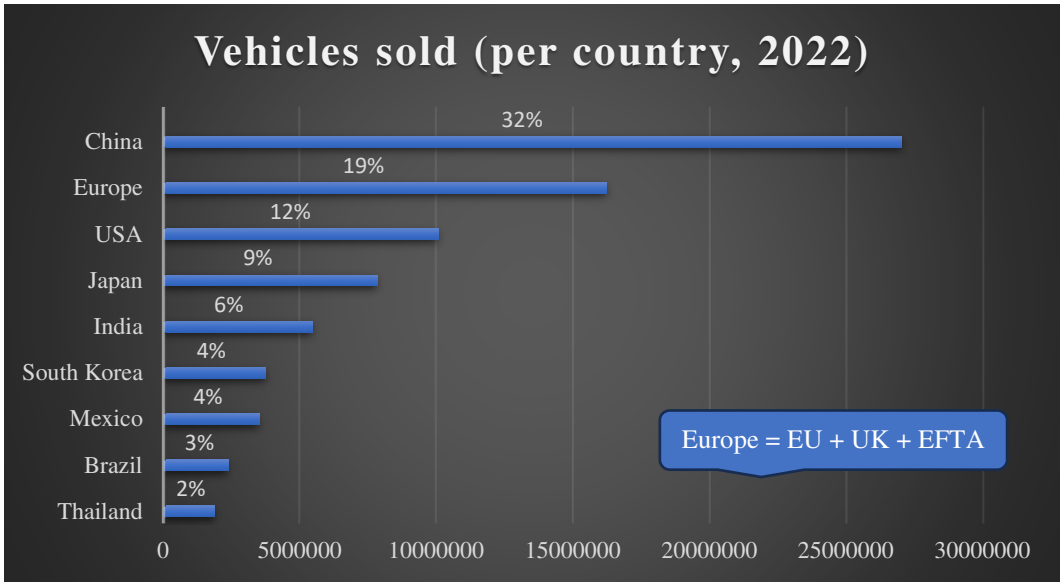

Figure 3. own rielaboration from OICA (https://www.oica.net/category/production-statistics/2022-statistics/)

As opposed to other sectors like apparel or electronics, though, production has not been condensed in a few locations, but has rather developed at a *regional* scale. Political backlashes because of high car imports induced carmakers to "build where they sold", as Japanese companies had to do in the 80s after pressure from the US government (Gereffi et al., 2021:*511-512*). Moreover, the bulky nature of many car components and the adoption of "just-in-time" production systems to have lower inventory costs have compelled suppliers to "follow sourcing" and settle operations close to their customers (Sturgeon at al., 2008:*301-302*).

National and local contexts are also important. Consumer preferences for more expensive models or types of vehicles (like pick-ups trucks in Thailand), driving conditions (left-handed versus right-handed driving) and regulations exhibit national variations (Sturgeon et al., 2009:*14-15*). Furthermore, much of the engineering and design have tended to agglomerate in local clusters, such as Detroit in the US or Cologne in Germany (ibid.). It can thus be observed how the geography of the automotive industry differ at each segment of the chain: R&D functions are performed in clusters, some general components are sourced globally, dominant modes of production play out regionally, and car models are tailored for different countries.

The governance of the sector has been shaped by the incapacity of lead firms to create industry-wide standards, due to the extremely complex nature of vehicles and reluctance of give up their role of system integrators (Jacobides et al., 2015:*1955*). To link back to the GVC framework, this has hindered the formation of modular types of governance and have allowed carmakers to keep control of the chain. Nonetheless, with the increase in the capabilities of first-tier suppliers, some parts are now co-designed. Inter-firm linkages are therefore relational, but historically there have been different approaches in various countries. US carmakers have

opportunistically switched suppliers after the co-design of a component to try to reduce costs, thus implying a market-based type of governance, whereas Japanese ones have tended to captively control their suppliers before forming relationship based on trust (Sturgeon et al., 2008:*309*).

Rise of EVs (electric vehicles)

The shift to battery electric vehicles (BEVs) is profoundly reshaping the structure of the automotive industry. The supply chain is being spatially reconfigured by new key suppliers of batteries and of the raw materials used to make them. New lead firms have emerged along with traditional automakers, which have all announced gradual phase-outs from internal combustion engine (ICE) vehicles (IEA, 2023). National actors have become central in spearheading the change with financial incentives, the provision of the necessary infrastructure, and ever-stringent emission regulations. This section analyses the implications these dynamics are having on the architecture and the governance of the industry.

EVs are driven by an electric engine instead of an ICE and are powered by electricity stored in batteries. Being an electric engine structurally simpler than an ICE, the new bottleneck in the construction of a vehicle is the battery, which can account for up to 40% of the total cost (Wuttke, 2023:*4*). Figure 4 describes the supply chain of a lithium-ion battery.

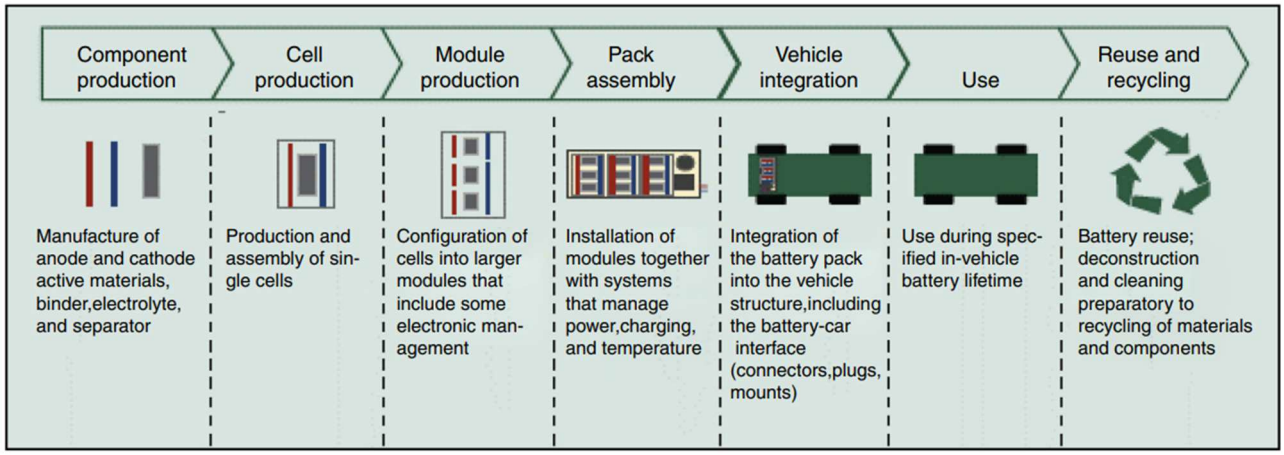

Figure 4: Lithium-ion battery supply chain, from Jussani et al. (2017:*335*)

Without considering recycling, looking at the various phases helps to highlight some key points. Firstly, the whole chain is more expanded upstream, as cell components are manufactured with rare earth metals (like lithium, cobalt, nickel among others) sourced in countries previously almost excluded from the sector (ibid.,:*336*). Diverse chemical combinations of the basic elements of batteries determine differences in prices, driving range and energy density. This brings to the second point: batteries for EVs are not (yet) commodities, but rather complex products which only a handful of firms concentrated in a small number of Asian countries can today manufacture. Nonetheless, many authors have pointed to the continuing dominant role automakers will play (Murmann&Schuler, 2023:*147*, Harrison, 2021:*122*). Indeed, everything from basic cells to battery packing and BMS (battery management systems) can be a competitive advantage. Therefore, automakers are seeking more vertical control of the supply chain and have established multiple partnerships with the main

battery manufacturers to be flexible in a rapidly changing environment (Harrison, 2021:*111*). In Figure 5 depicts this pattern.

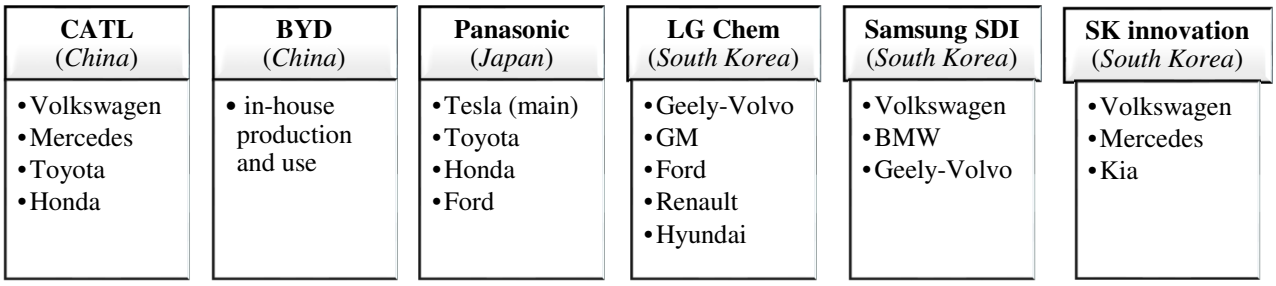

Figure 5: largest battery cell suppliers and partnerships, own elaboration from Harrison (2021:*112*)

It comes with no surprise that the current leader in EV sales, the Chinese BYD, is the only player vertically integrated in the supply chain of battery production. The emergence of Chinese domestic champions is shown in Figure 6 and further explained in the next section.

Car brand	EVs sold 2022	EV market share 2022	year-on-year increase
BYD (China)	1,858,364	**18%**	100%
Tesla (US)	1,314,319	**13%**	-7%
Volkswagen (Germany)	839,207	**8%**	-33%
GM (US)	584,602	**6%**	-25%
Geely-Volvo (China-Sweden)	512,276	**6%**	20%
Stellantis (US-France-Italy)	497,816	**5%**	-17%
Hyundai (South Korea)	433,164	**5%**	0%
BMW (Germany)	351,356	**4%**	-20%
Mercedes-Benz (Germany)	337,364	**3%**	-25%
Renault-Nissan-Mitsubishi (France-Japan)	335,964	**3%**	-25%
GAC Group (China)	287,977	**2%**	30%
SAIC Motor (China)	256,341	**2%**	20%

Figure 6: EV sales per company, 2022. Own elaboration from IEA Global EV Outlook 2023

Another trend which will increasingly grow in importance in the future relates to CAS (connectivity, autonomous driving, and mobility-as-a-service) innovations. Concerning this matter, tech and semiconductor companies like Alphabet, Intel and Nvidia possess the most advanced software capabilities and are already investing in these technologies (Doner et al., 2021:*320*). With progress directed towards digitalization and robotic automation, these companies and traditional OEMs will be able to benefit from huge technological rents through the appropriation of most of the patents (Crossa&Wise, 2022:*302*). Who stand to lose are instead the suppliers of mechanical parts of ICE cars, which will face many threats if they are not able to dynamically adapt. For instance, Doner et al. (2021:*19*) reports that 70% of Thai workers are at risk because of automation. The shift to EVs will raise uncertainties about their future outlook.

Upgrading prospects

The localisation of production in developing countries, albeit by foreign companies, have stimulated local manufacturing, employment, and linkages to other sectors. Suppliers have been linked to the value chains of global automakers, and in doing so have in many cases improved productivity and complied with worldwide quality standards (Sturgeon&Biesebroeck, 2011:*27*). However, spillovers to high value creating activities like design and developments of domestic brands have remained rather limited (Wuttke, 2022:*2*). In GVC parlance, asymmetric power relations have restricted the possibilities for local suppliers to *functionally* upgrade, and developing countries have tended to specialize in labour-intensive low value-added tasks dependent on export to nearby rich countries. Pavlínek (2020) describes these features in the integrated peripheries of Eastern Europe, while Crossa&Ebner (2020) also highlight patterns of hyper-specialization and technological exclusion in Mexico. The shift to EVs is set to proceed slower in these countries comparatively to Western Europe and the US. Subsidies are lower, and carmakers are making room for new EV powerplants in their home countries, transferring traditional car production to their neighbours (Pavlínek, 2023:*51-52*).

The case of Thailand testifies that functional upgrading can be achieved even if the automotive sector is controlled by foreign multinational corporations. The focus on "product champions" like pick-ups or the Eco-car in 2007 facilitated large scale economies in the production of their parts, and infrastructure policies created "industrial estates" to support exports (Sturgeon et al., 2016:*18-22*). This differentiated Thailand from other ASEAN countries plagued by fragmented low profitable markets. As a result of its success as a local assembly hub, in the early 2000s Toyota established one of its 5 international R&D centres specialized on pick-up trucks (ibid.). Doner et al. (2021) have termed this foreign-driven industrial upgrading "*extensive development*". Yet, the Thailand case shows also how export platforms may have limited linkages to local suppliers. Institutions like universities, associations and government agencies were not able to significantly link the growth of the sector to local upgrading, demonstrating how industry stakeholders are crucial to the indigenization of technology (Doner et al., 2021:*124-125*). Mohamad&Songthaveephol (2020) argue that forging links and coordination at this institutional meso-level is the key in view of the change to EVs, since the necessary adaptation cannot come from local suppliers.

China, using the terminology hinted above, has experienced a rather "*intensive development*" characterized by the emergence of local brands capable of designing, producing, and exporting their own cars (Doner et al., 2021:*264*). The Chinese context stands out due to the immense size of its market and China's manufacturing and technological prowess. However, the case is still illustrative in emphasizing the central role of the government in reshaping the industry. With a car market dominated by foreign automakers, the rise of EVs represented a strategic opportunity to restructure the sector and to promote Chinese brands and suppliers. With the "Made in China 2025" plan, the government provided for years lavish subsidies, protected domestic battery suppliers, and obliged foreign automakers to form joint-ventures with domestic producers (Yeung, 2019:*45-46*). Moreover, in 2016 was announced a production quota system which, starting as early as 2021, forced all carmakers to have at least 12% of EVs in their total vehicles sales, otherwise credits had to be bought from

other producers (ibid.). This institutional context enabled domestic carmakers to thrive, and by 2018 90% of EVs were sold by Chinese brands (Schwabe, 2020:*1112*). Even though the industry is undergoing a consolidation phase because of excess capacity production and low profitability, domestic giants (like BYD, Geely, SAIC, BAIC and CATL for batteries) are poised to dominate the future EV sector.

Conclusions

After having described the automotive industry using the GVC approach, this essay has elucidated how the shift to electric vehicles has reconfigured the value chain of the sector. The crucial new sourcing bottleneck now concerns batteries. A handful of Asian companies control battery manufacturing, and automakers have sought multiple partnerships (*relational* linkages) to navigate in a constantly innovating and uncertain setting. The vertically integrated Chinese BYD stand as the exception. Moreover, the increasing share of software components in the cars of the future is opening a door to tech companies like Alphabet and Apple to set foot in the industry. These dynamics present traditional component suppliers with serious long-term risks.

The essay has also investigated different patterns of upgrading trajectories. Firstly, developing countries in the periphery of their richer neighbours which have tended to specialize in intensive-labour activities do not provide many opportunities for upgrading of local suppliers. The situation of Mexico, for instance, has been framed in terms of foreign capital dominance, technological exclusion, and labour exploitation; an analysis with the Disarticulation Approach seems in this case more adapt to disclose these processes of uneven development. Moreover, Thailand and China have provided models of “extensive” and “intensive” industrialization, using the Doner et al. (2021) terminology. Thailand has become a regional assembly and export cluster and has interiorized some design functions (*functional* upgrading), albeit under the control of foreign Japanese firms. EVs could provide an opportunity, but an extensive coordination at multiple level of public governance is needed to support local suppliers. China, instead, has seen the rise of domestic champions after years of accommodating policies from the government, which are now leading the EV race. These cases cannot be generalized but comparing them sheds light on the conditions under which different types of upgrading occur.

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