11 August 2022

Electric Vehicle Industry Analysis

GSBA 540 – Contemporary Issues in Competitive Strategy

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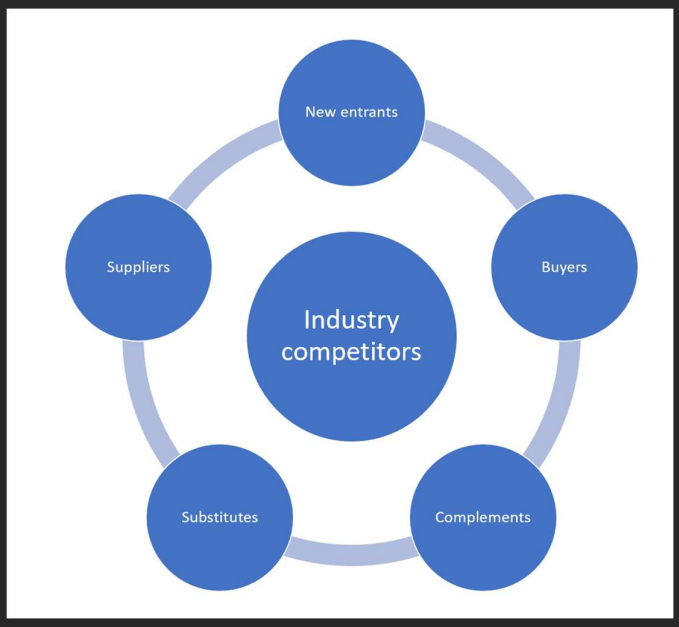
Strategic group

The strategic group being considered in this analysis is:

- Electrical vehicle (light duty vehicles[i]/passenger cars) manufacturers;
- In the United States;
- In 2020 (before the Covid pandemic and subsequent supply chain complications)

This group includes EV vehicles like Tesla S,3,X,Y, Ford Mustang Mach-E, Rivian truck and SUV and thus manufacturers like Tesla, Ford, Rivian as of 2020.

Each factor and force have been rated as High, Medium, and Low. These ratings have been given from the perspective of ***how challenging the factor/force is for the focal industry****.*



Threat of new entrants

1. Economies of scale

   Vehicle manufacturing is an expensive industry to get into. The **high fixed costs of manufacturing infrastructure including land, machinery, long gestation period and R&D** means that unit economics is profitable only after a large scale.

   Tesla had to slowly scale up production with no competition to reach economies of scale. New startups like Rivian are backed by market leaders like Ford ($500 million) and other major financiers (Amazon $700million)[ii].

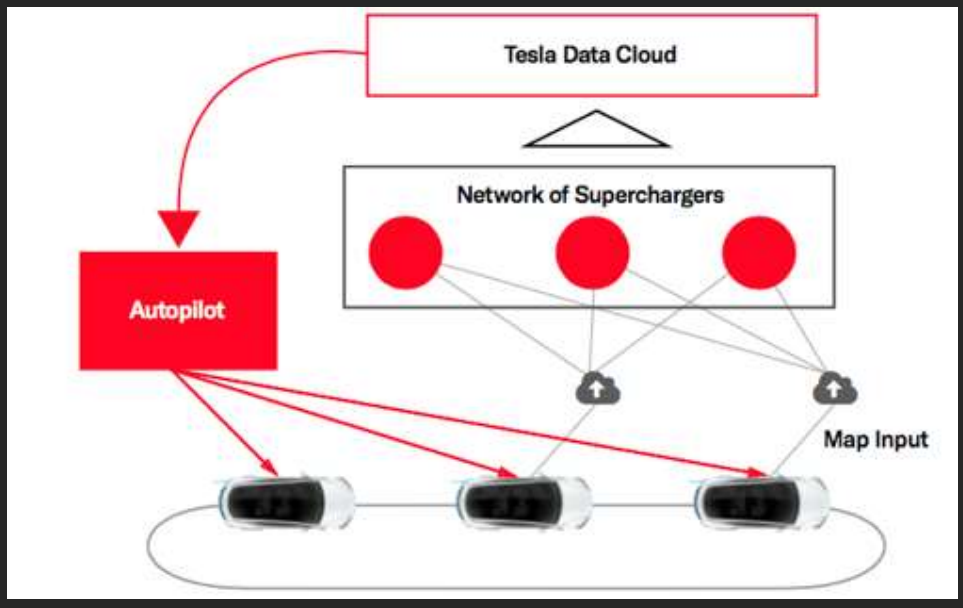
   All major global automobile manufacturers have set major goals in increasing their EV share. Since EV and ICE automobiles are largely common barring the battery, electric motor and inverter, these manufacturers will be able to **leverage their existing ICE economies of scale** to succeed in the EV market. There might also be parallel at-scale development in **foreign markets (like NIO in China) that can laterally join** the US market in the future. Given all of this, there is threat from existing automobile manufacturers but not so much threat from outside the broader vehicular industry.

OEM	Announcement
BMW	0.1 million electric car sales in 2017 and 15-25% of the BMW group's sales by 2025
Chevrolet (GM)	30 thousand annual electric car sales by 2017
Chinese OEMs	4.52 million annual electric car sales by 2020
Daimler	0.1 million annual electric car sales by 2020
Ford	13 new EV models by 2020
Honda	Two-thirds of the 2030 sales to be electrified vehicles (including hybrids, PHEVs, BEVs and FCEVs)
Renault-Nissan	1.5 million cumulative sales of electric cars by 2020
Tesla	0.5 million annual electric car sales by 2018 1 million annual electric car sales by 2020
Volkswagen	2-3 million annual electric car sales by 2025
Volvo	1 million cumulative electric car sales by 2025

Threat of new entrants: Medium

2. Network effect

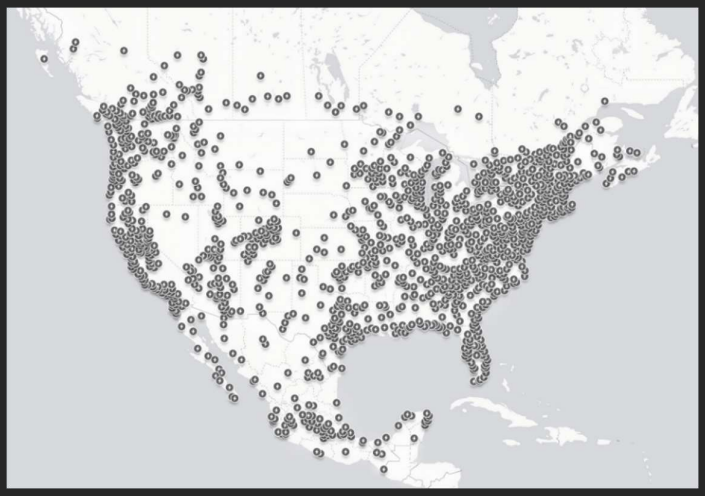
Electric vehicles and autonomous driving are different capabilities, but since both represent the future of automobiles, they are often packaged together. For instance, Ford has 'BlueCruise', Rivian has 'Driver+' and Tesla has 'Autopilot'. Self-driving, being a **machine learning** based model improves with training data that Tesla gets through existing customers on the road. Equally capable technological firms like Google (Waymo), Uber (CMU Lab) have not been able to outperform Tesla due to their limited R&D scale vs Tesla's production scale Thus, there is a very strong network effect, termed as **fleet learning**, with the vehicle becoming better as more people buy Teslas.



Fleet learning algorithm[iii]

A major factor in success of electric vehicles has been driving range. One way to accomplish this is having a **convenient charging network** (other being battery capacity). The more

people using your vehicles, the more chargers you'll be able to provide which feeds into a network effect advantage for existing firms. Similar logic applies for **after-sales support**.



Incentive to add chargers increases as customers join which in turn encourages new customers[iv]

Threat of new entrants: Low

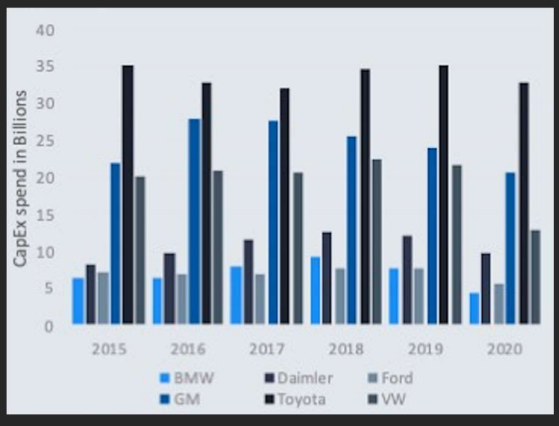
3. Switching costs

Switching costs for EVs are almost the same as switching costs for ICE automobiles. Apart from the effort of reselling the vehicle, closing a lease early, there are not many challenges. A caveat is that the EV ecosystem can have a higher switching cost than the EV itself. This is covered in the 'complements' section of this document later.

Threat of new entrants: High

4. Capital costs

As mentioned above, setting up an automobile production line is a **capital-intensive** process. Existing manufacturers have had decades of experience in this, and Tesla too has invested billions into its Gigafactories (Nevada and Austin in the US). While capex for EV industry was not specifically available, the graph illustrates the capex for ICE OEMs. If anything, it would be higher for EVs given the intensive **R&D** and lesser economies of scale in electric parts.



Threat of new entrants: Low

5. Incumbency advantages

The government provided subsidies to support the growth of electric vehicles. Now that awareness, suppliers etc have grown, the incentives in the US are reducing. This is evidenced by the **drop in vehicles sold limit for the $7,500 tax credit** from 250,000 to 200,000 in 2009[v].

Threat of new entrants: Low

6. Access to distribution channels

The sale of automobiles has traditionally been through **dealerships or OEM-owned stores** (with Tesla even offering **B2C sales through their website**). Thus, distribution partners are smaller, scattered and there is a fair channel access for most manufacturers.

Online sales channel - Screen grab from Tesla's website (by BusinessInsider)

Threat of new entrants: High

7. Restrictive intellectual property / government policy

A bit about government policy and financial support was covered in incumbency advantage. However, another point worth noting is the open sourcing of critical technologies. **Tesla has pledged to open source** its patents and is also experimenting with opening up its supercharger network. Other **research by academia and corporates** on autonomous driving algorithms and datasets is also publicly available.[vi]

> **All Our Patent Are Belong To You**
>
> Elon Musk, CEO • June 12, 2014
>
> Yesterday, there was a wall of Tesla patents in the lobby of our Palo Alto headquarters. That is no longer the case. They have been removed, in the spirit of the open source movement, for the advancement of electric vehicle technology.

[vii]

[viii]

Threat of new entrants: High

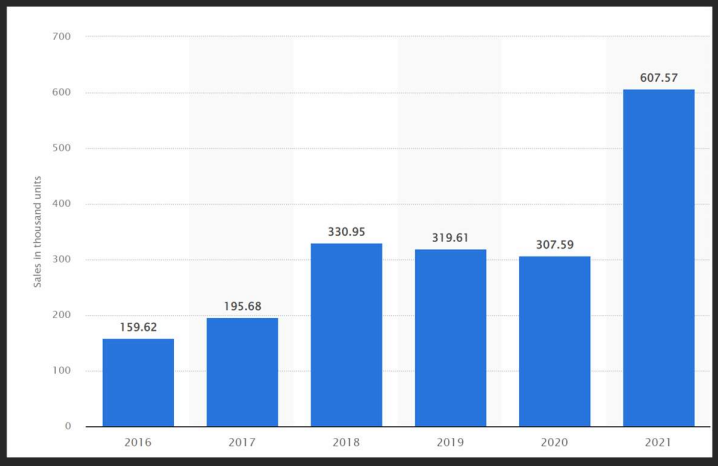
8. High barriers to exit

Large scale automobile manufacturing plants are often set up in remote areas through negotiations with the government. Moreover, there is a lot of capex for automobile specific manufacturing equipment which is difficult to liquidate. (Tesla itself had to purchase the NUMMI factory (Toyota + GM) after GM's bankruptcy)[ix].

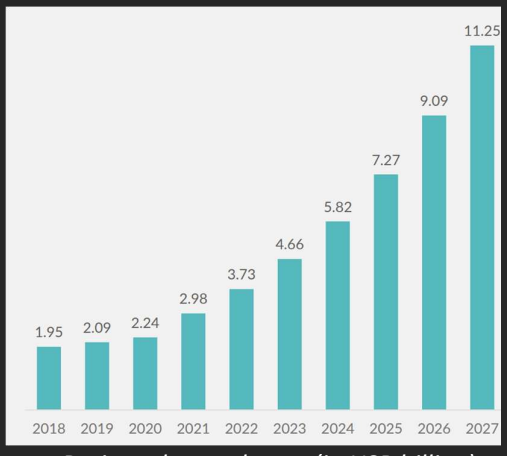
Threat of new entrants: Low

9. Industry growth

Industry demand for EVs will steadily increase due to environmental concerns. Thus, new entrants **can compete for the growth in the pie rather than someone else's existing share**. The CAGR for EVs is the US is estimated to be **24.7%** until 2027. Many US states have signed on the **COP26 pledge** to cut carbon emissions by accelerating transition to EVs by 2035.

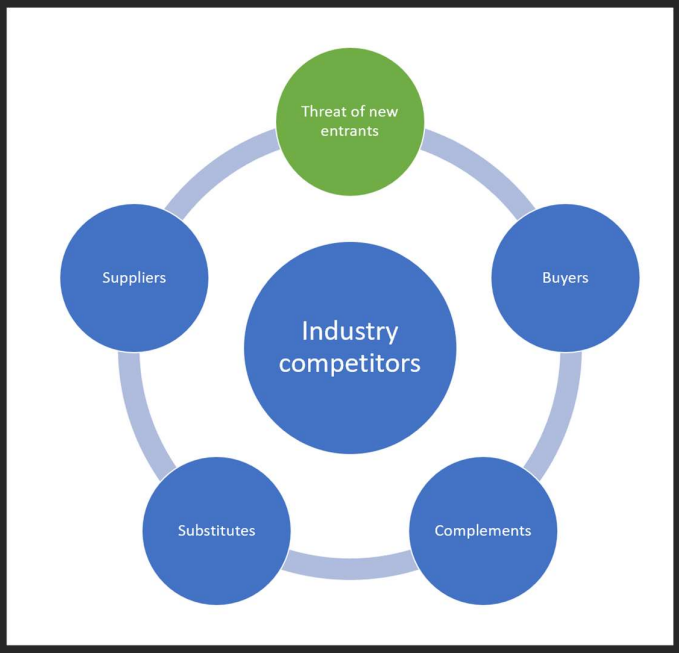


Number of plug-in light electric vehicles sold in US[x]



Projected growth rate (in USB billion) for commercial electric vehicles in US[xi]

Threat of new entrants: Low



Overall threat of new entrants: Low

Bargaining power of suppliers

Suppliers to EV manufacturers are majorly the component manufacturers such as batteries, chassis, tires, motors, glass and so on.

1. Supplier concentration

   Just as engine manufacturers have supplier power in the ICE vehicle market, **batteries are a critical** component of EVs. There are very few manufacturers that can produce high-capacity Li-ion or LFP batteries at low cost. **Panasonic** is the current leading supplier given their agreement with Tesla. Further downstream from battery manufacturers, supply chain **bottlenecks for semiconductors** and silicon adds to bargaining power of suppliers.

   Given that the **rest of the supplies** are usable across the broader automotive industry and not just EVs, those **have been commoditized** and there are many global suppliers for non-battery components.

   Challenge from suppliers: High

2. Switching costs

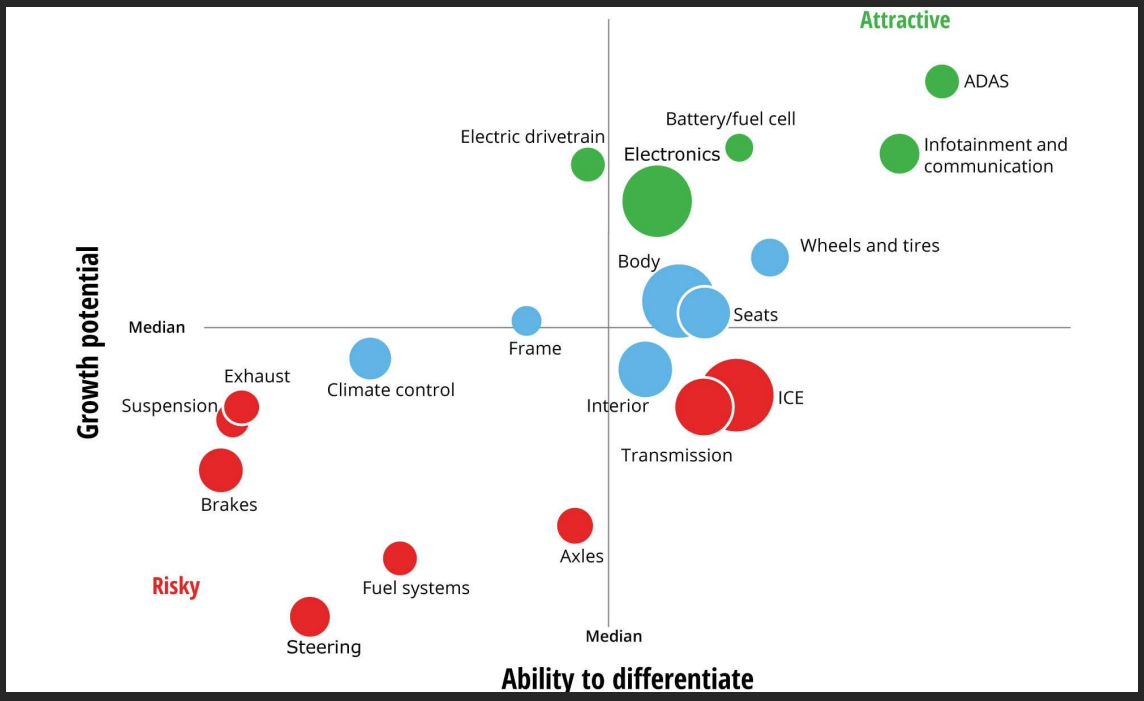
   Automobile manufacturing is a **highly modular industry**. This means that there are well defined specs for component integration. Switching suppliers will mean having the new **supplier retooling** for your specs or you **recalibrate to accommodate specs** of a supplier's existing product. Either approach is costly.

   Challenge from suppliers: High

3. Differentiated products

   The automotive industry, like most other complex manufacturing industries, works in the tier system of manufacturing. The parts suppliers rolling into component suppliers which are integrated module suppliers that finally sell to OEMs like in our strategic group.

Some of these modules like suspensions, steering and transmissions **have been commoditized** whereas others like fuel cells, tires, onboard touch-panels **still have differentiation**.



Differentiation (horizontal axis) of automotive suppliers[xii]

Challenge from suppliers: Medium

4. Fewer substitutes

   For reasons mentioned in 'switching costs', substitutes are not readily available. Challenge from suppliers: High

5. Threat of forward integration

   Doubtful since vehicle manufacturing is risky, capital intensive and specialized when compared with component manufacturing. However, if products like **Rivian's skateboard** prove successful, they can pose a threat of forward integration. But given that Rivian is just one of many suppliers, overall they are unlikely to integrate forward in the EV value chain.

Ford invested $500million in Rivian for its 'skateboard' architecture[xiii]

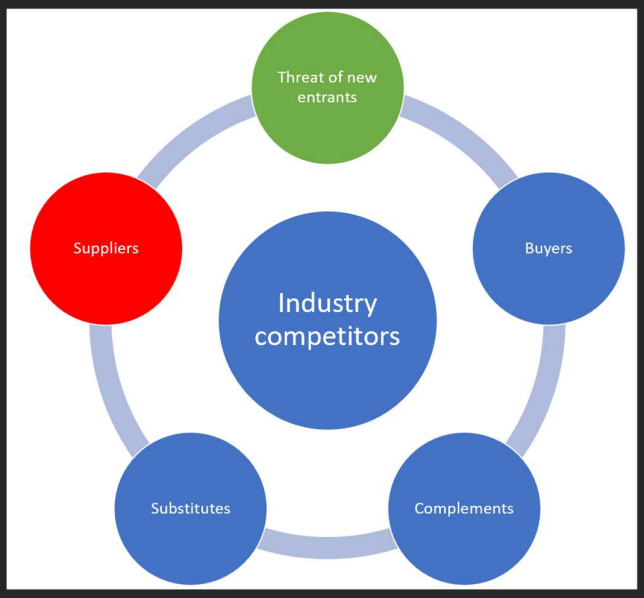
Challenge from suppliers: Low

6. Supplier's dependance on industry

   Suppliers are not too dependent on the EV industry specifically. EVs still account for only 2% of US vehicle sales[xiv] and these suppliers can easily switch to ICE manufacturers (substitutes).

   EV specific components like batteries are in high demand from many other industries too such as consumer electronics, energy storage and other industrial applications.

   Challenge from suppliers: High



Overall challenge from suppliers: High

Bargaining power of buyers

1. Customer power

   The market is currently growing with limited EV vehicle choices and units. Thus, buyers have lesser power. In fact, with some manufacturers like Tesla, they often place thousands of dollars as advances years before vehicle delivery which act as interest-free debt.

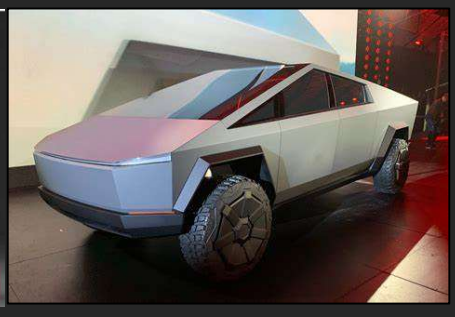
   Challenge from buyers: Low

2. Customer switching costs

   Covered in the 'Customer power' point above. Challenge from buyers: High

3. Undifferentiated products

   The Cybertruck looks like no other. Rivian's light bar stands out too. Even when designs are not as stark, brand recognition and trust play a major role in influencing purchase decisions.



Images of new-age design differentiation of electric vehicles OEMs - Rivian and Tesla[xv]

Challenge from buyers: Low

4. Backward integration
   Since buyers are dealerships, enterprises (B2B) or retail consumers (B2C), they do not pose a credible threat of backward integration.

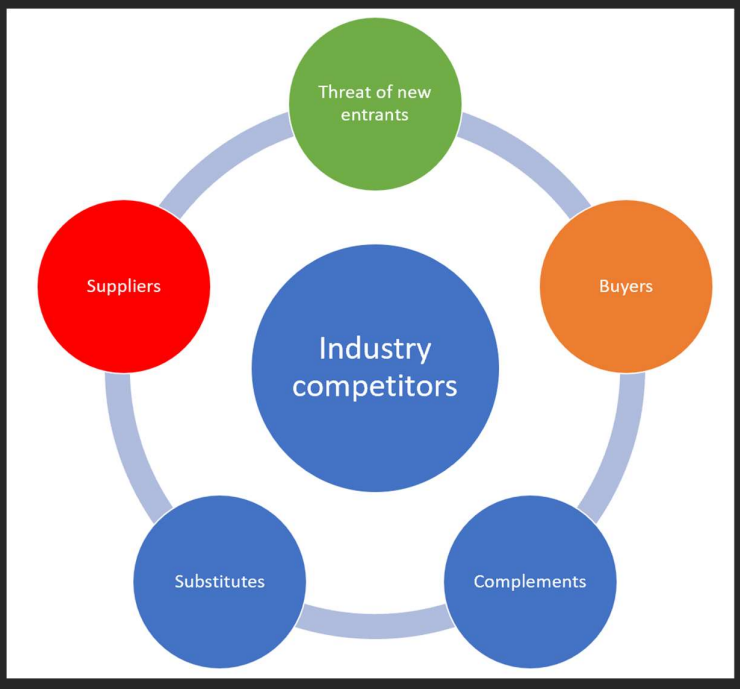
   Challenge from buyers: Low

5. Impact of purchase
   After a home, buying a vehicle is the most significant investment for most people. Thus, consumers will deliberate extensively over the purchase both in price and product features.

   Challenge from buyers: High

6. Impact of product quality
   Given the daily use, status parallels and high-cost purchase that an automobile means, product quality plays a major role. This is evidenced by Model S' reputation for misaligned doors, rattling noises at high speeds etc.

   Challenge from buyers: High



Overall challenge from buyers: Medium

Threat of substitutes

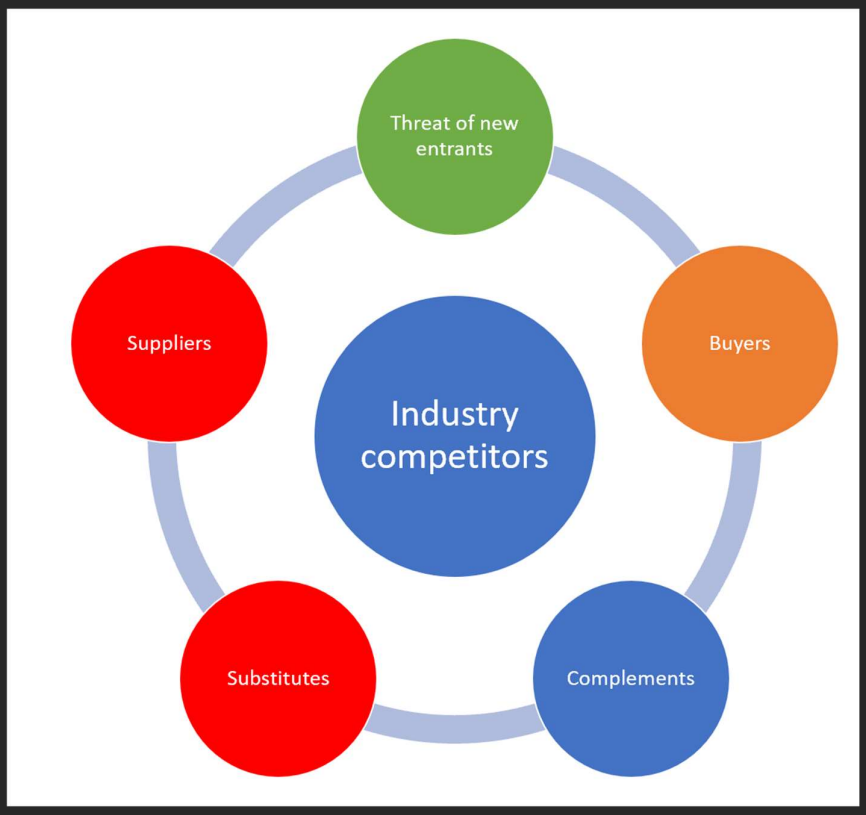
1. Closeness
   Since the strategic group is limited to 'EV' manufacturers, substitutes would mean hybrid and ICE automobiles, public transport, ride sharing services (Uber, Lyft) and more. These definitely pose a major threat to EVs because they are largely replaceable too.

   Threat of substitutes: High

2. Performance/ price ratio

On performance metrics, electric cars do better with acceleration while ICE cars perform better with respect to range. However, the major metric for comparison would be cost per mile which (even after factoring higher purchase cost) is lower in EVs. The macroeconomic factors that dictate crude oil rates would influence the ICE/EV comparison. But given that gasoline is a non-renewable resource and EV vehicles have a higher life and lower maintenance[xvi], over the course of a vehicle's life, it can be assumed that the analysis will support electric vehicles.

Threat of substitutes: Low



Overall threat of substitutes: High

Rivalry among existing competitors

1. Differentiation

Covered in #3 under 'Bargaining power of buyers'. Competitors have many factors of comparison, and thus do not need to compete on price. A large differentiator is battery range and charging time. Challenge from rivalry: Low

2. Need for capacity to expand in large increments
   Elaborate production lines are needed for automobile manufacturing. Thus, **when a new line is introduced, it's not for marginal increase in production, but rather for a whole step increase**. These capacity changes bring risks with them in case of under/over utilization of the line/inventory. Specific utilization details are needed to comment on this factor further.

   Challenge from rivalry: High

3. Product is perishable
   Automobiles last for decades. Manufacturers like Tesla are trying to take this even beyond the current lifecycle with a lot of vehicle improvements coming through '**software updates**'.

   Challenge from rivalry: Low

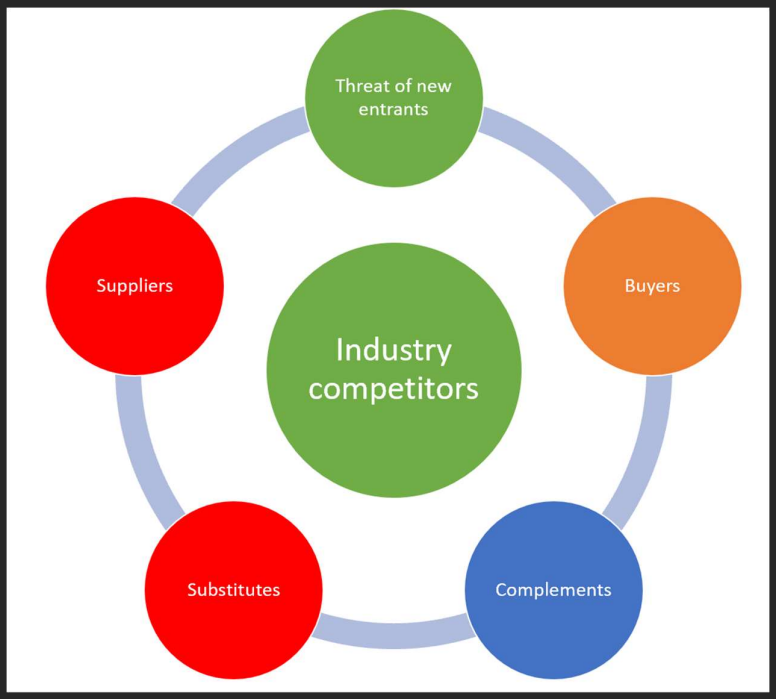
4. Competitors are numerous and similar in size,
   Given the aforementioned barriers to entry, there are not many *electric* automobile manufacturers. Challenge from rivalry: Low

5. Industry growth is slow
   Covered already. Growth is not slow. Challenge from rivalry: Low

6. Exit barriers
   Covered already under 'New Entrants' section. Challenge from rivalry: High

7. Diversity of rival strategies
   Rivian targets outdoor audience, Tesla targets aspiring, environmentally conscious buyers on one end and luxury car buyers on the other. There is a significant diversity in strategies.

   Challenge from rivalry: Low



Overall challenge from rivalry: Low

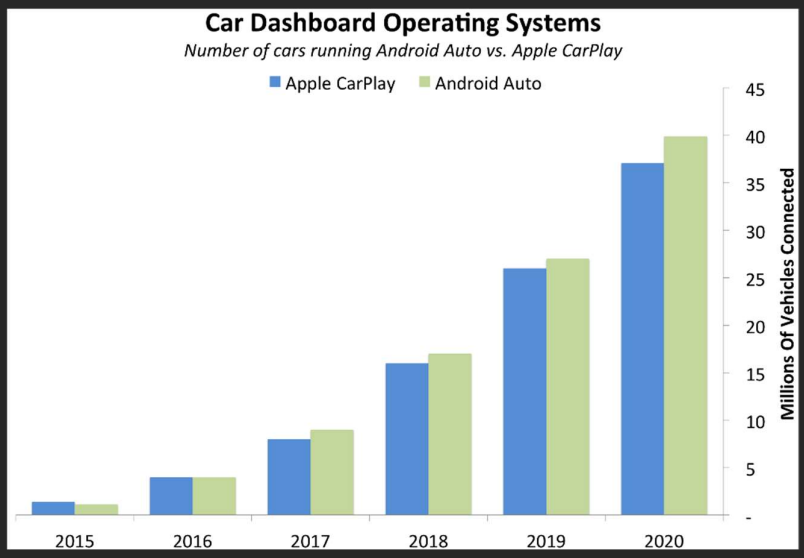
Complements

Complements to EVs would be:

- power generation
- vehicle charging networks
- leasing
- smartphone integration
- self-driving capabilities
- insurance

1. Complements are concentrated

- Complements like **power generation, smartphone integration and charging networks** are concentrated and can influence power over members of the strategic group. Firms like Tesla are mitigating the risk by integrating forward and building **superchargers and PowerWall**. When it comes to smartphone integration, Apple CarPlay and Android Auto have strong positions given their dominant positions in the smartphone OS industry.



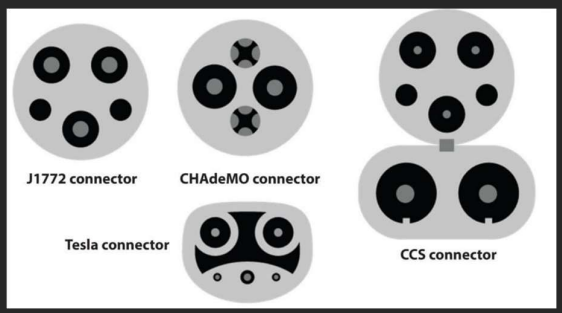
Two companies control over 75% of the car dashboard OS experience[xvii]

Threat from complements: High

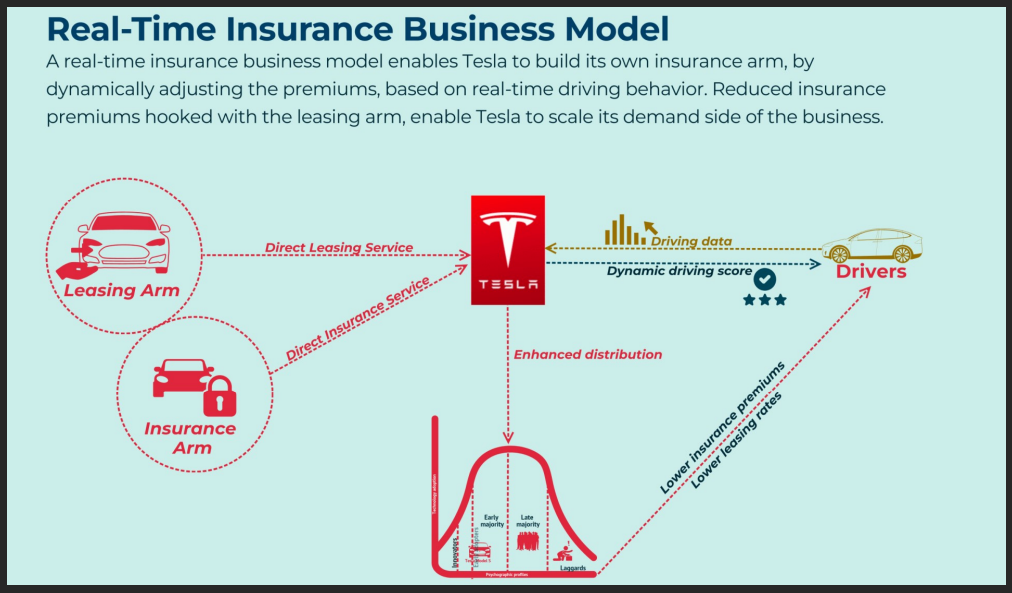
2. Relative complement switching costs

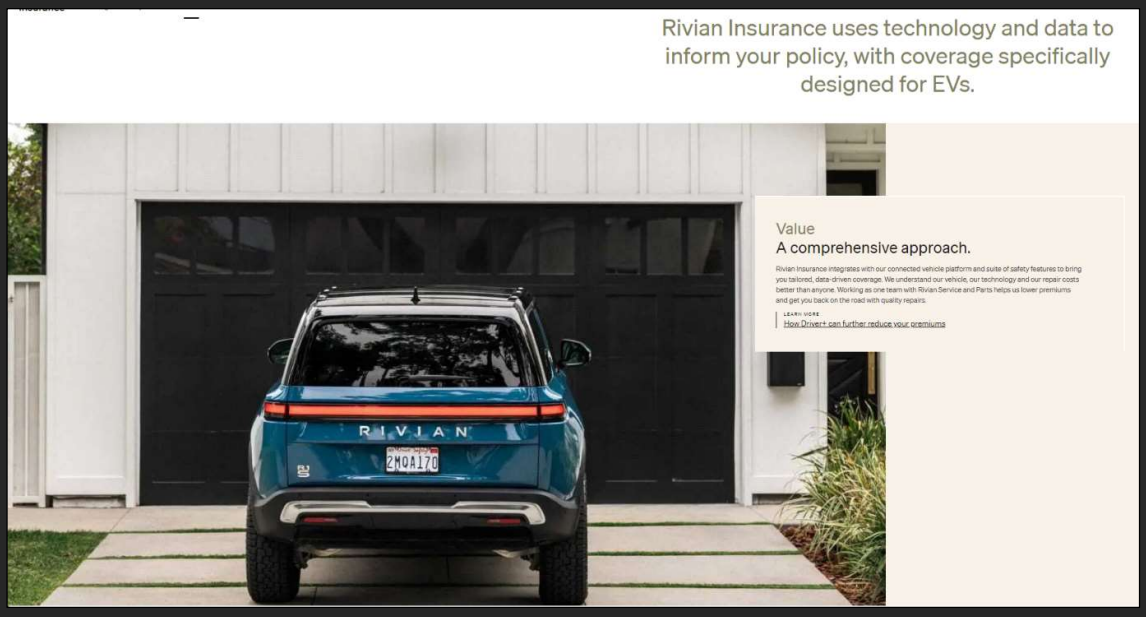
Switching costs are very high since often these superchargers only work for vehicles with **specific charging adapters** and need **app-based authentication**. Thus, if the customer's route is not well served by a manufacturer's network, they'll have incentive to switch.

There are also high switching costs for car operating systems, self-driving and autonomous driving but a low switching cost for power generation and insurance. However, by **tying insurance premiums to driving skill**, OEMs might be able to offer better rates than averages.



Differences in charging connector types[xviii]





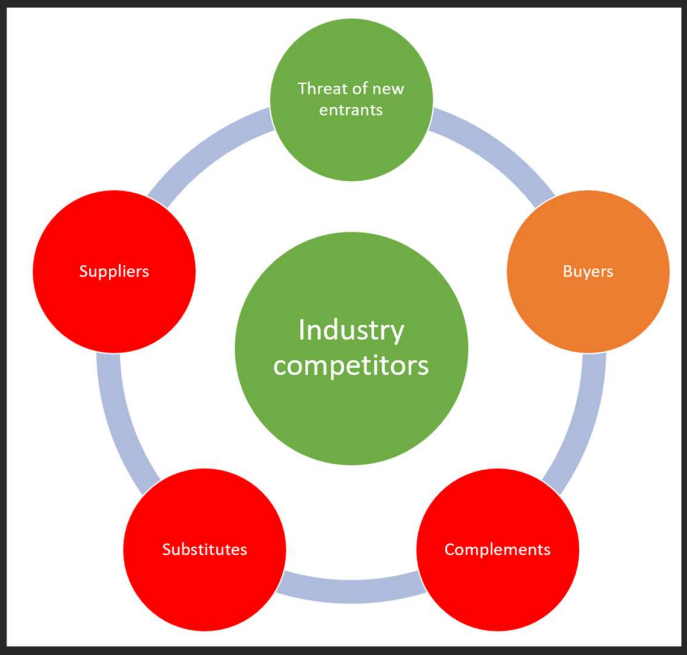
Better insurance rates based on driving skill[xix]

Threat from complements: High

3. Influence on demand

For buyers of certain automobiles, brand value was largely tied to the founders (Elon Musk/Trevor Milton + Twitter) causing demand shifts. The VC incentives often cause false promises like Tesla's **missed production targets and falsifications** by Nikola.

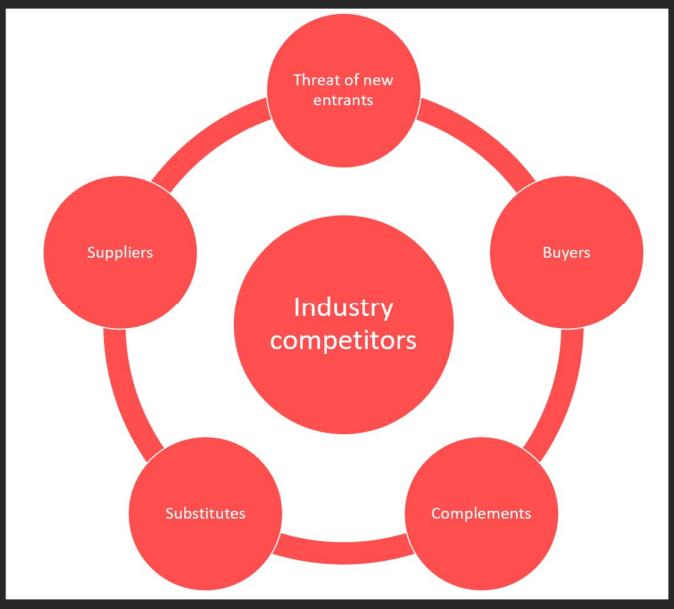
Threat from complements: High



Overall threat from complements: High

Overall Industry attractiveness

Given the comprehensive coverage of the forces and their corresponding factors, I'd rate industry to as having higher challenges due to strong threats from substitutes, suppliers, and the influence of complements. That being said, **taking ownership of the complements and considering backward integration present strategic business opportunities** for the focal industry to mitigate challenges.



*Overall challenge from all of Porter's forces: **Medium to High***

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[xv] Check Out The Five Features That ONLY Rivian Has (insideevs.com), Production of new Tesla Cybertruck to start in 2023 | Carbuyer

[xvi] Department of Energy | Battery-Electric Vehicles Have Lower Scheduled Maintenance Costs

[xvii] Apple CarPlay Android Auto Market Size (businessinsider.com)

[xviii] EV charging levels — Ricks Free Auto Repair Advice Ricks Free Auto Repair Advice | Automotive Repair Tips and How-To

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