Navigating the Road Ahead: Tesla's Resilience in the Face of Emerging Rivals

Master's Thesis

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Abstract

In recent years, the automotive industry has undergone significant disruptions due to electrification, software integration, and the rise of shared mobility, all trends that continue to gather pace. Historically, Tesla has been well-positioned to capitalize on these shifts, benefiting from its pioneering role in electric vehicles (EVs). However, given the enormous potential of the market, Tesla is no longer the undisputed leader and is finding that competitors are gradually closing the gap.

This thesis investigates Tesla's strategic and financial positioning as it navigates increasing competition in the EV market. Through a combination of strategic models such as PEST, Porter's Five Forces, and SWOT, along with financial evaluations including reformulated financial statements and peer comparisons, the study assesses Tesla's capabilities to sustain its market leadership. Additionally, it examines Tesla's opportunities to capitalize on growing sectors such as artificial intelligence, humanoid robots, autonomous driving, and energy storage. The study shows that Tesla's early innovations and market entry have established a substantial competitive edge, which is now being challenged by rising competitors like BYD. Additionally, a gradual decline in EV demand presents further obstacles to Tesla's market dominance. These challenges have noticeably affected Tesla's financial performance, leading to declining profitability during an intensified price war. Despite these difficulties, Tesla continues to command high valuation multiples compared to its industry peers. This robust market confidence is supported by Tesla's technological progress and ventures in artificial intelligence, autonomous driving, and energy storage, fields that are expected to transform Tesla from an EV manufacturer into a frontrunner in software and energy solutions.

The findings of this paper indicate that Tesla's ongoing investment appeal will depend on its ability to adapt to the escalating competition in the EV space, as well as its strategic expansion into AI and energy sectors. Tesla is well-positioned to transform into a diversified company, deriving revenue streams from EVs, energy, software, and AI. From a long-term perspective, Tesla is viewed as an great investment opportunity, capable of yielding returns comparable to those of major tech companies, largely driven by its non-core segments. In the short term, however, the stock may exhibit volatility as Tesla gears up for a second wave of growth.

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1. Introduction

This section aims to give the reader an introduction to the thesis, the authors underlying motivation, methodology, theory, structure, as well as an overview of the case company.

1.1 Background and Introduction

The electric vehicle (EV) market, encompassing Battery Electric Vehicles (BEVs), Plug-in Hybrid Electric Vehicles (PHEVs), and their supporting infrastructure, is at the forefront of reducing the carbon footprint from road transportation, a sector accountable for over 15% of global energy-related emissions (IEA, 2023). The worldwide commitment to the Paris Agreement, with 195 countries striving for net-zero emissions by 2050, highlights the critical shift needed from traditional internal combustion engine vehicles (ICEs) to EVs. This transition is gaining momentum thanks to significant improvements in EV range, technological innovations, expanding range of models, increasing convenience, and a growing consumer desire to make environmentally friendly choices (Ibid). According to a recent market analysis by Statista, the EV sector's global revenue is expected to reach a remarkable $906,7 billion by 2028 (Statista, 2024). Furthermore, a Bloomberg report forecasts a significant surge in EV sales, projecting an increase from 10.5 million units in 2022 to nearly 27 million by 2026, with the number of passenger EVs on the road expected to reach 730 million by 2040 (Bloomberg, 2023). This substantial growth in EV adoption is anticipated to drive corresponding expansions in related sectors, including charging infrastructure, which presents a market opportunity estimated at $1.9 trillion from now until 2050 (Ibid), but also in the demand for energy storage systems to supply the green transition (Choi, 2023).

In the EV market, Tesla's prominence is clear with a 16% global market share in Q4 2023, according to Counterpoint (Counterpoint, 2024). However, Tesla faces growing challenges such as intensified competition, demand slowdown, decreasing EV incentives, and shifting market dynamics. Notably, the Chinese rival Build Your Dreams (BYD) surpassed Tesla, capturing an 18% market share in the fourth quarter of 2023. Despite holding a dominant position as the premier EV manufacturer with a market capitalization of $645.37 billion as of March 01, 2024, Tesla finds

itself among strong competition from established automotive companies as well as new market entrants. The ongoing battle for dominance in the EV market marks a critical moment for Tesla, now facing considerable competition for market share for the first time, proved by its decreasing share, as illustrated in the following table:

Global Passenger EV Market Share								
Auto Group	**Q1 2022**	**Q2 2022**	**Q3 2022**	**Q4 2022**	**Q1 2023**	**Q2 2023**	**Q3 2023**	**Q4 2023**
Tesla	21%	16%	17%	17%	22%	20%	17%	**16%**
BYD Auto	10%	12%	13%	15%	14%	15%	17%	**18%**
Volkswagen Group	7%	7%	7%	8%	7%	7%	8%	**8%**
Others	62%	65%	63%	60%	57%	58%	58%	**58%**

Figure 1: *Data retrieved from* (Counterpoint, 2024) – *adjusted by authors*

This potentially signifies the ending of Tesla's era as the uncontested leader in the EV market. Tesla's 2023 Annual Report paints a challenging picture for the future, with earnings falling short of investor expectations, which triggered a 6% decline in share price in aftermarket trading (Kolodny, CNBC, 2024). The company's operational margin dropped to 8.2% in Q4 2023 from 16% in Q4 2022, a decrease driven in part by intense competition and significant price cuts impacting profit margins. Furthermore, Tesla's delivery growth for the year, at 37.7%, did not meet the ambitious 50% target forecasted by CEO Elon Musk for upcoming years (Krisher, 2024). Additionally, the most recent annual report revealed that Tesla produced more cars than it sold, marking a transition from previous production constraints to current challenges with sluggish demand (Tesla, 2023). From an investor's perspective, a combination of demand issues, intense competition, and declining margins represents a risky combination.

Tesla's share price climbed to a peak of over $400 in 2021, pushing the company's market value beyond the $1 trillion mark. Following this peak, the stock price has seen more than a 50% decline, attributed to falling short on market expectations (Pizio, 2024). A notable decrease in Tesla's price-to-earnings (P/E) ratio has been observed, dropping from an approximate 80 at 2023's end to 43.6 by February 2024 (Seeking Alpha, 2023). Yet, Tesla's valuation remains significantly higher compared to traditional automotive companies. Tesla's P/E ratio still vastly outpaces the industry average for automotive companies of 11.51, as noted by Zacks Equity Research (Zacks Equity Research, 2024). The ability of Tesla to sustain a significantly higher valuation than peers after more than a 50% decrease in market value highlights its distinct appeal as an investment case.

Differing from its rivals, Tesla is sustained by a robust retail investor base, making up 43.16% of its investors in 2023 (Willing, 2023). These investors are assumed to be driven by the view of Tesla as more than merely an automaker, a perception reflected in its premium valuation (Ochoa, 2024). Projects like the Dojo supercomputer, designed to refine its Full Self-Driving feature, and the AI-enabled humanoid robot Optimus, are for some investors expected to become more lucrative than vehicle sales in the foreseeable future. Additionally, Tesla's advancements in battery storage technology are expected to play a crucial role in future revenue growth (Pizio, 2024). Currently, these non-core segments account for only a small share of Tesla's revenue (Tesla. 2023). However, due to the growth potential of these segments, they can't be left out when assessing Tesla from an investors perspective.

Considering the challenging conditions and Tesla's premium valuation compared to peers, a thorough analysis of the company is highly relevant. This paper aims to undertake an in-depth strategic and financial examination of Tesla, covering all facets of its operations, not just its EV core business. The analysis will enhance our understanding of Tesla's future growth potential, and help us evaluate its long-term appeal from an investors perspective.

1.2 Motivation

Being a first-mover in the EV industry, Tesla has gained a significant lead, and have been the clear dominating company, until recently, as BYD and other competitors are catching up. While overall demand has currently hit a slowdown, our belief is that this is merely temporary. On a long-term basis, electrification remains the future of vehicles, and competition will continue to rise. We are extremely interested in how Tesla will handle this competitive pressure. When choosing to investigate this issue, we take great inspiration from the case of Apple's disruption of the mobile phone. When Apple announced its first iPhone in 2007, competing firms like Nokia, Blackberry and Microsoft were quick to publicly neglect that the product would have any profound impact on the industry (Fried, 2017). They were wrong, and Apple went on to completely disrupt the industry, that hadn't had any good smartphone solutions before that. Fast forward to today, Apple is the global market leader in smartphones, sitting on ~25% of the market (Laricchia, 2024). We find it highly interesting that Apple has managed to maintain market share, even after the whole industry

quickly went on to produce competing smartphones. Despite the whole industry acknowledging smartphones as the future, they still haven't been able to catch up to the lead Apple achieved by being a first-mover.

The case of Tesla shares similarities to this. Tesla has disrupted the automotive industry, by being the first company to deliver a strong EV product. The broader automotive industry and the established automakers have gradually acknowledged that EVs are the future and are increasingly investing and ramping up production. Now, Tesla is facing significant competitive pressure from these emerging rivals - a pressure that will only increase over time. The case of Apple proves, that it is possible for a company in such a situation to be resilient in the face of emerging rivals, and maintain a leadership position over a long-term period. With this thesis, we hope to uncover how plausible this scenario is for Tesla in the EV industry, and explore its potential to lead in other segments as well. Ultimately, our goal is to provide insights that will help determine whether you, as a long-term investor, should place your trust in Tesla.

1.3 Problem statement

Based on the background and motivation for the research, this master thesis seeks to answer the following research question:

"How is Tesla strategically positioned to maintain its leadership in the electric vehicle industry, and how does its diversification into artificial intelligence, energy storage and self-driving capabilities influence its attractiveness from an investors perspective?"

To provide a thorough evaluation of Tesla's potential as an investment case, a choice of strategic and financial sub-questions has been formulated, forming the foundation for analyses. The thesis focuses on three specific areas of analysis, as outlined in the structure below, upon which it is built.

- **External environment**

The objective of this chapter is to foster a thorough understanding of the electric vehicle market and its trajectory under the influence of external factors. This section is designed to offer insight into the predominant factors shaping this complex industry. The chapter is structured around the following research question:

Q1: *"What emerging trends are influencing the electric vehicle industry, and how do these trends affect the competitive landscape? And what does the competitive environment look like in Tesla's additional sectors, such as battery energy storage systems, humanoid robots, autonomous driving, and AI?*

To investigate this topic, the chapter starts with a PEST analysis to establish the context from a macroenvironmental perspective. This is followed by an analysis of industry trends in the EV market. Next, a Porter's Five Forces analysis is conducted to assess the competitive dynamics and attractiveness of the EV industry. Finally, the chapter will examine the competition in the non-core segments, energy storage, humanoid robots, autonomous driving and ride-hailing.

- **Internal environment**

After the introduction to the automotive industry, attention turns to a more narrow focus on Tesla. This chapter initiates the evaluation of Tesla and examines the company from a strategic perspective. In doing so, the thesis aims to address the following research question:

Q2: *"Will Tesla's current strategic approach, resources and capabilities, enable the company to sustain and build a strong competitive position across its various segments?"*

The analysis will begin by evaluating Tesla's corporate strategy. Subsequently, the thesis will explore Tesla's most valuable resources and capabilities using the resource-based view. Following this, a VRIO framework will be applied to assess whether Tesla possesses any sustained

competitive advantages over its competitors. The section will conclude with a SWOT model that summarizes the findings from the strategic analysis.

- **Financial analysis of Tesla and peers**

A robust financial foundation is essential for a company to be a good long-term investment case. Hence, this chapter contributes to the examination of Tesla by assessing the company's historical performance and situating the findings within the industry landscape. Therefore, this section seeks to answer the following research question:

Q3: *"How is Tesla performing financially and operationally and how does its valuation compare to industry peers?"*

The financial analysis of Tesla will initiate with a thorough examination of their annual report, beginning with a reformulation of the income statement and balance sheet. This initial step will provide a solid base for delving deeper into Tesla's growth, solvency, and profitability. Subsequently, a peer group analysis will be conducted using a multiple analysis approach to determine whether Tesla is overvalued or undervalued relative to its industry peers, also applying perspectives from the strategic analysis.

1.4 Delimitation

This paper seeks to offer a thorough strategic and financial analysis of Tesla, concentrating on evaluating its potential as a long-term investment without examining a direct valuation. The analysis will explore the critical factors that contribute to Tesla's value and its competitive stance in different business areas. Rather than using a traditional discounted cash flow (DCF) model, the study will use an approach that combines strategic insights with a thorough financial analysis. This approach seeks to offer a comprehensive examination of Tesla, resulting in a detailed assessment. The strategic analysis will serve as the main focus of the paper, complemented by a financial

review that offers insights into Tesla's financial strengths and weaknesses, including comparisons with industry peers.

Opting for a multiple-based valuation coupled with an extensive strategic review is considered more suitable for this analysis than a DCF approach, given the wide spectrum of investor price targets for Tesla. These range dramatically, as highlighted by investor Cathie Wood's optimistic $2,000 target (Adinolfi, 2024) to more conservative estimates around $23 by other institutional investors (Nasdaq, 2024). Such discrepancies highlight the inherent challenge in assigning a definitive value to Tesla and underscore the unpredictability of a specific price target.

Tesla's ventures into sectors like artificial intelligence, robotics and autonomous vehicles signal potential future revenue streams not yet captured in its current financial statements. These emerging trends introduce additional layers of complexity to forecasting Tesla's performance, underscoring the value of adopting a multifaceted analytical framework for this study. In our view, assigning a specific price target to Tesla entails considerable uncertainty and thus lacks precision. A more rigorous and in-depth analysis of Tesla and all its business areas will yield greater insights into its long-term investment appeal.

To ensure the relevance of our analysis in the face of fluctuating market conditions, the data collection cutoff has been established as 30th April 2024. This date will serve as the foundation for the data utilized in our thesis, allowing us to work with the most up-to-date information available. For the financial data, we will utilize Tesla's 2023 annual report and will not include the most recent Q1 2024 figures released on April 23, 2024, due to the fact that the financial assessment is conducted at that period of time.

1.5 Methodology

This section outlines the methodological approach applied in the thesis.

Research approach

Academic research fundamentally aims to deepen our understanding of known subjects, explore areas where our knowledge is limited, and ultimately enhance our comprehension of the world we

live in (Adams & Raeside, 2024). According to the literature, research can be categorized into three types: descriptive, explanatory, and predictive, each serving a distinct purpose in knowledge acquirement. This study adopts both explanatory and predictive approaches (Ibid). It is explanatory in that it seeks to explain Tesla's current strategic actions and their effects. Simultaneously, it adopts a predictive stance by examining potential changes in Tesla's market position and anticipating future trends. This dual approach not only enriches theoretical knowledge but also has practical implications for investment decision-making.

One aspect is the method, another is the research methodology, which delves into the science and philosophy supporting the research conducted (Ibid). This thesis primarily sticks to the paradigm of critical rationalism, grounded in two main elements. First, it employs a deductive methodology, testing existing theories to evaluate Tesla's strategic positioning in the EV sector and beyond, ultimately assessing its attractiveness as an investment case. Second, the thesis utilizes both quantitative and qualitative data, each offering distinct advantages. Quantitative data aids in testing and falsifiability. This approach ensures that the research can be empirically tested and potentially disproved, adding accuracy to the study. On the other hand, qualitative data contributes by deepening our understanding of the underlying phenomena being studied. It provides detailed insights that are essential for refining the research questions and guiding the investigative process throughout the thesis (Ibid).

Data collection

The data used in this thesis primarily consists of secondary sources that are publicly available. As noted earlier, both qualitative and quantitative data types are applied. Qualitative data includes news articles, scientific articles, academic books, and reports sourced mainly through online search engines, the CBS library, financial websites, and physical books. Specifically, this encompasses annual reports from Tesla and its competitors, as well as industry reports that forecast the future of specific market segments. Additionally, articles from Bloomberg, the Financial Times, Forbes, and other publications focused on electric vehicles and the green transition are incorporated.

Quantitative data is gathered from market reports produced by reputable investment banks and financial databases such as BloombergNEF, S&P Capital IQ, and the Bloomberg terminal. The Bloomberg terminal, in particular, serves as a crucial resource for conducting the financial analysis, given its reliability for financial data. The thesis intentionally does not include any primary data collection, as it would not provide additional value. All necessary data is accessible online through platforms like Bloomberg and S&P Capital IQ, where data analysts and comprehensive market reports have already provided all the required information.

Credibility and validity

According to Saunders, Lewis and Thornhill (2023) biases are always to some degree expected to be present in research. However, they also suggest that bias can be reduced by conducting better scientific methodology. This is about reducing the possibility of providing a wrong answer based on own biases and others. This can be done by paying attention to the two terms validity and reliability, which are very important when writing a thesis (Ibid).

Validity in short, refers to the accuracy of a measure. It assesses whether the research truly measure what it claims to measure, without being influenced by other variables (Saunders, Lewis, & Thornhill, 2023). This has been ensured by using data from reputable sources. We have utilized literature from recognized sources accessed through the CBS library and major international newspapers, as well as market reports from investment banks and well-established financial institutions.

Reliability is defined as the degree to which data collection techniques or analysis procedures yield consistent findings (Ibid). It assesses whether results can be replicated by others under similar conditions. The literature identify that threats to reliability may arise from the subject being studied or the observer. This thesis employs solely publicly available data, which improves the reproducibility of the data used. Therefore, by sticking to the analytical assumptions outlined, the results of this thesis should be easily reproducible. Consequently, any potential threats to reliability would primarily stem from the observers.

Adopting a critical perspective, one could argue that the data used in the thesis may become outdated over the months it takes to complete the research. This is particularly true for financial

data, which can change frequently due to market fluctuations, as observed with companies like Tesla. As a result, some of the financial data may be obsolete by the time of analysis, due to recent changes in financial performance or relevant news about Tesla. To minimize this issue, financial data is collected later in the research process to ensure it is as current and relevant as possible. Moreover, some of the data used is forward-looking and thus less impacted by current market changes. Additionally, the validity and reliability of the research have been increased by using a diverse range of external sources, rather than relying on a single source which could establish bias. Employing mixed methods has clearly supported the assignment and strengthened its overall validity.

The thesis has utilized generative AI tools for language assistance and proofreading to enhance the clarity and precision of the text. It is important to emphasize that generative AI tools have not instructed any knowledge, but merely served as tools to assist in text adjustments.

1.6 Theory

1.6.1 Strategic models:

The main analytical scope of the thesis is based on strategic theoretical frameworks. While it adopts an investor's perspective, the authors' objective is not to provide a valuation but to focus on whether Tesla is positioned to remain competitive in its core business and to assess its growth opportunities in other segments, thereby adopting a strategic approach to the investment question. The thesis employs Grant's basic framework for strategy analysis, which views strategy as a link between the firm and its environment (Grant, 2018). It requires a comprehensive analysis of the external environment of the company, as well as an in-depth analysis of the company itself. This approach enables the thesis to assess what Grant defines as *"strategic fit,"* referring to the consistency of a firm's strategy with its external and internal environments (Ibid). Consequently, the strategic analysis of the thesis is structured into an external and an internal analysis. The objective is to evaluate the company’s strategic fit based on this analysis. Although the strategic component constitutes most of the analysis, it alone is not sufficient to fully address the research question and take an investor's perspective. Therefore, a portion of the analysis is dedicated solely to examining the financials of the company.

External

PEST: The external part of the analysis begins with an examination of the macro-environment using the PEST framework, which assesses how political, economic, social, and technological factors influence the firm's industry environment. The thesis intentionally uses the PEST rather than the PESTEL framework, which includes environmental and legal factors, for two reasons. Firstly, to keep the analysis concise and avoid information overload, a risk associated with the PEST framework as noted by Grant (Grant, 2018). Secondly, the impact of environmental factors on the industry is so evident that the authors consider it unnecessary to discuss them separately. In summary, there is a global consensus that fossil fuels contribute to global warming, prompting the industry's shift towards zero-emission vehicles. The legal factor is excluded and is instead incorporated within the political factor. While the PEST analysis is a useful tool for analyzing a company's external macro environment, it does have its limitations. A significant drawback, particularly for this thesis, is that it compartmentalizes external factors into specific categories, such as political factors. This categorization helps to organize various influences, but it can also overlook the interconnectedness of macro-environmental factors, which may relate to multiple categories within the PEST framework. For instance, a development or event in the external environment could be classified as both political and economic. Although the PEST framework alone does not encompass the entire external environment of a company, it establishes a baseline for understanding the factors impacting the industry and serves as a starting point for further analysis.

Trends: To address the simplicity of the PEST analysis, the thesis includes a separate section on industry trends within the external analysis. Unlike the PEST analysis, this section does not categorize each trend under specific factors. It is not based on a traditional strategic framework like other elements of the analysis, which the authors argue is a strength. Including a section that is not theoretically grounded allows for a practical understanding of the external forces shaping a company's landscape without confining each trend to a specific theoretical box. This approach adds nuance to the thesis and strengthens its effectiveness as a case study.

Porter's Five Forces: The thesis employs the Porter's Five Forces model, developed by Michael Porter, as a cornerstone of the external part of the strategic analysis (Grant, 2018). This framework is an effective tool for analyzing competition within industries and evaluating industry attractiveness. The forces that determine competition and attractiveness include three sources of horizontal competition: the threat of new entrants, the threat of substitutes, and rivalry among existing companies; and two sources of vertical competition: the power of suppliers and the power of buyers. It is important to focus on how these forces shape the industry, rather than the company specifically, which is a nuance that is often overlooked.

One drawback of the model is its short-term orientation; it tends to focus on the current and recent situations of the industry rather than looking ahead. The authors intentionally adopt a forward-looking perspective by including forecasts and projections to address this limitation. Another limitation is that the framework is designed to analyze a single industry, which is problematic for a company like Tesla that operates across multiple industry groups. It is impractical to fit all of the company's affairs into one Porter's Five Forces analysis.

One possible solution to this challenge could be to apply the model separately to each of the industries. However, this would result in five individual Porter's Five Forces sections, which would be nonoptimal and beyond the scope of the paper. Instead, the choice has been made to apply a complete Porter's Five Forces analysis to Tesla's core business, electric cars. For the remaining four industries, a shorter industry analysis is conducted, focusing mainly on the *"rivalry among existing companies"* aspect of the model. This section is titled *"Competition among non-core segments."*

Internal

Resource-based-view: For the first part of the internal analysis, the thesis adopts the resource-based view of the firm, which conceptualizes the firm as a collection of resources and capabilities that serve as the basis for competitive advantage and lay the foundation for strategy (Grant, Contemporary Strategy Analysis, 2018). By applying this theoretical framework, the thesis aims to identify the resources the company possesses and the capabilities these resources provide. Resources represent the assets owned by the company, while capabilities define what the company

can achieve with these assets. This section of the analysis does not follow a specific model but draws inspiration from Porter's generic value chain, distinguishing between primary and secondary activities (Ibid). This model offers a detailed insight into a company's activities. However, the thesis covers only those activities that are most significant for the company and that can truly be considered resources and capabilities. One of the limitations of Porter's generic value chain is that, while it provides a comprehensive view of the company's capabilities, it can fail to capture those that are truly unique and generate value for the company and its customers. Therefore, selecting only certain activities allows the thesis to be flexible and specific about what is important for the company.

VRIO: Jay B. Barney, an American professor, posited that for a company to secure a sustainable and enduring competitive edge, its resources and capabilities must show four critical attributes: they must be valuable, rare, hard to imitate, and exploited by the organization (Barney, 1991). If the competitive advantage does not meet all four criteria, it is merely temporary and can be replicated by competitors. This framework helps the thesis identify those competitive advantages that are most valuable for the company and can be sustained over a long period. No competitive advantage lasts forever, but some are so strong that they can endure for many years or even decades.

SWOT: The four-way classification of strengths, weaknesses, opportunities, and threats is criticized by Grant for being too simplistic and premature; he prefers the two-way classification of external and internal environments (Grant, Contemporary Strategy Analysis, 2018). While the thesis follows the two-way classification encouraged by Grant, the strategic analysis concludes with a SWOT model, using it to summarize the findings. Choosing to include the SWOT model allows the thesis to consolidate the findings from the external and internal analyses and distill them into a simple overview. Hence, while the authors acknowledge Grant's criticism of the SWOT model, it still adds value to the paper in terms of summarizing the conclusions from the strategic analysis into a concise overview.

1.6.2 Financial models:

Analytical balance sheet and income statement

A firm consist of operating, investing and financing activities. When calculating a firms financial ratios to measure profitability it can be beneficial to separate *"operational"* and *"investments in operations"* from "*financing activities*" (Plenborg & Petersen, 2017). It is important to distinguish between operating activities, which are directly related to the company's operations, and financing activities, which typically involve interest-bearing items or require a return on investment (Ibid). When rearranging the accounting figures, it should be done both on the income statement and balance sheet.

Looking at the income statement, the rearranged income statement should provide the Net Operating Profit After Tax (NOPAT), which are expressed by this calculation:

$$NOPAT = EBIT - Tax\ on\ EBIT$$

To employ this it is important to find the firms invested capital, which is the net amount a firm has invested in its operating activities, expressed by the formula:

$$\begin{aligned} Invested\ capial\ (NOA) &= Operating\ assets - Operating\ liabilities \\ &= Equity + Financial\ liabilities - Financial\ asset \end{aligned}$$

The end goal is to find "return on invested capital" (ROIC), a key metric in assessing a firm's efficiency at using its resources to generate earnings. The following formula is applied:

$$ROIC = \frac{NOPAT}{Invested\ Capital} * 100$$

The Return on Invested Capital (ROIC) is frequently highlighted by renowned investor Warren Buffett as his preferred metric for assessing the quality of a business (Buffett & Clark, 2008).

The next section will dive into the formulas used for both the reformulated balance sheet and the reformulated income statement. All the calculations below are retrieved form Plenborg & Petersen (2017).

Reformulated balance sheet

In the stated balance sheet, assets will equal the sum of liabilities and equity. However, as the analytical balance sheet separates the financing from operations, it is necessary to further expand this equation:

$$Assets = Liabilities + Equity \rightarrow Operating\ Assets + Financing\ Assets$$
$$= Operating\ liabilites + Financing\ Liabilites + Equity$$

The following formula give a clearer picture of the capital used for operations on the one side and financing on the other:

$$Operating\ Assets - Operating\ Liabilities = Financing\ Liabilities - Financing\ Assets + Equity$$
$$\rightarrow Operating\ Assets - Operating\ Liabilities$$
$$= Net\ Interest\ Bearing\ Liabilities + Equity \rightarrow$$

$$Invested\ Capital_{operational} = Invested\ Capital_{financing}$$

It's important to recognize that separating operational from financing activities can be challenging and somewhat subjective, depending on how the accounting items are classified in the annual report (Ibid).

Reformulated income statement

The analytical income statement requires every accounting item to be classified as belonging to either “operations” or “finance” (Ibid). This is done to obtain better knowledge of the different sources of value creation in the firm. The formulas applied in the reformulation are shown below:

$$EBITDA = Revneue - Operating\ income$$

$$EBIT = EBITDA - Depreciation\ and\ Amortization$$

$$Tax\ on\ EBIT = EBIT * Tax\ rate$$

$$NOPAT = EBIT - Tax\ on\ EBIT$$

$$Net\ financial\ income\ before\ tax = Financial\ expenses + Financial\ income$$

$$Tax\ shield = Net\ financial\ expenses * Tax\ rate$$

$$Net\ earnings = NOPAT - Tax$$

This rearranged income statement will often consider the operational profit to be the primary source of value creation (Plenborg & Petersen, 2017).

Peer group analysis

According to Plenborg and Petersen, valuation using multiples assumes that the compared firms are truly comparable, sharing similar economic characteristics and outlooks (Plenborg & Petersen, 2017). Ideally, these companies would also follow identical accounting practices. However, finding perfectly comparable firms is often challenging due to varied revenue streams among companies, including Tesla, which both have automotive sales, energy and services (Tesla, 2023). Given that approximately 86% of Tesla's revenue comes from its automotive segment, it is justifiable to compare it with other firms in the automotive industry. However, while still being aware that Tesla may not trade in line with other automotive companies due to their high future expectations in other growing segments. The following section gives a short introduction to the multiples applied in the analysis.

P/E ratio: The P/E ratio serves as an excellent indicator of profitability, offering a quick indication into how much the market is willing to pay for each dollar of a company's earnings. Additionally, it provides insights into growth expectations. Companies with high P/E ratios are often anticipated to benefit from new product lines, innovations, or enhanced market positioning. The formula is as follows:

$$P/E\ Ratio = \frac{Market\ price\ per\ share}{Earnings\ Per\ share\ (EPS)}$$

Market Price Per: The current trading price of the company's stock.

Earnings Per Share (EPS): The profit allocated to each outstanding share, a key indicator of company profitability.

EV/EBITDA: The Enterprise Value/EBITDA ratio is an effective tool for comparing companies within the electric vehicle sector, independent of their capital structures. It also adjusts for non-cash expenses like depreciation and amortization, which can vary widely due to differing accounting practices, offering a more accurate reflection of operational profitability and cash-generating capabilities. The formula is as follows:

$$EV/EBITDA = \frac{Enterprise\ Value\ (EV)}{Earnings\ Before\ Interest, Taxes\ Depreciation, and\ Amortization\ (EBITDA}$$

Enterprise Value (EV): The sum of the market value of a company's equity plus its net debt.

EBITDA: A measure of a company's operating performance and cash flow, calculated as earnings before interest, taxes, depreciation, and amortization.

P/B ratio: The Price to Book (P/B) ratio is particularly relevant in capital-intensive industries that require significant investments in manufacturing facilities, machinery, and equipment. This ratio offers insights into the market's valuation of a company's physical, tangible assets, indicating whether a stock is overvalued or undervalued relative to its book value. A high P/B ratio may imply that the market anticipates substantial returns on assets or that the company possesses unique capabilities or valuable assets not fully reflected on the balance sheet. The formula is as follow:

$$P/B = \frac{Market\ Price\ Per\ Share}{Book\ Value\ Per\ Share}$$

Market Price Per Share: The current trading price of the company's stock.

Book Value Per Share: Calculated by dividing the company's total book value (total assets minus total liabilities) by the number of outstanding shares.

Using P/E, EV/EBITDA, and P/B together provides a robust framework for evaluating companies in the electric vehicle industry, offering a balanced view of profitability, operational efficiency, and asset valuation.

1.7 Structure

First, the thesis begins with an abstract summarizing the analysis' finding to provide a short a concise overview for the reader. Next, the introduction introduces the paper, with a background and the authors motivation for choosing the topic, the problem statement leading up to the research question and sub questions. Included in the introduction section, is also the methodology, theories used, the authors delimitation and finally a detailed overview of the case company.

Then, the paper delves into its analysis, divided into a strategic and a financial analysis. The strategic part will be divided into an external and internal analysis. The external analysis will include a PEST analysis, followed by a deep dive into the industry trends, and a porters five forces. The internal analysis will give an overview of Tesla's strategy, its core value drivers through the resource-based view and VRIO analysis, and finally summarizing these findings in a SWOT model. Next, the paper conducts a financial analysis as the second part of the analysis sections including Tesla's financial performance and a peer group analysis.

After the analysis, the authors consolidate and discuss the findings in a discussion section. Finally, the paper wraps up with a conclusion, including recommendations. Throughout the paper, meta sections appear before each new section starts, to briefly introduce the content and purpose of the section.

Structural framework for the thesis:

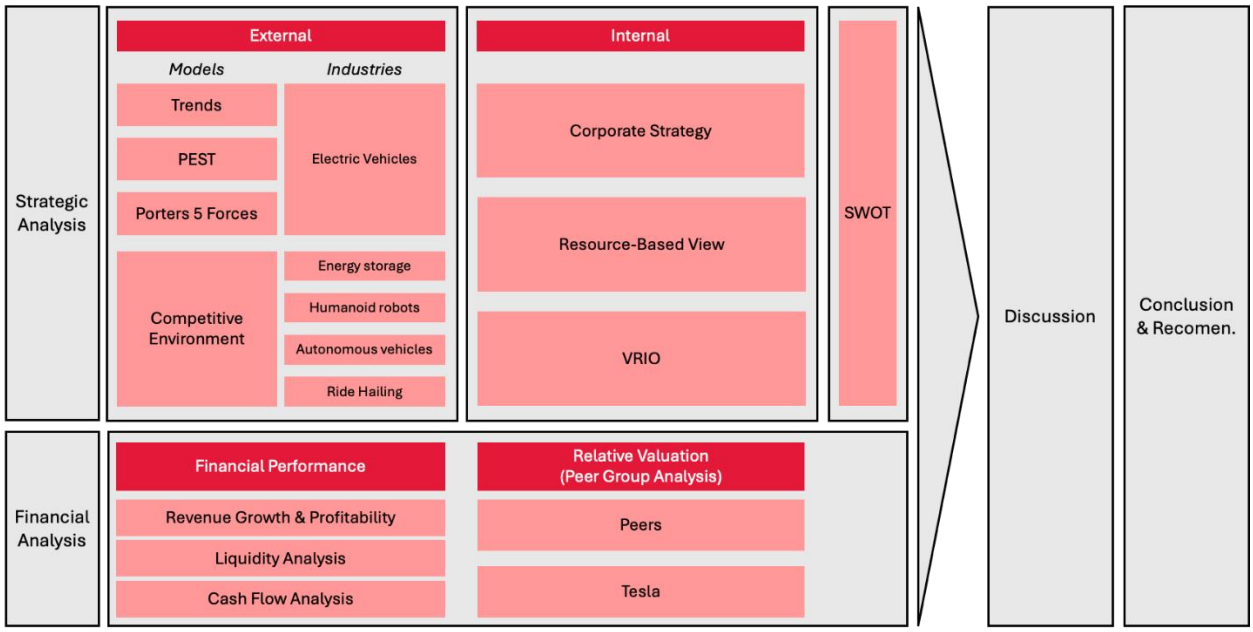


Figure 2: *Own creation*

1.8 Company overview

1.8.1 History

In the early 2000s, Martin Eberhard and Marc Tarpenning, two Silicon Valley engineers, recognized a gap in the EV market. Surprised by the lack of compelling electric options, they saw the auto industry's oversight as an opportunity, leading to the founding of Tesla in July 2003 (Baer, 2014). Their ambition was to showcase EVs' superiority over traditional gasoline cars in performance, speed, and driving pleasure (Wu, 2023). Their strategy started with launching the Roadster, a two-seater sports car, followed by plans for a more affordable four-seater sedan to appeal to a broader audience.

The Roadster faced delays but finally reached customers in February 2008. Elon Musk, who had initially joined as an investor and chairman, stepped in as CEO in October 2008. Under Musk's leadership, Tesla went public in June 2010, raising $100 million with its stock surging 41% on the first day, despite having turned a profit only once before that point (Squatriglia, 2010). This milestone marked Tesla's delivery on its promise of an electrified sports car that shifted public perceptions about EVs. Following the Roadster, Tesla expanded its offerings with the Model S in

June 2012, touted as the world's first premium electric sedan, with a base price of $49,900 (Tesla, 2012). The lineup grew to include the Model X SUV in 2015, the mass-market Model 3 in 2017, the announced Cybertruck in 2019 (awaiting delivery), and the Model Y in 2020.

To accommodate the surging demand, Tesla announced the construction of its first Gigafactory in Nevada in 2014, a move to increase production capacity significantly. As of 2024, Tesla boasts six Gigafactories worldwide, enabling the production of over a million vehicles annually (Tesla, 2024). By January 2020, Tesla had become the most valuable U.S. automaker, with its stock reaching a peak of $409.97 on November 4, 2021. Today, Tesla is a leading figure in the EV market and the automotive industry, highlighted by the Model Y becoming the bestselling vehicle in 2023 with 1.2 million units sold (Tesla, 2024).

1.8.2 Revenue drivers

Tesla splits its revenue into three segments: (1) Automotive, (2) Energy Generation & Storage, and (3) Services and Other.

Revenue Split by Segment	2023	2022	2021
Total Automotive Revenue (millions)	$82.420	$71.464	$47.233
YoY Change	*15%*	*51%*	
% of total revenue	*85%*	*88%*	*88%*
Automotive Sales	$78.509	$67.210	$44.125
YoY Change	*17%*	*52%*	
% of total revenue	*81%*	*83%*	*82%*
Automtoive Regulatory Credits	$1.790	$1.776	$1.465
YoY Change	*1%*	*21%*	
% of total revenue	*2%*	*2%*	*3%*
Automotive Leasing	$2.120	$2.476	$1.642
YoY Change	*-14%*	*51%*	
% of total revenue	2%	3%	3%
Energy Generation and Storage	$6.035	$3.909	$2.789
YoY Change	*54%*	*40%*	
% of total revenue	6%	5%	5%
Services and Other	$8.319	$6.091	$3.802
YoY Change	*37%*	*60%*	
% of total revenue	9%	7%	7%
Total Revenue	$96.774	$81.464	$53.824
YoY Change	*19%*	*51%*	

Figure 3: *Data Retrieved from* (Tesla, 2023) - *adjusted by authors.*

The automotive segment covers everything related to the sales of Tesla's electric vehicles. This is by far Tesla's largest segment, accounting for 85% of the total revenue. Automotive is further split into three sub-segments. The biggest being 'automotive sales', which includes revenues related to deliveries, both cash and financed, of all Tesla's models, the FSD capability features, internet connectivity, charging programs and software updates. These deliveries are not subject to leasing.

The Regulatory Credits segment contributes just 1% of Tesla's total revenue. These credits incentivize automakers to produce zero-emission vehicles (ZEVs), as US regulation state that automakers must either meet certain credit quotas or purchase excess credits from companies like Tesla, who sells surplus credits at a high profit (Kharpal, CNBC, 2021). This practice is mirrored in Europe and China, with companies such as Stellantis purchasing about $2.43 billion in credits from Tesla between 2019 and 2021. However, as more automakers meet their ZEV quotas, the demand for these credits is expected to decline (Duggan, Yahoo!Finance, 2020). Tesla's former CFO, Zachary Kirkhorn, stated in 2020 that regulatory credit sales are not a long-term, material part of Tesla's revenue drivers (Tesla, 2021).

Although only 6% of the total revenue is accounted for by Energy Generation & Storage, this segment grows at an impressive speed, increasing revenue by 40% and 54% in 2022 and 2023 respectively. Considering these growth rates, this segment will most likely play a bigger role for Tesla in the future by becoming a significant contributor to its total revenue. The same can be said for Services & Other, which also grows much faster than the overall Tesla revenue, thus it is also expected to account for a bigger percentage in the future.

Revenue Split by Geographic Area	2023	2022	2021
United States	$45.235	$40.553	$23.973
YoY change	*12%*	*69%*	
% of total revenue	*47%*	*50%*	*45%*
China	$21.745	$18.145	$13.844
YoY change	*20%*	*31%*	
% of total revenue	*22%*	*22%*	*26%*
Other international	$29.793	$22.764	$16.006
YoY change	*31%*	*42%*	
% of total revenue	*31%*	*28%*	*30%*
Total Revenue	$96.773	$81.462	$53.823
YoY change	*19%*	*51%*	

Figure 4: *Data Retrieved from* (Tesla, 2023) - *adjusted by authors.*

Tesla operates worldwide, yet over two-thirds of its revenue comes from sales in the US and China. The US contributes 47% to the revenue, while China adds 22%, with the remaining 31% coming from other global markets. Notably, despite China being the largest automotive market in the world, its share of Tesla's revenue is decreasing. This decline may be due to the rise of domestic electric vehicle manufacturers in China, which are increasingly capturing market share from Tesla.

1.8.3 Products

Although Tesla categorizes its revenue into only three main segments, it has several products in the pipeline that are not currently included in the income statement. This section offers a brief overview of all of Tesla's current products as well as those in development.

Electric Vehicles

Tesla's portfolio includes a diverse range of EVs and energy solutions. Currently, the company manufactures five unique consumer vehicles: the Model 3, Model Y, Model S, Model X, and the Cybertruck. In 2022, Tesla achieved a noteworthy milestone by beginning the production and delivery of its commercial electric truck, the Tesla Semi. Moreover, a second generation Roadster

and a next-generation compact vehicle are in the pipeline for future production. The illustration below provides a visual overview of each model, together with their respective production capabilities (Tesla, 2023). For a short overview of each model see appendix 8.

Current Installed Annual Vehicle Capacity			
Region	**Model**	**Capacity**	**Status**
California	Model S / Model X	100.000	Production
California	Model 3 / Model Y	550.000	Production
Shanghai	Model 3 / Model Y	< 950.000	Production
Berlin	Model 3 / Model Y	375.000	Production
Texas	Modely Y	< 250.000	Production
Texas	Cybertruck	< 125.000	Production
Nevada	Tesla Semi	-	Pilot Production
Various	Nex Gen Platform	-	In development
TBD	Roadster	-	In development

***Figure 5**:Data retrieved from* (Tesla, 2023) *– adjusted by authors*

The surge in Tesla's growth is largely attributed to the Model Y, which achieved remarkable success by delivering 1.2 million cars in 2023, securing its position as the world's top-selling car (Tesla, 2023). Complemented by the enduring popularity of the Model 3, the collective sales of these models reached 1.739 million deliveries in 2023, contributing significantly to the overall car delivery count of 1.808 million. Notably, the Model 3 has undergone recent enhancements, including a 9% increase in range and various refinements, which are expected to drive a notable increase in sales.

The company has initiated deliveries of its Cybertrucks, introducing two variants—the AWD Cybertruck and Cyberbeast, with starting prices at $79,900 and $99,990, respectively. However, the production of Cybertrucks has not met Elon Musk's growth expectations. Musk acknowledged the challenges during the Q3 earnings call, stating that the unique design made production difficult, and that the vehicle would not be financially positive for Tesla in its first year (Carson, 2024).

Tesla has alluded to a forthcoming next generation electric vehicle known as the Compact EV, keeping images undisclosed. Recent confirmation indicates that production of this budget-friendly electric car is scheduled to commence by the end of 2025 (Edkins, 2024). Priced at approximately $25,000, the Compact EV is poised to compete in the affordable electric vehicle market, challenging contenders like China's BYD and its *"Seagull"* model, which currently costs around

$10,200, presenting an attractive option for the average consumer (Jin, 2023). Initially, Musk pledged to manufacture a $25,000 car by 2022, a commitment he eventually revisited. Currently, the most economical offering from Tesla is the Model 3 sedan, priced at $38,990 in the U.S. Tesla has a history of falling short on launch timelines and pricing projections, prompting skepticism from numerous industry experts regarding the targets for the upcoming generation of electric vehicles (Jin H. , 2024).

The Tesla Roadster, Tesla's first production model launched in 2008, has been a subject of much discussion (Norton, 2024). Initially, Tesla announced plans in 2017 for a second-generation Roadster, targeting a 2020 release. However, this schedule has experienced delays, with Elon Musk recently announcing the completion of the production design, setting an unveil date for the end of 2024. The expectation now is for deliveries to commence in 2025. Anticipated to start at $200,000 for the base model, the Roadster boasts a 620-mile range and seating for four. A notable aspect of its development is the collaboration with SpaceX, another of Elon Musk's ventures, promising a vehicle that is unprecedented and extraordinary (Ramey, 2024.). From a business perspective, it's intriguing to consider how the Roadster, with its high price point and unique position within Tesla's product range, will impact Tesla's financial performance.

Energy generation and storage segment

Within the Energy and Storage segment, Tesla is experiencing significant growth, with revenues from this area having tripled since 2020, largely driven by its Megapack battery storage systems (Colthorpe, 2024). In 2023, total volumes surpassed 14.7 GWh, marking a 125% increase from the previous year. Tesla's product line within this segment includes three main types of energy storage systems: 1) the Powerwall, designed for home installations (13.5 kWh/11.5 kW of continuous power output), 2) the Powerpack for commercial installations (up to 323 kWh/up to 130 kW per unit), and 3) the Megapack for large-scale projects by utilities (3 MWh units) (Kane, 2024). Tesla is heavily invested in this segment and anticipates further growth in 2024 as the company continues to ramp up its new Megafactory in Lathrop, CA, toward a full capacity of 40 GWh (Ibid).

The energy storage segment is experiencing nearly exponential growth, underscoring its critical importance for the future, as highlighted below:

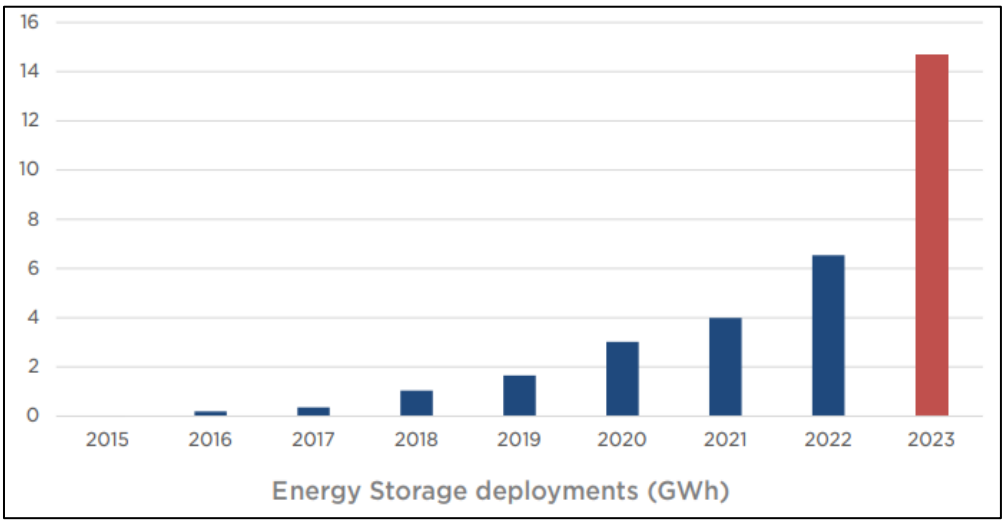


***Figure 6**: Data retrieved from* (Tesla, 2023)

Autopilot and full self-driving technology

Tesla offers a suite of driver assistance features, that comes standard with the purchase of a new vehicle or can be purchased after delivery. Currently, Tesla offer three different packages:

Level of automation

Package	Autopilot	Enhanced Autopilot	Full Self-Driving Capability
Features	**Traffic-Aware Cruise Control:** Matches the speed of your vehicle to that of the surrounding traffic **Autosteer:** Assists in steering within a clearly marked lane, and uses traffic-aware cruise control	**Auto Lane Change:** Assists in moving to an adjacent lane on the motorway when indicator is engaged by driver **Navigate on Autopilot (Beta):** Actively augments Auto Lane Change by providing guidance to the driver to transit motorway's on-ramp to off-ramp, including suggesting lane changes and navigating interchanges **Autopark:** Helps parallel or perpendicular park your vehicle, with a single touch **Summon:** Moves your vehicle in and out of a tight space using the mobile app **Smart Summon:** Your vehicle will navigate more complex environments and parking spaces, manoeuvring around objects as necessary to come find you in a car park within your direct vicinity.	**All functionality of Basic Autopilot and Enhanced Autopilot** **Traffic and Stop Sign Control (Beta):** Identifies stop signs and traffic lights and slows your vehicle to a stop on approach, with your active supervision. **Upcoming:** Autosteer on city streets

Figure 7: *Data Retrieved from* (Tesla, 2024) - *adjusted by authors.*

All three packages require active driver supervision, thus the features "*do not make the vehicle autonomous*", even though the name of the most advanced of the three, *"full-self driving"* (FSD), seems to indicate otherwise (Tesla, 2024). Tesla's FSD, is the 12th version of its kind, emphasizing

that Tesla has been developing it for a while. It is classified as SAE Level 2, which is just below the initial level of "automated driving features" that begin at Level 3, according to SAE standards established in 2021 (SAE, 2021). Hence, in terms of classification Tesla lags behind other players like Mercedes-Benz, BMW and Kia who have reached level 3 approval.

All new vehicles are equipped with eight external cameras and strong vision processing. Model 3 and Model Y rely solely on Tesla's advanced cameras and neural net processing (Tesla, 2024). Tesla's camera-only system is a very different approach than the one taken by most manufacturers, who combine data from cameras, radar, and lidar (depth sensing using laser), and restrict their operation to streets that have been pre-mapped with high-resolution 3D laser scans (Gent, 2021). CEO Elon Musk has been vocal in his criticism of lidar, arguing that it is costly and unnecessary (Ibid). Using only cameras reduces cost and eliminates the need for pre-mapping areas, making the approach more scalable. However, whether this camera-only strategy maintains equivalent quality and safety remains a significant question.

Tesla is also adopting a unique method for collecting the data needed to train its self-driving technology. Tesla use its existing fleet of customer-owned vehicles to gather real-world data every single day. Briefly explained, every time a Tesla owner enters their vehicles, and starts driving, it conveys various data directly to the Tesla Dojo supercomputer. An example is "Shadow Mode," which has been active in its vehicles since 2016. This mode operates even when autopilot is not engaged, as it simulates the driving process alongside the human driver. If the system's predictions diverge from the driver's actions, it triggers a signal that captures a snapshot, including the vehicle's camera views, speed, acceleration, and other parameters (Harris, 2022). This is then uploaded to the Dojo supercomputer, which processes the vast amount of input, to develop the machine learning and AI that serves as the basis for its self-driving technology. This approach to data collection, has provided Tesla with billions of miles of real-world driving data, GPS tracks, photos and videos. As a result, the technology essentially rests on a foundation of data harvested from the company's own customers. As of December 2023, Tesla vehicles had driven just below 800 million miles with FSD (Tesla, 2023).

Robotaxi and ride hailing service

Build upon the FSD and autopilot technology, Tesla is set to unveil its robotaxi on August 8, basically meaning a self-driving taxi. However, this comes after long delays, as CEO Elon Musk promised investors in 2019, that the company would already have 1 million robotaxis on the road by the end of 2020 (Kolodny, CNBC, 2022). Hence, it is highly unsure, what exactly will be revealed on august 8, and how close Tesla is to reaching fully autonomous driving. Considering the general development of robotaxis, and Musk's track record of setting unrealistic timelines, it is likely to be a prototype.

Tesla's vision includes an autonomous ride hailing service. According to Musk this service will work as a combination of AirBnB and Uber, where Tesla owners, will be able to add their self-driving car to the Robotaxi fleet whenever they are not using it themselves, to earn extra income. In his statement, Musk said "*Look at how many cars are parked. There are parking lots full of cars everywhere. Because cars need a driver, so most of the time they're doing nothing*" (FoxBusiness, 2022). This would provide customers with a strong incentive to buy a Tesla, and would generate extra revenue to the company, as it would take a cut of customers income. In their annual report, the company stated *"We intend to establish in the future an autonomous Tesla ride-hailing network, which we expect would also allow us to access a new customer base even as modes of transportation evolve"* (Tesla, 2023). The ride-hailing service will operate through an app similar to Uber, allowing consumers to request rides to specific destinations. A self-driving Tesla vehicle, without the need for a human driver, will arrive at your location to transport you. The service's fleet will include both company-owned and customer-owned Tesla vehicles.

The launch of the ride-hailing service will place Tesla in direct competition with Uber and similar companies. This was clear as early as 2016, when Tesla declared, "*using a self-driving Tesla for*

car sharing and ride hailing for friends and family is fine, but doing so for revenue purposes will only be permissible on the Tesla Network" (Kharpal, CNBC, 2016). Essentially, this restricts other ride-sharing platforms, such as Uber, from using self-driving Tesla robotaxis. Projections have been calculated for the potential earnings of the average Tesla robotaxi compared to a typical Uber. These projections suggest that the Tesla robotaxi could generate higher annual revenue than the average Uber.

Comparission: Uber vs Tesla robotaxi		
Uber vs Tesla robotaxi	Uber	Tesla robotaxi
Average daily mileage per vehicle (km)	200	300
Empty rate	30%	50%
Average price (USD/km)	2	1,5
Daily revenue generated per vehicle (USD)	280	225
Platform charging rate	25%	30%
Daily platform revenue per vehicle (USD)	70	67,5
Number of working days per year (days)	250	300
Annualized platform reveneue per vehicle (USD)	17500	20250

Esitmated revenue from robo taxi by different volumes							
Number of robo taxis	1000000	2000000	3000000	4000000	5000000	6000000	7000000
Annualized platform revenue per vehicle (USD)	20250	20250	20250	20250	20250	20250	20250
Revenue from robotaxi in millions (USD)	20.250	40.500	60.750	81.000	101.250	121.500	141.750

***Figure 8**: Data retrieved from (Yonghou & Jiang, 2024) – adjustet by authors*

Humanoid robots

At an AI event in October 2022, Tesla unveiled the prototype of its humanoid robot, Optimus, signaling a new direction in its development efforts (Reuters, 2022). Equipped with its own hardware innovations and advanced large model software technology, Tesla aims to transform the robotics industry with an affordable humanoid robot capable of performing a variety of tasks. Over time, this robot is intended to replace human labor in tasks that are dangerous, repetitive, or mundane (Ibid). However, the current version of Optimus is among many robots characterized by high costs, limited versatility, and insufficient intelligence to perform groundbreaking tasks that significantly improve productivity (Yonghou & Jiang, 2024). Consequently, Tesla has yet to generate any revenue from this segment, and it may be several years before it does so (Tesla, 2023). To demonstrate the potential, a simplified cost analysis has been conducted to show the economic viability of replacing a minimum wage worker in the U.S. with automation, highlighting the quick recovery of investment costs.

The example highlights the prospective advantages that robots could offer businesses, including extended operational hours and a singular expenditure roughly equivalent to an annual minimum wage.

Optimus		
battery life	4 to 6	hours
Charging time	10 to 20	minuets
Daily working time	< 20	hours
Weekly working hours	140	hours
Working weeks	52	weeks
Annaul work	7280	hours
Price for Optimus	**20 to 40k**	**USD**

Human labor		
Minimum wage per hour	7,25 to 15	USD
Weekly working hours	40	Hours
Working weeks	52	Weeks
Annual working hours	2080	Hours
Annual salary	**15k to 30k**	**USD**

Figure 9: *Own creation*

Yet, current humanoid robots have not reached such a level of technological sophistication, though advancements are expected within a short period. The market is currently in a phase of growth and remains comparatively small in terms of market value. Adhering to Goldman Sachs' optimistic growth forecasts for this sector reaching a billion-dollar valuation, investing in it appears promising (Goldman Sachs, 2024). Tesla, in particular, has emerged as a notable player in this field, though it's premature to designate any company as the definitive frontrunner.

1.8.4 Production Facilities

Tesla owns and operates six global factories. Six of them are in the US, one in China, and one in Germany.

Figure 10: *Data Retrieved from* (Tesla, 2023) - *adjusted by authors.*

Apart from the existing factories, Tesla announced in March 2023 that it plans to construct a new Gigafactory in Nuevo Leon, Mexico. This will be the company's first factory in South America.

However, there is no real timeline for the construction, and based on Musk's comments in the third quarter earnings call in 2023, saying that the company is not ready to go *"full tilt"* on the plant yet, due to concerns over uncertain economic conditions, it seems that completion of the site could be distant (Navarro, 2023).

1.8.5 Governance and Ownership

Effective corporate governance is essential for ensuring transparency, accountability and the protection of shareholders and stakeholders' interest. It can be argued that Tesla has an unique governance structure, that has garnered both admiration and scrutiny. In the center of it all is the CEO Elon Musk, which in recent years has gained remarkable influence within the business realm but has also become a notable figure in mainstream media. Nevertheless, Elon Musk is pivotal to Tesla's success and current value, exerting significant influence over investors and the board of directors.

Ownership

Elon Musk himself is by far the largest individual investor, with the latest data suggesting an approximate ownership of about 13% corresponding to 411 million shares of the companies 3,19 billion shares in common stock outstanding (Kolodny, CNBC, 2024). Retail investors has a significant chunk of the shares, owning about 43% which is the highest percentages among large U.S. companies. Other large investors are institutional investors like The Vanguard Group (7%), Blackrock (5,8%) and State Steet Corporation (3,3%) (Izquierdo, 2024).

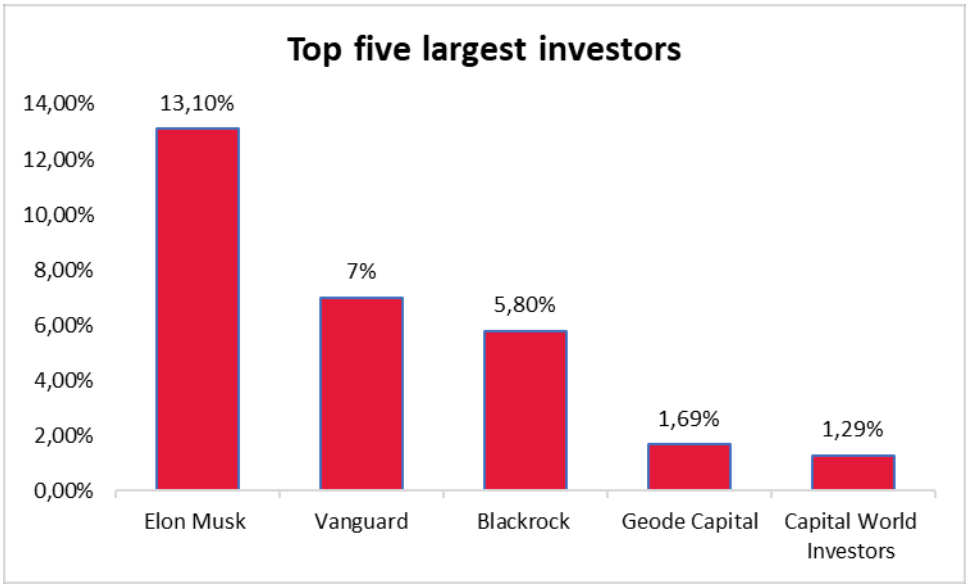


Figure 11: *Data retrieved from* (Wulandari, 2024) – *authors own creation*

Though, Elon Musk owns a large stake in Tesla, he has recently expressed his concern of being *"overturned",* stating *"I am uncomfortable growing Tesla to be a leader in AI & robotics without having ~25% voting control. Enough to be influential, but not so much that I can't be overturned."* (Kolodny, CNBC, 2024).

Such statements are not perceived well by the markets, and the shares slipped 1,8% in the premarket trading after the announcement (Ibid). This incident highlights governance concerns, echoed by numerous similar occurrences over the years. A considerable portion of Tesla's market valuation is attributed to its focus on artificial intelligence (AI). Therefore, should Elon Musk choose to divest Tesla of its AI and robotics division, it would likely provoke a significant response from the investment community.

Board of directors

Tesla's Board of Directors comprises both inside and outside directors. Robyn Denholm, an independent director, heads the board and is tasked with ensuring its independence from the CEO and management team. However, criticism has been leveled at the board structure, with concerns that it fails to hold Elon Musk accountable for his numerous outbursts, hasty decision-making, and controversial public remarks (Shaban, 2024). Critics argue that the board's close ties to Musk hinder its ability to exercise robust oversight as company directors. Several board members have

personal connections to the executive, including relatives, friends, and business associates. Most recently, a Delaware judge invalidated a $56 billion pay package awarded to Elon Musk, ruling that the company's board of directors had failed to demonstrate the fairness of the compensation plan or provide evidence of negotiations with Musk (Mangan, 2024). The pay package, granted in 2018, stood as the largest compensation plan in public corporate history. The judge further indicated that neither the Compensation Committee nor the Board had acted in the best interest of the company during the negotiation of Elon Musk's compensation plan (Ibid). Accusations of the independent board's failure to operate autonomously from the CEO are critical and could pose significant challenges moving forward.

2. Strategic Analysis

To evaluate whether Tesla represents a robust long-term investment opportunity, a comprehensive strategic analysis is necessary. This analysis aims to encompass both external market dynamics and internal organizational factors. The EV market is undeniably volatile, characterized by a excess of new entrants alongside established players competing for market share. According to theory, in turbulent markets, strategic flexibility and responsiveness are vital (Grant, 2018). It is precisely in such conditions that strategy assumes heightened importance. When companies like Tesla are confronted with unforeseen threats and continually emerging opportunities, strategic planning serves as the guiding compass that navigates them through turbulent waters (Ibid). However, there is no single unifying framework that captures all strategic elements in a complex company like Tesla, which is why this thesis will take a multi-framework approach, which will move from macro to the micro level of all relevant factors influencing Tesla and its performance. The main focus will be on the EV market, which currently represents Tesla's most significant segment in terms of revenue. However, as the thesis applies a broad perspective on Tesla, the analysis will also cover its other segments, including energy storage, humanoid robots, and autonomous driving.

2.1 External

This part of the analysis will focus on the external environment of Tesla. As highlighted by Grant (2018), to properly assess and analyze a company's strategic strength, it is critical to obtain a profound understanding of its environment. To achieve this, the external analysis includes three main sections. First, a macro-environmental analysis is conducted utilizing the PEST framework, to assess the external factors impacting the EV industry. Next, a section covering the most important industry trends is presented. Then, a comprehensive analysis of the competitive forces shaping the industry is conducted, using the Porters Five Forces framework. Finally, the industries of Tesla's non-core segments will be analyzed.

2.1.1 PEST Analysis

Given the multitude of external factors influencing operations within the EV sector, the initial focus of this strategic analysis will delve into the PEST framework. This framework, as outlined by Grant (2018), involves political, economic, social, and technological factors. Its objective is to systematically categorize and identify the significant external factors impacting the industry environment of Tesla. The largest markets for electric vehicles globally are China, Europe, and North America. China leads with shipments of 7.6 million units, holding a 55.5% market share. Europe follows with 3.2 million units shipped, and North America with 1.8 million units. Consequently, these markets will be the primary focus of our analysis (Canalys, 2024).

2.1.1.1 Political factors

The EV industry is currently influenced by various political factors, which can either benefit or hinder individual car companies and their market positioning in different countries, consequently impacting their financial performance. Two primary areas have been identified in the current political landscape for investigation: 1) government incentives and subsidies, 2) trade policies and tariffs. Policy is especially relevant in 2024, with an important US election looming, tax changes in China, and strong push in Europe and the US for localized production of batteries and EVs (Mckerracher, Bloomberg, 2024).

Government incentives and subsidies

The electric vehicle industry is marked by substantial government incentives and investments, recognizing that a failure to invest in the area could result in foreign competitors dominating the market. Starting with the U.S. and their enactment of the Inflation Reduction Act (IRA) on August 16, 2022, the investment in EV manufacturing have skyrocketed (Banks, 2023). The U.S. government also aims for the significant investment to shift a substantial portion of battery manufacturing from China to the U.S., thereby enhancing diversification within the industry. The IRA promotes various incentives, including those for clean energy, electric vehicles, battery, and energy storage technologies, as well as offering tax credits to consumers. As an illustrative example, this gives customers the right to receive up to $7,500 in federal tax credits for the purchase of qualified electric vehicles in the U.S. through 2032 (Tesla, 2023). Certainly, the passing of the IRA has notably boosted electric vehicle sales and battery production in the U.S., leading to the creation of millions of new jobs and billions of dollars invested in electric vehicle and battery manufacturing (Environmental Defense Fund, 2023). Tesla has also expressed strong support for the IRA, with their CFO stating, *"We're well positioned over the coming years to leverage the IRA*" (Hanley, 2023). However, in December 2023, the Biden administration intensified its protectionist agenda with the introduction of a proposed rule and guidance regarding the Inflation Reduction Act's (IRA) foreign entity of concern requirements. Aiming to bolster U.S. manufacturing and reduce dependency on China and other nations for EV components and critical minerals (Brady, 2024). This directly affects a company like Tesla, as they source their batteries for the Model 3 from China. Consequently, they will no longer qualify for tax credits for the Model 3 Rear-Wheel Drive and Model 3 Long Range models from December 31, 2023 (Ibid).

When looking at China, substantial debates have arisen in recent years, particularly in the EU, regarding investigations into unfair state subsidies. EU Commission President Ursula Von Der Leyen voiced these concerns, stating: "*Global markets are now flooded with cheaper electric cars. And their price is kept artificially low by huge state subsidies*" (Blekinsop, 2023). Since 2009, the electric vehicle (EV) market in China has received substantial backing, with an estimated $28 billion allocated to subsidies and tax breaks. This significant investment has propelled China to the top spot in both production and sales (Yu, 2023). However, experts speculate that many

Chinese EV manufacturers have been artificially sustained, as most remain non-profitable, with only BYD proving profitable (Ibid). With the recent surge in EV volume in China, the government has opted to reduce government incentives, potentially leading to a decrease in demand. A decline in demand in China could result in overcapacity, leading to a flood of Chinese cars entering the global market. Undoubtedly, this scenario is likely to urge the imposition of trade barriers, particularly by the EU.

Trade policies and tariffs

Favorable government policies and a substantial domestic market have been instrumental in paving the way for EVs in China (IEA, 2023). Despite incentives and subsidies from the U.S. and the EU, they have not yielded results as significant as those in China. As a result, there is a growing focus on imposing trade barriers on China. The apprehension regarding China's dominance is evident, as even Elon Musk, who previously laughed at Chinese competitors, acknowledged during a recent Q3 (2023) earnings call with the statement: *"The Chinese car companies are the most competitive car companies in the world…frankly, I think, if there are not trade barriers established, they will pretty much demolish most other companies in the world"* (Kharpal, CNBC, 2024). Currently Europe by far account for the largest share of Chinese EV export, due to the regions high demand, low import tariffs and substantial government subsidies for EVs regardless of origin (Sebastian, 2023). In contrast China-based producers have largely avoided exporting to the U.S. which has a 27,5% tariff on automotive import from China (Kharpal, CNBC, 2024). According to recent data, the EU car industry will concede annual loss in net profits of $7 billion by 2030 (European Parliament, 2023). There exists an asymmetric relationship that the EU must address, as it imports approximately five times more BEVs from China than it exports to China. However, data has showed that two-thirds of EU imports of EVs from China are from legacy EU and US firms manufacturing in China. Tesla is by far the largest exporter of electric vehicles from China to the EU, with 39% in the first six months of 2023 (Preussen, 2023). If the EU Commission uncovers evidence of subsidies in Chinese EV producers, it could have a significant impact on Tesla's market share in the EU, as well as other Western producers of EVs in China, that exports to EU.

Clearly, both the U.S., Europe, and China are competing for dominance in the lucrative EV market, potentially leading to a trade war characterized by retaliation and a shift towards a more protectionist market in the future.

2.1.1.2 Economic factors

Macroeconomic Sensitivity

The automotive industry, can be characterized as highly cyclical. This means, that the industry is highly correlated to the state of the economy and the strength of the consumer sector (Boyle, 2022). Cars are so-called big-ticket items, meaning high-priced goods that are purchased by consumers with low frequency. This makes the industry very sensitive to the economy's upswings and downswings, as consumers and businesses are more likely to purchase a vehicle during times where they feel confident about their personal economic prospects. Figure 12 below, illustrates this, showing that vehicle sales historically tend to mirror economic growth.

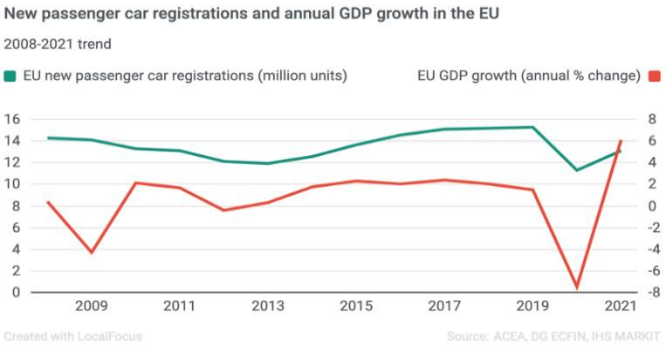


***Figure 12**: Data retrieved from* (Acea, 2020).

For many years, the interest rate levels haven't had any significant influence on the industry, as it has been rather stable, resulting in many people taking advantage of zero-interest loans to purchase vehicles. However, the recent years interest rate hikes have changed this. In the fourth quarter of 2023, new vehicle sales with zero-interest financing accounted for only 2,3% of all sales in the US. (Boudette, 2024). In that period, monthly payments for car loans also rose to near-record highs, at an average of $739. This tough credit environment has strong impact on the industry. In general, the recent years' unstable macroeconomic environment, makes it harder for manufacturers to predict demand, and might impact the pace of additional capacity investments. A good example of

this is Tesla's hesitation to go full speed on their new Mexico Factory, due to economic uncertainty (Navarro, 2023).

Zooming in on the three big markets for EVs, China, Europe and US, there are region-specific economic factors important to consider. China has had a rough 2023 and early 2024, with slowing growth, driven by a domestic real estate crisis (Bradsher, 2024). Confidence among businesses and consumers plunged in April 2022 amid Covid-19 lockdown, but even as the economy reopened in 2023 it remained weak (Goldman Sachs, 2023). When confidence is low, consumers are less likely to make big purchases, such as buying a new car. According to Goldman Sachs (2023), China's investment in the "New Three" industries (electric vehicles, batteries, and renewables) may not completely counterbalance the negative impacts of the property downturn over the next few years. The sector is expected to compensate for only about 50% of the anticipated 6 million job losses in the property and internal combustion engine industries in 2024 (Leahy, 2023). Many economists argue that confidence among Chinese consumers won't be restored until the property market is stabilized, and this could have a big impact on EV sales in China (Ibid). However, China surpassed Japan in 2023 to become the world's largest auto exporter, creating a strong new revenue stream for the country (Goldman Sachs, 2023).

Consumer confidence in Europe and the US has shown greater improvement, but remains low compared to pre-covid levels. US has been quite efficient in fighting inflation, and lowering interest rates, showing strong economic resilience (Rosen, 2024). On the contrary Europe are seeing consistently low growth, and struggles to handle high inflation and interest rates (Santander, 2023).

Commodity Prices

Reaching cost parity with ICEs is a crucial part of boosting EV adoption. Higher gas prices and lower electricity prices contributes significantly to the attractiveness of EV's. In general, it is becoming increasingly more cost effective to own an EV, due to electricity prices outperforming gas prices. A study done by The Washington Post (2023) covering refuel in all 50 states of the US, concluded that it is cheaper to refuel an EV, and that it will continue to get cheaper as renewable capacity expands and battery range improves (Coren, 2023).

2.1.1.3 Social factors

An analysis conducted by McKinsey indicates a significant transformation in consumer preferences to achieve a net-zero economy by 2050, as outlined in the Paris Agreement (United Nations, 2023). By then, oil and gas production are projected to decrease by 55% and 70%, respectively. Additionally, the transition will eliminate demand for ICEs, with EV sales rising from 5% in 2020 to nearly 100% by 2050 (McKinsey & Company, 2022). Moreover, the demand for low-emission energy sources will increase substantially, as power demand in 2050 is expected to more than double compared to current levels. Companies with expertise in carbon capture and storage technologies stand to gain from this transition as well (Ibid).

A recent study has highlighted a strong correlation between a country's GDP per capita and its adoption of EVs (Cristina & Jose, 2022). Wealthier nations tend to embrace emerging technologies sooner, as their consumers can afford greater investments in innovations (Chol, 1990). This phenomenon may explain why economically prosperous economies such as China, Europe, and the United States dominate EV sales. Nevertheless, capturing the interest of emerging economies, remains a significant hurdle for EV manufacturers. As per World Economics (2024), these economies span 24 nations, collectively contributing to 50.1% of the global GDP in 2023 and boasting a combined population of 4.3 billion with an average life expectancy of 75 years. One of the primary challenges is that EVs still remain too expensive for most residents in emerging economies. However, data suggests that by as early as 2025, the total cost of owning an EV, factoring in purchase price, maintenance, fuel expenses, and resale value, is projected to be lower than that of an ICE car in most regions. This trend is primarily driven by the rapid decline in battery prices and the more efficient production of EVs resulting from economies of scale (McKinsey & Company, 2022). Consequently, there has been a surge in EV sales in emerging markets in recent years. This trend is particularly noticeable in countries like India, Thailand, and Indonesia, where a growing middle class, coupled with government incentives, has propelled the adoption of EVs (Editorial Board, 2023). This should dispel the misconception that EVs are exclusive to wealthy nations, as the adoption rates in emerging economies are strong. This suggests that a sizable yet untapped market exists, presenting a potentially lucrative opportunity for electric vehicle manufacturers.

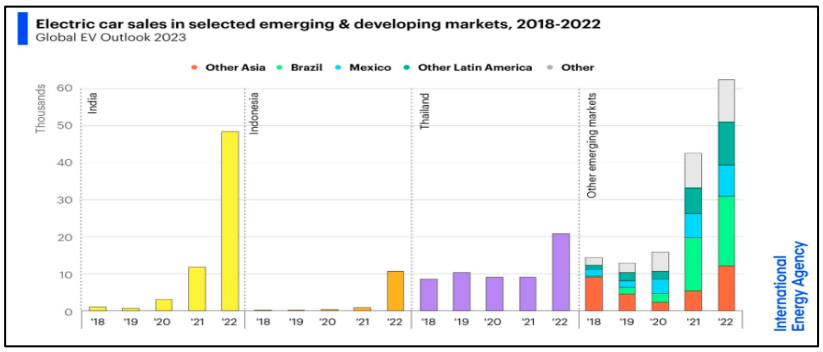


***Figure 13**: Data retrieved from* (IEA, 2023)

2.1.1.4 Technological factors

Even though there has been a surge in EV sales, there are still notable obstacles hindering widespread adoption. Some of the most significant challenges stems from technological concerns, such as high upfront cost, range anxiety, charging infrastructure and battery concern (EXRO, 2024). The high initial cost has historically hindered widespread adoption of EVs. However, recent technological advancements have made EVs more affordable, even for individuals with average incomes. As of March 2023, there is an average of 23% price difference between ICEs and EVs in the U.S., with ICEs priced at $48,008 and EVs at $58,940. Considering the $7,500 tax credit for zero-emission vehicles (ZEVs) in the U.S, the cost of an EV comes down to $51,440, which is comparable to the price of an ICE.

The main expense in manufacturing an EV lies in its battery, which accounts for nearly a third of the overall production costs. Therefore, decreasing battery production expenses is key to reaching competitive price levels. According to Moore's Law, costs are expected to decrease by consistent percentages with each doubling of cumulative production units. For batteries, this means a doubling in energy density approximately every 12 months, along with a halving of costs every five years. Following this trend, it's clear that EVs are on track to become more affordable than ICEs (Vinkhuyzen, 2023).

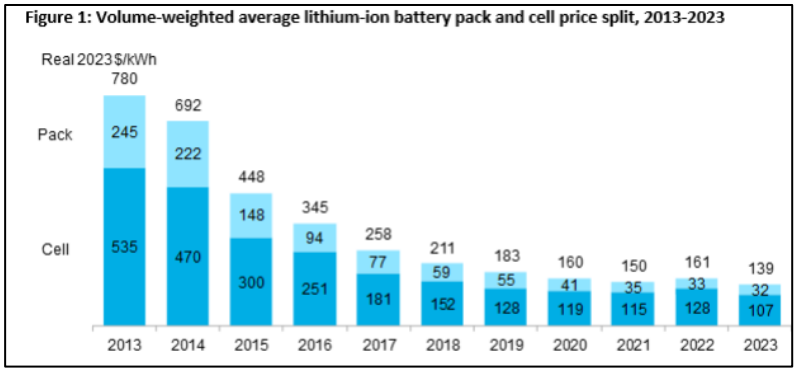


Figure 14: *Data retrieved from (Vinkhuyzen, 2023)*

As illustrated in the graph, it is evident that that the price has seen a huge decrease throughout the years, as the technology gradually improves. On a regional basis, average battery pack prices were lowest in China, at approximately $126/kWh, where packs in US and Europe were 11% and 20% higher, respectively. China holds a significant advantage in battery manufacturing due to its control over many input materials. While it may not possess the richest natural resources for batteries, it commands most of the world's refinery capacity for essential materials like cobalt, nickel sulfate, lithium hydroxide, and graphite, which are pivotal in battery production (Yang, 2023).

This situation has created pressure on both the U.S. and Europe, which have not been as focused on long-term planning for securing natural resource capacity. Nonetheless, according to surveys conducted among miners and metal traders, prices for crucial battery metals such as lithium, nickel, and cobalt are expected to further decrease in 2024. Coupled with ongoing technological innovations and manufacturing enhancements, it is anticipated that battery pack prices will hit $80/kWh by 2030, rendering EVs even more cost-effective (BloombergNEF, 2023).

Another aspect to consider is range anxiety and the inadequacy of charging infrastructure. In a January 2021 survey conducted by Worldwide, 54% of the 18,250 respondents emphasized the importance of vehicle range when purchasing a new EV. Recent advancements have markedly enhanced the range capacities of EVs, with the Lucid Air Dream Edition Range setting a benchmark with an 835km range, closely followed by the Tesla Model S Long Range at 650km, as reported by Statista (2023). However, these figures represent the peak of current EV range capabilities rather than the average. Statista (2022) forecasts that by 2025, the mean range for EVs will be approximately 380 kilometers, escalating to 440 kilometers by 2030. In this context, it is

anticipated that leading manufacturers, including Tesla among others, will continue to surpass these averages, achieving significantly extended ranges.

The charging infrastructure is a critical element in the widespread adoption of EVs. According to the latest Electric Vehicle Charger Global Market Report for 2024, the EV charging infrastructure is anticipated to reach $125,39 billion by 2030, expanding at a CAGR of 25,4% from 2024 to 2030 (Research And Markets, 2024). This growth is propelled by advancements in technology and stringent government policies aimed at promoting environmental sustainability. By the close of 2022, the world saw approximately 2.7 million public charging stations, with over 900,000 units installed in that year alone marking a 55% increase from the previous year's total, as reported by the IEA in 2023 (IEA, 2023). The Asia-Pacific region, led by China, was identified as the largest market for EV chargers in 2023 (Ibid). Future projections anticipate a surge in the integration of fast-charging stations alongside a rise in residential and commercial charging solutions. Hence, for companies involved in developing the charging infrastructure, there may be considerable profits to be realized.

2.1.1.5 Sub-conclusion: PEST analysis

The EV industry is deeply affected by political factors. Governments worldwide are supporting the transition from ICEs to EVs with significant incentives, such as the US Inflation Reduction Act, to drive decarbonization and establish leadership in renewable energy sectors. Meanwhile, China has solidified its position as a major force in the EV market through substantial government subsidies, contrasting with the US' protectionist measures against Chinese imports. This has led to a trade imbalance, especially with Europe's more open import policies. With increasing concerns over China's market dominance, the US and EU may consider higher tariffs, raising the potential for a trade war that could see Chinese companies leading in their local markets, while Western brands maintain strong positions in the US and Europe.

The EV sector is highly sensitive to economic fluctuations. This cyclical nature means that consumer confidence and broader economic conditions significantly influence vehicle sales. Recent interest rate hikes have led to a decrease in zero-interest financing deals, making car loans

more expensive and potentially reducing sales. Economic instability has made it difficult for manufacturers to commit fully to new investments.

Social dynamics among consumers also drive the growth of the EV market. There is an increasing demand for low-emission products as consumers aim to reduce their carbon footprint, which boosts EV sales and accelerates the phase-out of ICE vehicles. While EV adoption has been strong in advanced economies like the US, EU, and China, emerging markets such as India and Thailand are witnessing growing adoption due to more affordable pricing and a rising middle class, presenting significant opportunities for EV manufacturers.

Technological advancements are crucial in enhancing the convenience, performance, and cost-efficiency of EVs, playing a vital role in the transition from ICE vehicles. Challenges such as high upfront costs, limited range, and slow charging times are being addressed through rapid technological developments. The rate at which both the automotive industry and consumers adopt EVs largely depends on the progress of these technologies.

Overall, the macro environment presents certain risks, including the potential for trade wars, economic instability, and rising interest rates. However, these challenges are viewed as short-term obstacles. In the long term, the EV market is expected to be propelled by social dynamics and enhanced adoption of EVs, driven by technological advancements.

2.1.2 Industry Trends

The industry is currently experiencing an unprecedented transformation. Disruptive forces are reshaping the landscape at a remarkable speed, introducing changes more rapid and profound than anything previously witnessed in the sector. This section aims to outline the trends set to define the industry's future, encapsulated by the acronym “ACES”, highlighting the shift towards vehicles that are *Autonomous*, *Connected*, *Electric*, and *Shared*.

Autonomous driving

Most cars on the road already have basic features of advanced driver assistance systems (ADAS), including adaptive cruise control, lane-keeping assistance, and automatic emergency braking.

Besides enhancing driving convenience, this also increases safety, as it is estimated that 90% of road traffic accidents leading to death, are due to human error (Babla, 2020). McKinsey further highlights a study, showing that the growing adoption of ADAS in Europe could reduce the number of accidents by 15% by 2030 (Deichmann, et al., 2023). The most transformative is the prospect of autonomous vehicles or fully self-driving vehicles. The progress being made in AI, machine learning and deep neural networks is speeding up the development of autonomous driving (AD), requiring no human intervention (Deichmann, et al., 2023). It has the potential to completely revolutionize mobility and would be a historic technological leap. The Society of Automotive Engineers, has made classification system, known as SAE levels, that defines the automation capabilities of vehicles. See figure 14 below.

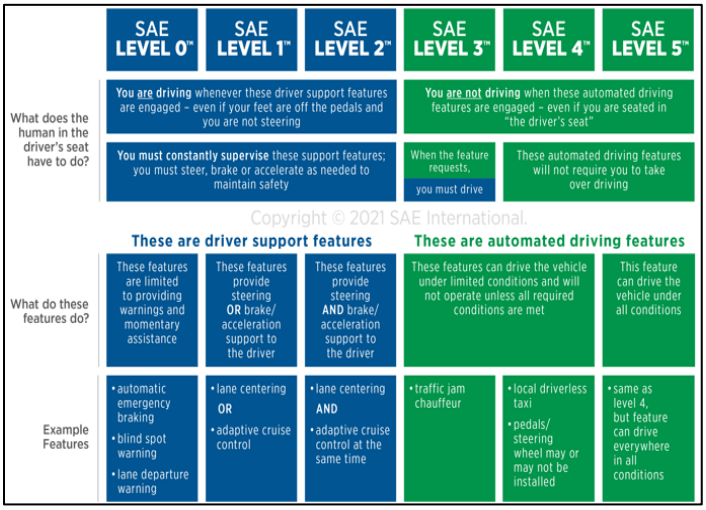


***Figure 15**: Data retrieved from* (SAE, 2021)

Private passenger cars

For passenger cars, AD has the potential to revolutionize how consumers experience passenger-car mobility. By not requiring any human intervention, AD can give consumers the option to do essentially whatever they desire while sitting in the car, such as work, consume entertainment, eat, or take a nap. It could significantly increase productivity. Imagine for instance, a person who drives 30.000 kilometer a year, to and from work, shifts to an autonomous vehicle and spends that time working instead. Apart from productivity, other use-cases could be improving mobility for elderly and disabled people and attracting more people away from urban areas towards rural and suburbs.

In a survey conducted in 2021, consumers showed high willingness to consider AD features, with 1/4 of car buyers being highly interested, however less open to driving fully autonomous vehicles (Möller, Padhi, Pinner, & Tschiesner, 2019). However, there are major challenges to roll-out and adoption of the technology. While safety is an argument for AD, it is also a key factor preventing higher consumer confidence in the technology. Developing the technology to make it safer will be key for mass-adoption, and to gain trust among regulators. Regulatory support is critical to overcoming safety concerns, create the ecosystem around it and implement global standards. As a start, luckily the auto industry and public authorities already largely agree on AD's potential to save lives (Deichmann, et al., 2023). However, currently there are no global standards for AD functions in private vehicles, but many regulators are working on it (Ibid).

Commercial vehicles

The opportunity for AD to be implemented for commercial use is huge. It could transform several commercial vehicle industries, such as freight transport, taxis, shuttles, busses, delivery etc. Fully self-driving trucks offer major potential efficiency, cost, reliability, workforce and safety improvements. For long-distance truck delivery, regulation put a constraint to how fast logistics companies can deliver goods to customers (Malman Law, 2023). Fully self-driving trucks could solve this problem, as the driver could rest while the truck drives autonomously, significantly lowering delivery times, leading to more satisfied customers, less accidents due to driver errors, and substantial cost savings. At some point, the driver could be fully replaced by the autonomous driving technology, significantly reducing labor costs. McKinsey expects this to be possible from 2027 (Chottani, Hastigns, John, & Neuhaus, 2018).

AD technology will also tap into the taxi and shuttle industry, with so-called robotaxis and roboshuttles. Autonomy for taxis and shuttles is much further developed than for private cars, with regulation already in place to enable pilot-projects allowing vehicles to drive around without human supervision in place like San Fransisco, Phoenix, Beijing, and Shanghai (Yang, 2024). One major challenge is reaching cost-parity with conventional taxis and Ubers. Currently, the technology requires some degree of remote human supervision to operate safely, resulting in high operating costs for taxi and shuttle companies, which is then transferred as higher costs for the end-consumer (Ibid). That means that the robotaxis aren't competitive and profitable. At the same

time, while scaling and expanding the service would likely bring down costs, some players are reluctant to do this, due to safety concerns and the fact that it takes much time and investment to adapt the technology to a new geographical area, as it is based on a meticulously pre-scanned map (Ibid).

Connected vehicles

Connectivity is the second trend shaping the industry. Briefly speaking, the concept revolves around vehicles using connectivity and digital features to provide a superior mobility experience (Bertoncello, Martens, Schneiderbauer, & Zedelius, 2023). Today, 50% of cars sold already offer connectivity to some degree, however mostly simple features like tracking vehicle use and monitoring technical status. By 2030 this share is expected to increase to 95% (Ibid). It is becoming an increasingly important criterion for consumers, as the number of consumers willing to switch brand for better connectivity increased by 30%-points from 2014-2022 (Ibid). Autonomous driving is expected to significantly increase the need for improved connectivity, as the focus previously dedicated to manually operating the vehicle can now be redirected towards other activities, including those involving digital features. The main challenges organizations face involve establishing a profitable business model, navigating technological hurdles, and building awareness and interest in their technology.

Shared mobility

The introduction of autonomous vehicles could significantly accelerate the potential of the shared mobility. As PwC writes in a report, "*it will no longer be necessary to search for a shared vehicle in the surrounding area: instead it will be possible to order vehicles to wherever the user happens to be via a convenient "on demand" service*" (Kuhnert & Stürmer, 2018). Hence, autonomous vehicles are an enabler that will make sharing concepts much more economically viable and convenient for the customer.

Separation of hardware and software

The "ACES" trends described above, will together push software to the forefront as a key buying factor and differentiator in the industry. All the above mentioned trends have strong implications for automotive electronics and software. The increasing significance of software suggests a major shift: the potential separation of hardware and software, which could fundamentally change the automotive sector's landscape of players and value. Traditionally, original equipment manufacturers (OEMs) comprehensively defined the specifications down to the smallest detail, and then suppliers delivered on this. However, with software now emerging as a critical factor for customer preference and a competitive differentiator, the process of vehicle production is expected to evolve into a more collaborative co-development between OEMs and their suppliers. Existing OEMs might not have the capabilities to develop the software, meaning tech-players may have a window of opportunity to enter the industry. Hence, we might see an increasing threat of new entrants, which will be covered more in depth in the Porters 5 forces analysis.

2.1.2.1 Sub-conclusion: Industry trends

The automotive industry is being reshaped by the ACES trends—Autonomous, Connected, Electric, and Shared vehicles. Autonomous driving promises to enhance safety and efficiency by reducing human-error accidents and transforming both personal and commercial transport. Vehicle connectivity is becoming ubiquitous, enhancing the user experience with advanced infotainment systems and vehicle monitoring. Electrification is accelerating, driven by environmental imperatives, requiring robust infrastructure and advancements in battery technology. Shared mobility, fueled by autonomous technology, is poised to reduce the need for private car ownership, especially in urban areas. Lastly, the increasing importance of software in vehicles is leading to a separation of hardware and software roles, potentially inviting tech companies into the automotive sector and altering traditional industry dynamics. These trends collectively demand innovative, strategic responses to leverage opportunities and navigate challenges in a rapidly evolving market.

2.1.3 Porter's Five forces

To analyze the industry, the thesis utilizes the Porter's Five Forces model (Grant, 2018). The objective of the model is to analyze competition and attractiveness of the industry, which is determined by five forces of competitive pressure. This includes three sources of horizontal competition: threat of new entrants, threat of substitutes and competition from established rivals; and two sources of vertical competition: power of suppliers and power of buyers. The industry to be analyzed is defined as the electric vehicle market, not the automotive industry as a whole. The focus of the analysis is on how the five forces shape the industry, rather than how it affects Tesla specifically. This section first covers the analysis of the five separate forces, and then provides a conclusion on the strength of each force and how it affects the attractiveness of the industry. It's worth noting that traditional automotive companies currently serve as entrants, substitutes, and competitors in the market.

2.1.3.1 Bargaining power of buyers

As attractive EV options are increasingly brought to market, the bargaining power of buyers will naturally increase. Established automotive companies are gradually transitioning into EV production, thus a lot of new models are introduced to the customers, giving them more freedom to choose based on their needs. This increases the bargaining power of buyers, threatening industry players. Moreover, it gets harder to retain existing customers. In a recent survey, McKinsey found that brand loyalty in the automotive sector is weakening, with more than half of the respondents saying that they are very likely to switch brand when moving from ICE to EV (Furcher, Giraldo, Felix, & Smith, 2023). This is a threat to the established automotive players that also offer EV models. McKinsey (2023) argues that the decreasing brand loyalty is natural in times of systemic change, as consumers are more willing to abandon long-standing loyalties.

As a result of the softwarization trend, the customer experience is becoming increasingly personalized. Through software settings, the consumer is capable to adapt the car to personal preferences, and personalization increases switching costs (Arora, et al., 2021). Hence, having a car that is not just a mechanical machine for transportation, but rather a personalized *"computer on wheels",* will increase the hassle of switching from one brand to another for the customer. This will significantly reduce the buyers' bargaining power.

2.1.3.2 Bargaining power of suppliers

Vertical integration trending to gain control of supply chain

Critical to EV production is the supply of lithium batteries, and with current growth rates, there will be shortages of lithium as a raw material going forward. In a report, BCG estimates that lithium reserves will be insufficient to meet EV demand at current rates of investment, possibly reducing BEV global market share by up to 6% by 2030, putting at risk some six million new BEV sales (BCG, 2023). Such supply constraints make the EV industry fragile, and with this skewed supply-demand relation, suppliers clearly have more bargaining power than EV manufacturers. This explains why, in recent years, there has been a trend towards backward vertical integration to minimize supply disruptions. Many major companies are increasingly investing in incorporating the production of batteries and other components directly into their supply chains (John, 2023). The majority of these investments are carried out through partnerships across the industry, and according to investment bank Nomura Greentech, there has been "*an unprecedented amount of announcements, joint development agreements, early supply contracts from the automakers with battery materials providers, with battery manufacturers in a collaborative way that I don't think we've really seen*" (John, 2023). This is a direct contradiction to the traditional automaker supply chain. In the past, automakers, in particular American and European ones, were outsourcing activities in their supply chains, relying on a plural of suppliers for each component of a car (John, 2023). Hence, the current trend of vertical integration, is a complete transformation of these companies' supply chains (Lyengar, 2004). Companies like General Motors and Ford have formed equity alliances with lithium suppliers (Chris, 2023). Similarly, the success of industry leaders like Tesla and BYD can be attributed in part to their extensive vertical integration (Mak, 2023).

Due to significant demand, the suppliers are experiencing high growth, thus becoming less dependent on each customer. The companies who integrate backwards via alliances, joint ventures and partnerships reduce the bargaining power of suppliers, but those who don't will struggle to get access to critical raw materials.

Chinas dominance in the supply chain

Critical raw material reserves for battery and EV production, such as lithium, cobalt and nickel are heavily concentrated in specific geographic areas. While the majority of these reserves are not physically located in China, the country has managed to gain control of the supply chain. China sits heavy on lithium, providing the Chinese suppliers with high bargaining power. The figure below, shows China's dominant market position in various stages of the lithium battery value chain.

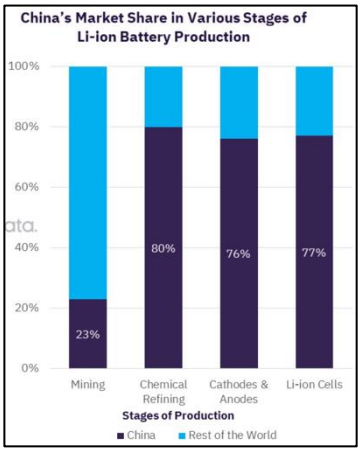


Figure 16: *Data retrieved from* (GlobalData, 2022)

During a webinar held last year, McKinsey asserted that "*what was Europe for ICEs is today China for BEVs*" (McKinsey & Company, 2023). This shift poses a significant ecosystem challenge for the European and American industry. Chinas strength in this market, has provided its domestic EV-manufacturers with a head start in securing deals with battery-suppliers. Western EV manufacturers are on the other hand more exposed as they currently depend on having access to China and other Asian countries' lithium battery supply. This represents a significant threat to industry players, especially considering the rising geopolitical tensions between the West and China. Becoming the global leader in battery and EV-supply chains is part of Chinas "*National 13th Five-Year Plan for the Development of Strategic Emerging Industries*", issued in 2016 (CSET, 2019). This plan has governed significant investments, leading to the country's competitive advantage (Singleton, 2023). EU and US made an alliance in 2017 to set targets to ramp up battery production capacity (EIT, 2024). Currently, China holds a significant lead, which diminishes the bargaining power of other industry players. Many major Western EV manufacturers already obtain their lithium batteries from China. For example, Tesla acquires a substantial portion of its batteries from its competitor BYD. Similarly, Stellantis, the company behind brands like Peugeot, Fiat, and

Jeep, recently entered into an agreement with CATL, the world's largest battery manufacturer (Global Times, 2023)

2.1.3.3 Threat of new entrants

The EV industry is protected by significant entry barriers, primarily due to the high capital needed for R&D and production facilities. Developing a new vehicle is time-consuming and expensive, with substantial funds invested long before production starts. Once development is completed, scaling up for mass production presents the next challenge. Established players further solidify their position by leveraging economies of scale, which reduces the cost per vehicle and enables them to maintain higher profit margins and afford substantial price cuts. Tesla is a prime example of this, having recently reduced prices to maintain its market share. While this strategy has led to a reduction in gross margins for Tesla, dropping from 40% to 17.6% in Q4 2023, the company's margins still significantly surpass the industry average of approximately 9%. This benefit is largely due to Tesla's low cost of goods sold (COGS), achieved through economies of scale (Naughton, Business Insider, 2024). New market entrants lack the necessary volume to harness economies of scale, and in the current competitive pricing environment, their higher COGS could severely impact their margins, potentially threatening their survival. Furthermore, established players have better access to a reliable supply of raw materials and batteries, advantages that new entrants often struggle to secure.

Grant (2018) explains that the effectiveness of barriers to entry depends on the resources and capabilities that potential entrants possess (Grant, 2018). Hence the effectiveness of the barriers to entry, depends on which kind of company is entering. The following sections divide entrants into three sections: major automotive companies, pure-play EV start-ups and tech companies.

Major automotive companies

Most major automotive companies are gradually transitioning from ICEs to EVs, a process that involves substantial challenges but also leverages their existing resources and capabilities. These companies have the financial strength to invest heavily in EV production and access to comprehensive supply chains, established brands, and technical know-how. However, phasing out

ICE production poses significant exit barriers, as it involves either costly transformations of their factories to accommodate EV production or selling these specialized sites at a likely discount. Despite these challenges, established automakers have a considerable advantage over startups in entering the EV market. Figure 17 below, clearly showcases how some of the established automakers utilized their financial strength to invest aggressively in EVs between 2019 and 2022 (IEA, 2023).

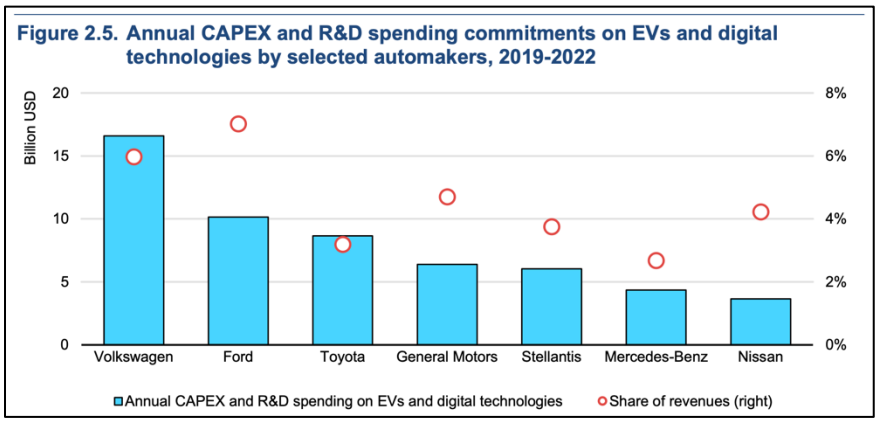


Figure 17: *Data retrieved from* (IEA, 2023)

Pure-play EV startups

Compared to the established automotive companies, start-ups lack several of the resources and capabilities required to enter the industry. Most will be challenged by the high capital requirement, access to effective supply-chains and lack of scale benefits. Early- and growth-stage venture capital (VC) funding for EV-car startups has been falling steadily since 2017 (IEA, 2023). This is a testament to the fact that the industry is maturing, and competition is increasing, making it harder for start-ups to achieve a position in the market. The more the market consolidates and matures, the more VCs become hesitant, as the risk of investing increases. Instead, they are looking for opportunities in other parts of the value chain, either upstream such as batteries and minerals or downstream such as charging infrastructure (IEA, 2023). Therefore, at this stage of the industry lifecycle, the threat posed by these players is not substantial.

Major tech companies

The softwarization taking place in the industry, driven by the trends autonomous vehicles, connectivity, electrification, and shared mobility, provides an unprecedented window of opportunity for big tech companies to enter the industry. The change of value perception for customers, when choosing a vehicle, bring software to the forefront, and the traditional value chain of the industry can be completely disrupted by tech-players. Today, major consumer-electronics companies already dominate the infotainment in cars, i.e. the touchscreen or display mounted in the dashboard in the middle of the car, and in the future a smartphone-like system will likely be the new normal in cars (Burkacky, Deichman, Kellner, Keuntje, & Werra, 2021).

The primary threat from tech companies lies in the autonomous driving sector. McKinsey (2021) suggests that advancements in this technology could significantly disrupt the market, attracting new entrants and benefiting tech firms with strong software development skills. Traditional automakers (OEMs) may struggle due to a lack of necessary tech expertise, talent, and R&D capabilities, potentially increasing their dependence on tech companies. However, leading EV manufacturers with capabilities in software and over-the-air updates might maintain a competitive edge, offering some resistance (Ibid). More details on autonomous driving will follow in the section covering competition in non-core segments.

Leading tech players have for several years worked on bringing their own electric vehicle to market. For instance, back in 2014, Apple launched Project Titan; a plan to build an autonomous EV. However, in February this year, a decade and $10 billion in investments later, Apple decided to cancel the project (Binns, 2024). This choice was made to focus efforts on generative AI instead. While other tech companies, like Chinese smartphone manufacturer Xiaomi remain committed to their EV plans, Apple's withdrawal from the race could signal that the industry has become too consolidated and competitive to enter (South China Morning Post, 2024). As Binns (2024) speculates, the window of opportunity to do something category defining may be closed and catching up with Tesla's, BYD's and others' technology may require too much work, even for big tech companies.

2.1.3.4 Threat of substitutes

The obvious alternative to EVs is fossil-fueled cars or so-called internal combustion engines (ICEs). While it is for certain that the world of automobiles is moving from the traditional ICE vehicles towards zero emission vehicles, this transition is slow and globally ICE still dominates. According to data from Bloomberg (2023), global passenger vehicle sales in 2022 was still heavily dominated by ICEs, with EVs only accounting for 14% (see figure 17 below). Despite that ICEs are forecasted to decrease rapidly in share over next decades, it is projected to still account for a large share even 10 to 15 years from now (Mckerracher, Electric Vehicle Outlook, 2023). Hence, EV cars will continue to compete with ICE cars for many years.

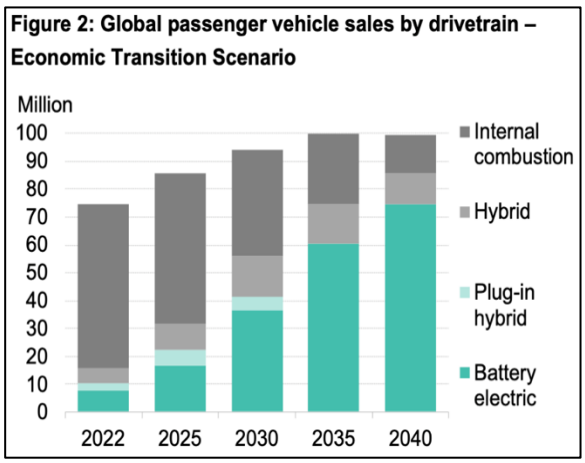


Figure 18: *Data retrieved from* (Mckerracher, Electric Vehicle Outlook, 2023).

Hybrids and plug-in hybrids continue to serve as effective alternatives to fully electric vehicles. Many consumers opt for these vehicles as a transitional choice between ICEs and EVs, preferring not to make a direct switch to EVs. This preference is why many original equipment manufacturers (OEMs) continue to produce hybrids and plug-in hybrids instead of focusing exclusively on EVs. Companies like Tesla, which exclusively produce EVs, may sacrifice potential revenue from hybrid markets but could benefit from a concentrated focus on EVs. As depicted in figure 18 above, the trend suggests that plug-in hybrid sales are expected to rise but will account for almost none of the market share in 2035. Meanwhile, hybrid vehicles are anticipated to increase their market share, reaching peak sales around 2030, before gradually decreasing thereafter.

Adoption constraints

EVs represent a disruptive technology, prompting some customer resistance to transitioning from ICEs. However, the decreasing price and operational costs, including charging, make EVs increasingly appealing compared to ICE vehicles. This affordability plays a significant role in shifting consumer preferences towards EVs. Additionally, the expansion of charging infrastructure and enhancements in EV range are improving their convenience. Despite these advancements, historical concerns over these factors have often deterred potential buyers from adopting EVs. Like expert in petroleum economics and energy policy, Michael Lynch (2023), puts it, "*Adding six to eight hours to the travel time of a three hundred mile trip is the kind of thing that will turn off many potential buyers*" (Lynch, 2023). The issue of convenience affects not only potential EV buyers but also current users. As Lynch (2023) points out, dissatisfaction with the current level of convenience could pose significant challenges for the industry and the broader adoption of EV technology. A survey supports this argument, revealing that 21% of EV owners are discontent enough to consider switching back to ICE vehicles (Ibid). Currently, ICE vehicles still have the upper hand in terms of convenience, offering longer ranges, more developed infrastructure, and an abundant supply of gas stations. Although the shift towards EVs is undeniable, the pace of this transition remains uncertain. To accelerate the pace of transition, the industry's ability to break down these barriers to adoption will be critical.

Intensive lobbying from automotive giants slows EV adoption

London-based think, InfluenceMap, first released its list of the world's most obstructive companies on climate policy in 2019 (InfluenceMap, 2019). The list identified the 33 most influential corporations opposing climate policy, and six automotive players made the list: Fiat Chrysler, Ford, Daimler, BMW, Toyota, and General Motors. Since 2015, these companies, together with associations, have led the auto industry's lobbying effort to block, delay and frustrate initiatives to regulate and reduce emissions in the sector, thereby slowing the transition to EVs (Laville, 2019). However, fortunately for the EV industry, the opposition is falling, with four auto companies making the list in 2021, and only two (Toyota and BMW) in 2022 (InfluenceMap, 2022). It appears, that as the big automotive companies are ramping up EV production and slowly starting to phase

out their ICE business, the lobbying effort against climate policy favoring EVs, is reduced. Hence, while lobbying is still helping to keep the ICE substitute alive, the threat is falling.

Threat from alternative fuels

While the global consensus agree that the future of driving is electric, there are alternative fuels. Hydrogen-powered vehicles (aka. fuel cell electric vehicles (FCEV)), is similar to a traditional EV, in that is uses an electric motor, but is fueled by a combination of hydrogen and oxygen that produces electricity (Voelcker, 2022). Hydrogen vehicles offer multiple benefits, the most notable being their quick refueling capability, which is comparable to the time it takes to refill a car at a typical gas station. (AJ Caldwell, 2020). On range, it also slightly outcompetes EVs. These are two of the major challenges to EV adoption, and a hydrogen car might therefore be a feasible solution. Toyota, Honda, and Hyundai are among the companies that have introduced hydrogen-powered vehicles. However, these vehicles are still in their early stages, similar to where the EV industry was 10-15 years ago. Production is limited, which means manufacturers haven't yet reached the scale needed to offer products at competitive prices, and the infrastructure for refueling stations is not well-developed (Voelcker, 2022). Bloomberg (2023) states in their Electric Vehicle Outlook, that hydrogen vehicles currently play no meaningful role in the market. Less than 16.000 fuel cell cars were sold globally in 2022 (IDTechEX, 2023). They are projected to grow at a 23% CAGR from 2023-2044, but this will amount to less than a 5% share of global zero-emission vehicles by 2044 (IDTechEX, 2023). Boston Consulting Group is also modest in its estimate, projecting that it will account for less than 1% of vehicle sales in 2035 (BCG, 2023). Hence, hydrogen vehicles indeed have attractive attributes that outcompete EVs on certain parameters, but as a mid-to-long-term threat it shouldn’t be taken too seriously.

2.1.3.5 Rivalry among existing players

The analysis of the competitor landscape focuses primarily on battery-electric vehicles (BEVs).

Tesla and BYD way ahead

The sector features numerous participants but is predominantly controlled by a select few large firms, characterizing it as an oligopoly. Recent developments in the broader automotive industry, including EVs, have shown a trend toward consolidation, with a notable increase in mergers and acquisitions, joint ventures, partnerships, and alliances, as highlighted by (Bandini, 2020). This trend has led to an industry largely governed by a few major corporations. As should be clear at this point, the industry is growing rapidly and in 2023 a total of 9,5 million BEVs were sold globally, up 35% from 2022 (Carey, 2024). Of those 9,5 million vehicles sold, just four companies accounted for half, as illustrated in figure 18. With 1,8 million vehicles sold, Tesla controls 19% of the market, closely followed by BYD with a 17% market share, being the two biggest players by a large margin. BYD is rapidly gaining ground on Tesla, even surpassing them in the fourth quarter of 2023. These two firms dominate the market, jointly accounting for a third of the total sales volume, significantly ahead of the third-largest player, European Volkswagen Group. Based in Germany, the Volkswagen Group includes several well-known brands such as Skoda, Audi, and Porsche, making it the largest European contender with an 8% market share. This compares to BMW and Mercedes-Benz Group, which hold 4% and 2% of the market, respectively. The remaining top-10 companies consists of South Korean based Hyundai Motor Group incl. the Kia brand ranked 5th in the world, and Chinese based Geely Group, GAC Aion and SAIC-GM-Wuling. Although Tesla experienced a 38% increase in deliveries from 2022 to 2023, it is losing market share to competitors who are undergoing significantly faster growth.

These competitors include BYD, Geely Group, GAC Aion, BMW, and Mercedes, which recorded growth rates of 73%, 51%, 77%, 74%, and 73% respectively, as shown in figure 19. Hence while these (except for BYD), are still far behind Tesla on EV sales, they are catching up, and taking market share.

Top 10 BEV Players

Company	Tesla	BYD	Volkswagen Group	Geely Group	Hyundai Motor Group	GAC Aion	SAIC-GM-WULING	BMW Group	Stellantis	Mercedes-Benz Group
Market share, %	19%	17%	8%	6%	5%	5%	5%	4%	3%	2%
Deliveries, millions	1,8	1,6	0,8	0,6	0,5	0,5	0,5	0,4	0,3	0,2
Share of total deliveries, %	100%	53%	8%	22%	7%	100%	33%	15%	5%	9%
Delivery growth 2022-23, %	38%	73%	35%	51%	N/A	77%	4%	74%	21%	73%

Note: Globally, full year 2023

Figure 19: *Own creation*

As shown in the table, the majority of top auto manufacturers still derive a significant portion of their sales from ICE vehicles, with battery electric vehicles (BEVs) making up a small fraction of their total car sales. Among the top 10, only Tesla and Gac Aion specialize exclusively in BEVs, while BYD, having ceased production of ICE vehicles in 2022, now focuses on EVs, with the remainder of its deliveries being plug-in hybrids. Common for the other major players, is that the majority of their sales still stems from ICE vehicles, hence ICE remains their core business. However while the BEV sales don't yet account for a substantial share of their business, it is growing rapidly, with several of the players reporting >70% volume growth in 2023. Many of these companies have set ambitious EV targets. For example, Volkswagen aims for all-electric production by 2033, Geely Group by 2030, and Hyundai Motor Group aims to sell 1 million EVs by 2025. SAIC-GM-Wuling anticipates that EVs will make up 40% of its total sales by 2025, and BMW Group expects 50% of its sales to be EVs by 2030 (IEA, 2023). Meanwhile, Mercedes has postponed its target, now aiming for EVs to represent 50% of its sales by 2030, a five-year delay from its original goal (Waldersee, 2024). Other players, not included in the tables, also have ambitious EV targets. These include Ford targeting 600.000 BEV sales by 2026, Toyota seeking to introduce 10 EV models by 2026, and Honda scaling EV production capacity to >2 million units annually by 2030 (IEA, 2023).

While already being highly consolidated, the industry is expected to become even more concentrated over time. According to Ford CEO Jim Farley, "*the massive amounts of capital needed to invest in the technologies will force smaller companies to be acquired and put pressure on new electric-vehicle start-ups that are already running into trouble as funding dries up*" (Wayland, 2022). In order to simply survive the transition from ICE to BEV, smaller companies will likely have to be acquired to access sufficient funding. Farley also states that the partnerships and joint ventures dominating the industry today, will be replaced by acquisitions going forward (Wayland, 2022). Hence, we will likely see an industry that will be dominated by a few large players, and the size of these will increase through acquisitions of smaller competitors, resulting in high concentration.

Differentiation

EVs are heterogenous, meaning different models have attributes that are significantly different from each other. Like traditional automobiles, players compete on quality of materials, interior, acceleration, comfort etc. However, one main attribute setting EVs apart, is the range factor. As the charging network is much less developed than gas stations, and as EVs can travel on average only half the distance of ICEs before requiring a *"refuel",* range is critical to whether users can make it to the next charging spot or are able to complete their daily commuteVanderwerp, 2022). Hence, competitors can outperform each other by increasing range of their models. Most modern BEVs can top 322 km on a full charge, but a few models significantly outperform the market (Fink, 2024). European and American producers like Tesla, Mercedes, BMW, GMC, Genesis, Porche and Rivian dominate the top 10, with California-based Lucid's "Air" model coming out on top with 660 km (Fink, 2024). However, Chinese automaker Zeekr's (part of Geely Group) new model can reportedly travel a whopping 1032 km, which would slash current competition (Aresco, 2023).

Price is also a major differentiating factor. This is proved by the current price war between some of the industry's major players, especially number one and two Tesla and BYD. Recent price cuts are considered as a response to slowing demand and overcapacity, especially in the world's largest market, China (Kao, 2024). BYD and Tesla has been slashing prices lately, to gain market share and release excess capacity. Only a few companies can currently carry through with such price cuts and still maintain a profitable business.

Cost, scale, and capacity

Companies can distinguish themselves by leveraging cost advantages. Major manufacturers such as Tesla, BYD, and Volkswagen benefit from substantial economies of scale, enabled by their large production volumes and efficient manufacturing techniques. In the current climate of the industry, minimizing costs is crucial for maintaining healthy profit margins. This is particularly vital in the race to introduce affordable EV models aimed at broadening the customer base, as it puts additional pressure on manufacturers' margins. Therefore, firms that achieve lower production costs gain a significant competitive edge over their rivals. With the rapidly growing demand for EVs, manufacturers are also challenged on capacity. Having the capacity to produce enough

vehicles with quick speed is critical to meet demand. Capacity and scale serves as some of the major barriers to entry, as it takes years or decades to build up sufficiently.

2.1.3.6 *Sub-conclusion: Porters Five Forces*

Tesla and BYD are currently way ahead of competitors, but several players are catching up. As shown in the analysis, Tesla have been losing market share consistently during the past few years, while number two and three, BYD and Volkswagen Group has been increasing share. Tesla has undoubtedly had a first-mover advantage for many years, but as ICE-manufacturers are increasingly scaling up EV production and bringing new competitive models to market, we expect Tesla's global market share to continue to decline over the next years. This will especially be caused by losing share in the Chinese market. Emerging Chinese rivals such as BYD have strong cost advantages, enabling them to offer low-cost affordable models to customers. With almost a quarter of Tesla's total revenue coming from sales in China, a decline in market share can significantly impact the company.

Chinas role is significant, due to their strong control over the supply chain, especially critical raw materials for battery production, such as lithium. This favors domestic Chinese players, and is a threat to American and European manufacturers. In order to safeguard against supply chain dominance, manufacturers have increasingly integrated backwards, improving control over supply chain via M&A, partnerships, alliances and joint ventures. However, adding the geopolitical tension between the West and China as well as the highly active subsidy intervention by the Chinese government to the equation, western players are highly exposed. Based on the analysis, it is expected that domestic Chinese players like BYD, Geely Group and GAC AION will capture substantial market shares from western players in China over the coming years. For the American and European players who currently have a strong presence in China, such as Tesla and Volkswagen, this will have strong consequences. Given that China is the world's largest car-market, losing ground here, could significantly impact their global position in the industry.

The overall competitive environment is intense, especially due to price wars, to gain market share from rivals. Recent periods have shown that players are willing to sacrifice profitability, in order to capture a larger share of the market, by bringing down prices. Large players with economies of

scale such as Tesla, BYD and Volkswagen group have an advantage, as they can maintain profitability despite offering lower prices, due to their strong and efficient production. Players that don't manage to control costs, risk being put out of business if these price-wars continue.

The analysis also showed, that the nature of the players competing in the automotive landscape is changing. From being completely dominated by traditional car-manufacturers, the presence of emerging trends like autonomous driving, shared and connected vehicles and softwarization, has attracted several large tech companies to the market. For the general industry, these should be seen as potential partners, rather than just competitors. Capturing value from the trends, can be difficult for car-manufacturers who may not have the existing resource and capabilities, why partnering up with leading tech players seems like a good solution.

The Porters five forces analysis paints a picture of an industry with a promising growth outlook, however with an intense competitive rivalry. Combined, the factors result in an industry with an overall medium level of attractiveness.

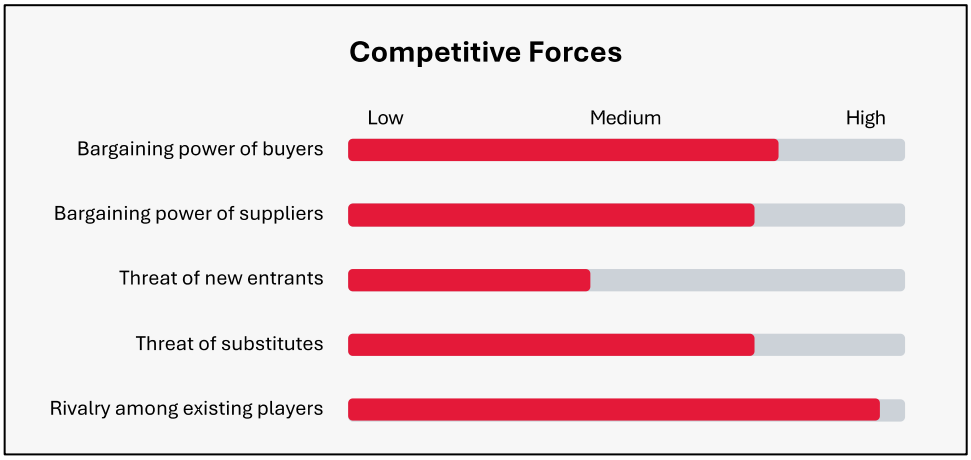


Figure 20: *Own Creation*

2.1.4 Competition among non-core segments

This section will examine the industries of Tesla's non-core segments.

2.1.4.1 Battery Energy Storage Systems

McKinsey highlights the growing significance of the energy storage sector in bolstering renewable energy production, ensuring a consistent contribution towards meeting global energy demands. Investment in BEES saw a dramatic upsurge in 2022, with funding exceeding $5 billion, nearly tripling the figures from the previous year. The forecast for the global BEES market is optimistic, projecting an expansion of between $120 billion and $150 billion by 2030 (Linder & Erik, 2023). This market is broadly categorized into two primary segments: 1) front-of-the-meter (FOTM) utility-scale installations, exceeding ten megawatt-hours in capacity, and 2) behind-the-meter (BTM) setups, encompassing commercial and industrial installations that vary from 30 kWh to ten MWh (Ibid). The utility-BEES market is on a rapid ascent, forecasted to expand at a CAGR of 29% leading up to 2030. By this time, annual utility installations are anticipated to reach between 450 to 620 gigawatt-hours, potentially constituting up to 90% of the total market value. This expanding segment is one that Tesla is investing in significantly with its Megapack storage system (Tesla, 2023). The competitive landscape of the global BEES market tightened in 2022, with the top five global system integrators commanding a 62% market share of total BEES shipments in megawatt-hours, according to insights from Wood Mackenzie, a prominent consultancy in the energy sector (Greentechlead, 2023). The distribution of market leaders is as follows:

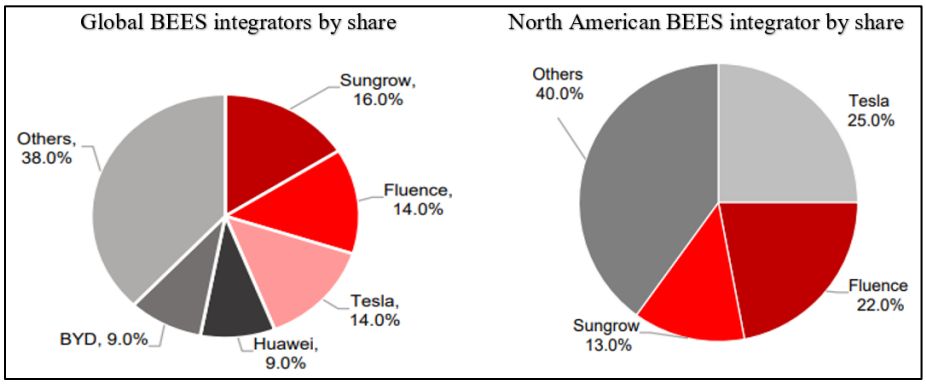


Figure 21: Data *retrieved from* (Greentechlead, 2023)

The competitive landscape of the BEES sector is notably consolidated, and dominated by a few large players, yet also characterized by the presence of numerous smaller entities, represented by the “others” segment. In 2023, Tesla surpassed Fluence to become the largest player in North America, capturing a 25% market share. This region is particularly strong for Tesla, aligning with its significant presence in the electric vehicle (EV) market. Major players are channeling billions into BEES initiatives, driven by the sector's anticipated rapid growth. Despite severe competition,

Tesla's Megapack stands out as a highly competitive offering in comparison to those of its rivals, as detailed in appendix 10. BYD and Tesla both adopt a similar research and development approach, opting to manufacture their energy storage solutions internally. This strategy contrasts with Fluence's decision to utilize external suppliers, thereby affording BYD and Tesla enhanced control and flexibility within their supply chains. Additionally, Tesla's inclusion in BloombergNEF's Tier-1 BEES list, as noted by Colthorpe (2024), highlights its significant position within the energy storage sector.

Looking at regional presence, the North American market are especially consolidated, with the five major players above collectively hold an 81% market share, indicating a highly concentrated market landscape. This concentration is largely influenced by the Inflation Reduction Act (IRA), which is expected to significantly propel market growth, positioning North America as a pivotal region for leadership in the sector (Greentechlead, 2023). Conversely, the Asia Pacific market, particularly China, presents a different scenario with China commanding an 86% market share in 2022. Despite this dominance, the market is more dispersed and marked by vigorous competition, with companies facing challenges from both ends of the supply chain. In Asia Pacific, price competitiveness has emerged as a critical determinant for securing contracts. This environment poses challenges for companies like Tesla when contending against locally subsidized competitors, highlighting the contrasting market dynamics between North America and Asia Pacific (Ibid).

It is evident that the leading companies in the BEES market are channeling substantial investments into expanding their portfolio, motivated by its forecasted rapid expansion. The competitive landscape is indeed robust, yet the anticipated rapid growth of the BEES market suggests plenty opportunity for multiple major players to not only coexist but also to thrive and reap substantial profits. The top contenders, with their superior product offerings and benefitting from economies of scale as well as from synergistic product ecosystems, are poised to drive this sector to exciting new heights in the forthcoming period.

Overall, the market dynamics are characterized by intense competition, dominated by a handful of major players who have managed to consolidate their position. This consolidation leaves little room for smaller competitors, largely due to the extensive tacit expertise required and the substantial financial barriers to entry

2.1.4.2 Humanoid robots

A recent report by Goldman Sachs states that the market for humanoid robots could reach $38 billion by 2035 with a CAGR of approximately 20% (Goldman Sachs, 2024). Today the global market size is valued at $1,68 billion. The humanoid robot market is complex, and different companies have different forces. According to UBTECH's official website humanoid robots can be divided into six tiers (ie, L0 to L5) by the degree of intelligence. Currently, the development of humanoid robots is in transition from L3 to L4, reflecting the gradual improvement of "autonomous" functions, see appendix 11. Within the robotics industry, distinct advantages emerge among various players based on their pioneering efforts in software and technology (UBTECH, 2024). The sector is multifaceted, broadly categorizing into three main groups as described by (Wang, 2024):

Traditional Robotics Firms: Entities like Boston Dynamics in the U.S. and Honda in Japan are pioneers in this space. With decades of robotics research under their belts, these companies have mastered advanced motion technologies and maintain a consistent product sales performance.

Technology Giants with AI Expertise: Companies such as Tesla in the U.S. and Google's Deepmind stand out for their leadership in artificial intelligence. They are actively channeling substantial resources into research and development (R&D) and production, aiming to introduce humanoid robots in the foreseeable future. Their investment is driven by a vision to harness AI for enhancing the capabilities and applications of humanoid robots.

Rising Humanoid Robot Startups: Firms like Agility Robotics, 1X Technologies and Figure AI represent this emerging segment. Often possessing niche technologies, these startups show promising rapid commercialization potentials. Their agility and innovation enable them to quickly adapt and respond to market needs, positioning them as key players to watch in the robotics revolution.

This segmentation reflects the diverse approaches and specializations within the robotics industry, highlighting the dynamic nature of technological advancements and market strategies across different sectors. The robotics industry's landscape showcases a different set of strategies and expertise, underscoring the sector's quick evolution driven by technological innovations and diverse market approaches.

The humanoid robot market is marked by a spectrum of competitors. An indication to investor confidence in this growing field is highlighted by Figure AI's remarkable fundraising achievement. This startup, noted for crafting robots that closely mimic human appearance and functionality, has captured widespread interest for its potential to revolutionize roles in sectors like shipping, logistics, warehousing, and retail, which are industries facing labor shortages. Figure AI's successful $675 million fundraising round, culminating in a $2.6 billion valuation, is sustained by investment from tech giants such as Jeff Bezos, Nvidia, and Microsoft (Palmer, 2024). This flood of capital signals Figure AI's prominent stance within a group of firms striving to make humanoid robots a mainstream reality. Concurrently, entities like Agility Robotics, enjoying Amazon's backing, are scaling up operations to produce thousands of their bipedal robots annually, underscoring the competitive heat Tesla's Optimus robot is set to encounter from both established and emerging ventures with substantial investment (Ibid). Yet, the overarching hurdle remains affordability. As delineated in appendix 11, the prevailing price points suggest a significant barrier to broad adoption, posing a challenge that the industry must navigate to realize the full potential of humanoid robotics in everyday applications.

Nonetheless, a robot such as Tesla's Optimus is regarded as highly cost-effective compared to human labor and will reduce in cost as the market matures (see calculation in the products section, under company overview). This evaluation gains further relevance considering the World Health Organization's projection that by 2030, one in six individuals globally will be 60 years or older, indicating a substantial market for robots designed for labor-intensive tasks (World Health Organizatoin, 2022). The shifting demographics hint at a forthcoming labor shortage, positioning humanoid robots as ideal substitutes. According to Goldman Sachs, AI has the potential to displace the equivalent of 300 million full-time jobs while simultaneously enhancing the global annual value of goods and services by 7% (Talmage, 2024). This data suggests a robust market for humanoid robots, and given the current advancements in AI, the pace of development could accelerate beyond previous expectations.

2.1.4.3 Autonomous vehicles

While autonomous driving is in the early development stage, it has a huge growth potential in the coming years and decades. According to Statista, the market for autonomous vehicles could reach

$2.3 trillion in 2030, which is bigger than the current global passenger car market (Placek, 2023). As described in the industry trends section, the key bottlenecks to mass development and commercialization are regulation, technology, and consumer safety (Chiao, et al., 2024). According to a survey conducted by Mckinsey (2024), the market will be highly concentrated. The majority of the 86 respondents (consisting of industry decision makers), predict that only three or less companies will capture a dominant share of the market, with only two or less in the European market (Ibid). Data from the Financial Times reveals, that auto and tech companies are the biggest investors in the industry, with about half of all funds being directed towards developing a *"full system"* (McGee, 2020). This suggests that these companies are aggressively positioning themselves to capture a significant market share and are aiming to dominate. This is noteworthy considering the high risk and uncertainty of such investments, especially given the prediction that only a few companies will ultimately succeed. If this forecast proves accurate, the 2-3 companies that ends up dominating, could see their revenues soar by capturing a significant portion of a $2.3 trillion market by 2030. While it's challenging to predict which companies will emerge as leaders, this section will first highlight the key factors crucial to gaining a competitive edge and then explore the current competitive landscape.

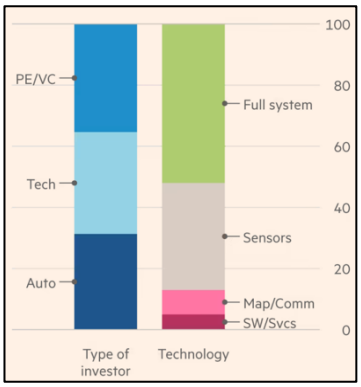


Figure 22: *Data retrieved from* (McGee, 2020)

Key success factors

The main obstacle for players to convince regulators and customers is proving that autonomous vehicles are safe. In order to do this, a key metric called *"disengagement miles",* is reported by companies to show their progress. It indicates how many miles the vehicle travels autonomously,

before disengaging from autonomous mode and being intervened by a human. According to the California Department of Motor Vehicles (DMV), who releases an annual report on autonomous driving, disengagement occurs "*when a failure of the technology is detected or when the safety driver needs to take immediate control of the vehicle*" (DMV, 2024). This number show how strong and safe the technology is, with the higher the distance before disengagement, the better. Companies that advance on this, will send a strong signal to regulators and customers, that their technology is safe.

The autonomous driving technology is based on artificial intelligence, as it must be capable of making decisions itself without human intervention. To effectively develop AI, you need huge amounts of data, and that is why data-gathering is key to succeeding with autonomous driving. Gathering this data, is done via different forms of testing, including virtual simulations, closed test tracks, and on public roads. The objective of this testing is to collect extensive data representing real-world driving scenarios, enabling the vehicle to be trained in making decisions regarding the appropriate action to take when encountering specific scenarios. The larger the amount of data, the more scenarios the car will be prepared for, and the safer and better it will be. Those mastering this will gain strong competitive advantages.

Competitor Overview

No company has yet reached large scale commercialization, but some are ahead when it comes to testing their product on public roads. California is the only entity in the world with public data on testing and authorizations, through the annual report mentioned before. From the report, it appears that in 2023, 38 companies have permits to test autonomous vehicles with a safety driver, 6 have permits for driverless testing, and only 3 are authorized the deployment of autonomous vehicles, meaning moving beyond the testing phase and now being allowed to operate autonomous vehicles on public roads, in selected areas, for commercial use (DMV, 2024). Interestingly, Tesla does not hold permits in any of the three categories mentioned.

Waymo and Cruise ahead

Alphabet's (parent of Google) subsidiary, Waymo, is one of the three companies, and is considered a pioneer in the industry, as it first started developing back in 2009 (DMV, 2024). In 2018, Waymo launched the world's first commercial autonomous ride-hailing service in Phoenix, US. Leading in California with 438 vehicles and 3.67 million miles driven last year, Waymo benefits from its early market entry and extensive testing, which is crucial for safety and efficiency. The company conducts tests on public roads, private tracks, and in simulations, having completed over 20 billion miles in simulations alone. According to Saswat Panigrahi, Waymo's chief product officer, their significant testing scale and Google's computing power, which supports 25,000 virtual vehicles running simulations 24/7, are key competitive advantages (Field, 2023). US-based Cruise, is a close competitor to Waymo. Majority owned by the automaker General motors (GM), it was founded in 2013 (Cruise, 2024). Like Waymo it is one of the pioneers in autonomous driving, and has been testing on California roads since 2017. Since California started to publish testing data 9 years ago, Cruise and Waymo have been dominant, as seen on figure 23 below.

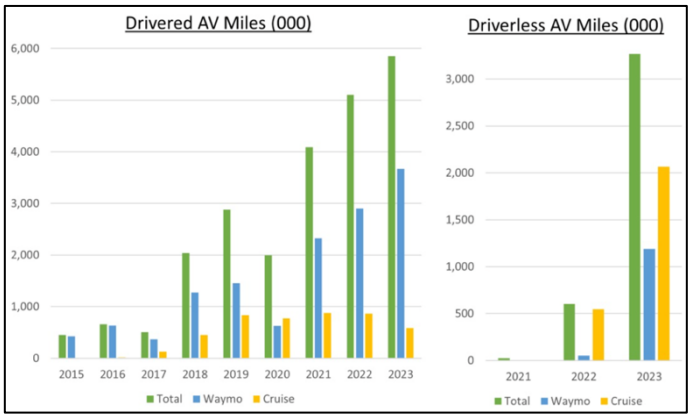


Figure 23: *Data retrieved from* (Juliussen, 2024)

However, in the fall of 2023, Cruise was forced by regulators to recall vehicles and pause all driverless operations, following an incident in San Francisco where a pedestrian was struck by a normal passenger car, and then hit a second time by a Cruise robotaxi that wasn't able to stop in time and then dragged the pedestrian for 20 feet (Lu, 2023). This is a major setback for the company, which was in the middle of an expansion effort, to start testing in more US cities. This incident highlights the fine balance between needing to rapidly develop and expand testing to stay

competitive, yet also prioritizing safety, as even a minor error can lead to significant setbacks or potentially end projects entirely.

Mercedes Benz is the second of only three companies authorized to deploy driver-less vehicles on Californian roads, moving beyond testing (DMV, 2024). Thereby, it is the first automaker to receive US state approval for deployment of SAE Level 3 vehicles (Mercedes-Benz, 2023). Thus, among traditional automakers, Mercedes appears to be leading the competition, in the US at least. The German automaker has been in the game for some time, first starting testing back in 2015. In fact, it is the only company together with Waymo, that has been consistently testing every year since DMV started to publish their report in 2015 (Ibid). To develop self-driving capability, Mercedes has partnered up with Nvidia, to benefit from its strong AI capabilities (Altavilla, 2020). Mercedes' German peer, Volkswagen Group, has taken a similar partnership approach, joining forces with Microsoft, to produce autonomous vehicles running on Microsoft's cloud-based technology (Microsoft, 2021).

Trucks

For trucks, several companies have also committed to developing autonomous technology. The global truck manufacturer MAN announced its full commitment to developing autonomous trucks in 2021, with a planned full rollout by 2030 (MAN, 2021). The company is currently testing its technology in Germany. Formerly associated with Mercedes, Daimler has publicly disclosed its plans to develop autonomous trucks in collaboration with Alphabet's Waymo (Daimler Truck, 2024). Other key players in this field include Volvo, Paccar, and Iveco, all of which are forming partnerships with tech companies.

An industry characterized by co-development

As outlined in industry trends, there is a growing divide between hardware and software within the automotive sector, with co-development becoming increasingly common. This trend is particularly evident in the creation of autonomous vehicles, where most Original Equipment Manufacturers (OEMs) are opting to collaborate with technology firms. These collaborations take

various forms, such as investments, acquisitions, joint ventures, and partnerships. Although the methods differ among companies, most engage in partnerships to co-develop. While this strategy reduces investment risk, it may also result in lower returns compared to pursuing developments independently. The figure below, clearly illustrates how leading automotive firms are partnering with tech companies.

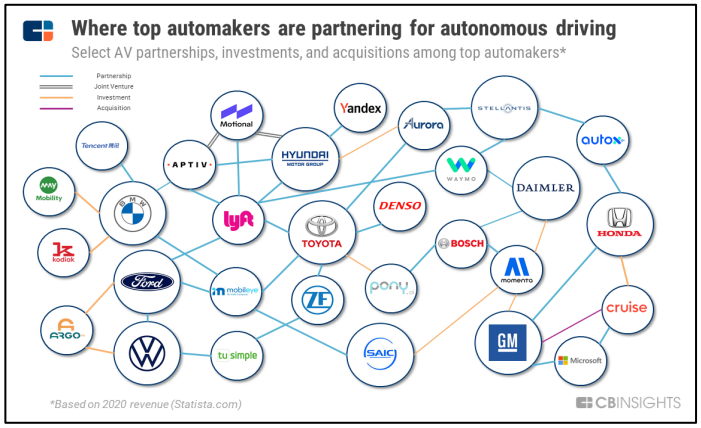


Figure 24: *Data retrieved from* (CBInsights, 2021)

2.1.4.4 Autonomous ride-hailing

Ride hailing could see significant growth in the coming years, fueled by the trends shared mobility and autonomous driving. McKinsey estimates that the global industry (North America, Europe and China) will generate between $450 and $860 billion in revenue by 2030, with autonomous ride-hailing accounting for as much as $70 billion to $410 billion (Heineke, Kloss, Ruden, Moller, & Wiemuth, 2023).

Globally, the competitive landscape of ride-hailing is fragmented, consisting of many different regional players. According to Statista, almost half of the market is accounted for by the category *"other"* which are small players with less than 2% market share (Statista, 2024). The American company Uber is the clear dominant leader, with approximately 25% market share. The company operates in +70 countries, making it one of the few global players, and has reached 150 million monthly active platform consumers, according to its lates investor presentation (Uber, 2024). The second biggest, is American company Lyft, with approximately 8% market share. A few smaller players like Bolt, inDriver, Grab, and Gojek each hold between 2-5% of the market.

Compared to traditional human-driven ride-hailing, the autonomous ride-hailing or *"robotaxi"* market is currently quite small. According to a 2022 report by Frost & Sullivan, the market size for robotaxis was only $3 million (Frost & Sullivan, 2022). However, the same report forecasts that the market will expand to $65 billion by 2035, with an impressive compound annual growth rate (CAGR) of 105%. This projected growth is partly due to the competitive pricing of robotaxis; for consumers, a ride costs 67% less than using a personal vehicle and 93% less than a traditional taxi (Ibid). For operators, the costs associated with the necessary hardware and software are decreasing rapidly. These factors position robotaxis as compelling alternatives to conventional taxis and shuttles.

Competitive Environment

The industry is still in its very early stage, hence the majority of players are still in the development and testing phase, while a few companies such as Cruise is already operating a small robotaxi service, in selected US countries. As seen on figure 25 below from the Frost & Sullivan report, the landscape consist of different stakeholders, including traditional ride-hailing companies, Automotive OEMs (incl. subsidiaries) and tech companies.

	Players & Roles	
Private Transport Companies	Private sector transportation companies operating public transport networks looking to shift part of their services to autonomous mobility	Transdev, Keolis, Arriva, Deutsche Bahn AG
Public Transport Companies	Private sector mobility providers looking to shift some of their services to autonomous mobility	MARTA, Hamburg Electric Autonomous Transportation, Rotterdam Metropolio, Ile-de-France Mobilités
Transnational Corporations (TNCs)	Connected car companies that will transition their ride-hailing fleets to robotaxis	Uber, Lyft, DiDi Chuxing, Baidu Apollo
Captive Subsidiaries of OEMs	Automobile manufacturers with in-house divisions developing and operating robotaxis	Cruise, Argo, Motional, Aurora, Tesla
Autonomous Vehicle Manufacturers	Standalone autonomous shuttle and robotaxi manufacturers	NAVYA, EasyMile, Yandex, ABB, e.Go, Next, Polaris, AutoX, Einride, Magna
Autonomous Technology Providers	Self-driving technology developers and suppliers	LeddarTech, Sensible4, Velodyne, Waymo, Luminar, ZF, Moovita, May Mobility
Autonomous Support Providers	Self-driving testing, simulation, communication, and infrastructure suppliers	Autotalks, Savari, Connexion, Bosch, Continental

Figure 25*: Data retrieved from* (Frost & Sullivan, 2022).

Ride-hailing companies: For ride-hailing companies like Uber and Lyft, there is a very strong incentive to transition their ride-hailing fleet into autonomous robotaxis, as it offers significant cost reductions and efficiency gains. Cost of human labor (their largest expense) would be saved, and they would be able to operate 24/7, and not only when the human driver is available. If succeeding in developing robotaxis, these companies have a significant advantage, as they already have access to the consumer base through their app and large ride-hailing network. Hence, for these it is about getting access to the technology, so that they can transition their existing human-driven fleet into an autonomous one. Uber realized this potential early, starting in-house development back in 2016 (Frost & Sullivan, 2022). However, they ended up selling the division to Start-up Aurora for $4 billion in 2020 (Frost & Sullivan, 2022). In 2022, Uber then entered into a partnership with autonomous driving company Motional (a joint venture between Hyundai and tech company Aptiv), signing a 10-year deal. Hyundai as a car-manufacturer can benefit from Ubers ride-hailing ecosystem, and Uber can benefit from Motional's autonomous technology.

Car-manufacturers: For traditional automakers, the emerging robotaxi market offers a chance to adopt a new business model by transitioning to mobility-as-a-service (MaaS), where they can provide vehicles through subscriptions or lease them out as robotaxis (Frost & Sullivan, 2022). Various strategies are being pursued by these companies. For instance, General Motors and Renault-Nissan are looking to develop and operate their own robotaxi services through subsidiaries and investments, respectively, moving into a new domain of operating vehicle fleets instead of merely selling cars. Conversely, Toyota is focusing on developing autonomous vehicles to lease to Lyft's robotaxi fleet, integrating into an existing ride-hailing ecosystem, a strategy similar to Hyundai's collaboration with Uber (Frost & Sullivan, 2022). Tesla is adopting a unique approach by enabling Tesla owners to convert their vehicles into robotaxis using its self-driving technology, planning to create its own ride-hailing network through the Tesla app (Tesla, 2023). This strategy sets Tesla apart, as it intends to restrict its autonomous vehicles to its own platform, competing directly with companies like Uber.

2.1.4.5 Sub-conclusion: Competition among other segments

In terms of growth, all four industries show promise, with double-digit CAGRs projected. Autonomous vehicles stand out with a potential market size exceeding $2 trillion by 2030. However, only 2-3 players are expected to dominate, making investment risky yet lucrative for those who succeed. This high risk is mitigated by most companies adopting a co-development approach, partnering to share resources and reduce risks. The competition is intense, as players rush to test and gather data to speed up development, but at the same time being careful not to roll-out unsafe technology which could result in fatal accidents and even kill the project.

The ride-hailing industry faces disruption from autonomous vehicles. Companies developing self-driving cars will have an advantage, either licensing technology to existing platforms like Uber and Lyft or establishing their own. Traditional ride-hailing firms like Uber and Lyft have an edge with their established platforms, but their success depends on advancements in autonomous tech from car manufacturers. These manufacturers have opportunities to exploit new business models, either indirectly through licensing or directly by launching their own platforms. Tesla's decision to keep its autonomous tech exclusive signals its ambition to lead in this sector.

Battery energy storage systems also have a promising growth outlook, with projections indicating a market expansion to between $120 billion and $150 billion by 2030. The market are currently dominated by a small handful of key players, especially in North America, which benefits from legislative support like the Inflation Reduction Act. Investment in this sector are expected to keep growing due to the critical role of energy storage supporting renewable energy and stabilizing grid systems.

The humanoid robot market, though projected to grow to $38 billion by 2035, remains relatively small compared to the other industries. Its modest size, combined with the significant technological advancements required and currently limited use cases, diminishes its short-term appeal. The market features a variety of players, including traditional robotics firms like Boston Dynamics and Honda, known for their advanced motion technologies, and tech giants such as Tesla and Google’s Deepmind, which are integrating sophisticated AI to enhance robot functionality. Despite its lesser attractiveness in the short term, as assessed in this thesis, humanoid robots hold considerable long-term potential. Widespread adoption, however, hinges on reductions in cost and improvements in user-friendliness, developments that may still be several years away.

2.2 Internal

2.2.1 Corporate Strategy (Three-Step Master Plan)

This section aims to provide an overview of Tesla's strategic direction and assess the achievement of these strategic objectives. Elon Musk's optimistic and vocal approach to Tesla's agenda, coupled with various shifts over time, has made it challenging to discern the company's core focus. This analysis will clarify Tesla's strategic priorities by examining the different plans articulated by Elon Musk. The strategy can be separated into a three-step master plan.

Plan 1: The Secret Tesla Motor Master Plan (2006)

Tesla's initial corporate mission, articulated in "The Secret Tesla Motors Master Plan" of 2006, aimed to *"accelerate the transition to sustainable transportation."* This strategy began with the creation of the high-end Roadster to fund a more affordable vehicle, the Model S, which would in turn finance an even more accessible car, the Model 3 (Musk, Tesla, 2006). Additionally, the plan emphasized the provision of zero-emission electric power generation options. Tesla successfully launched the premium Roadster and swiftly moved into the more budget-friendly EV market with the Model S and Model 3. The latter was intended to be offered at $35,000, which would have marked a significant milestone in making electric cars truly affordable. However, the starting price of the Model 3 was ultimately over $52,000, with promises of less expensive versions to follow (Hawkins & Shakir, 2023). This deviation from the original price target represents one of the few aspects of the strategy that Elon Musk did not fully realize. Despite this, the Master Plan has had a profound influence on the auto industry by introducing groundbreaking electric vehicles that wasn't seen before (Ibid). There is no doubt that the first master plan was a success for Elon Musk, which initially sparked the whole Tesla hype, and made many people pre-order the mysterious cars.

Plan 2: Part Deux (2016)

The success of Elon Musk's initial Master Plan drew significant attention to Tesla, impressing many with its revolutionary vehicles. However, the second phase of the plan, introduced in 2016,

presented challenges for Tesla due to ambitious promises that proved difficult to fulfill (Hawkins & Shakir, 2023). Briefly, *"Part Deux"* shifted focus towards developing solar roofs with integrated energy storage and expanding the electric vehicle (EV) product line to cover all major segments (Musk, Tesla, 2016). It also aimed to develop self-driving capabilities that would be ten times safer than manual driving through extensive fleet learning. Additionally, these self-driving features were intended to generate income for owners when the vehicles were not in use (Ibid).

Part Deux of Tesla's Master Plan has been less successful compared to the nearly fully realized objectives of the first Master Plan. The solar roof initiative has not achieved the expected rollout, with the latest annual report indicating insignificant cash flow dedicated to this area (Tesla, 2023). However, Tesla's energy storage solutions have seen significant growth in recent years. Additionally, Tesla also launched the Model Y using the Model 3 platform, which has become their most popular model to date. This period also highlights several unfulfilled promises by Elon Musk, such as the Cybertruck and an affordable car, which many years after the first Master Plan, still hasn't approached the targeted $35,000 price point. Moreover, the strategy to develop self-driving capabilities that would be safer than manual driving has not come to completion. A 2016 video depicted a Tesla Model X navigating various driving environments, but it was later revealed that this was staged using 3D mapping on a pre-set route. Eight years on, there has not been any substantial breakthrough for Tesla (Hawkins & Shakir, 2023). In summary, Part Deux is marked by several unmet promises, particularly in achieving full self-driving capabilities, painting a picture of Elon Musk as an ambitious yet over-promising figure.

Part 3: Master Plan 3 (2023)

Despite not fully achieving the goals outlined in Part Deux of the Master Plan, Elon Musk has unveiled a new strategic direction with Master Plan 3 in 2023 (Tesla Team, 2023). The updated mission statement has shifted from "*accelerate the transition to sustainable transportation*" to "*accelerate the world's transition to sustainable energy*," indicating a broader focus. This shift away from emphasizing just transportation suggests Tesla's expansion into a wider array of products, including electric vehicles, batteries, energy storage solutions, solar panels, and related systems (Ibid). The third plan is notably detailed, heavily emphasizing renewable energy,

supported by extensive data that underscore its necessity, aligning well with Tesla's growth in the energy storage segment.

The strategy continues to emphasize electric vehicles and the urgent need to transition from fossil fuels to electrification. However, many investors and analysts were disappointed by the lack of attention to unresolved promises from previous plans, such as more affordable base models and self-driving technology, which are anticipated to drive a second wave of EV growth. These missing elements led Seeking Alpha to label Master Plan 3 as a flop, and Tesla's stock price fell by 8% following the introduction of the plan (Mckenzie, 2023).

While Master Plan 3 broadens Tesla's scope to focus more comprehensively on the transition to sustainable energy, rather than solely on vehicles, this new direction can appear complex and less straightforward from an investment perspective, at a time when a clear and robust strategic focus is particularly crucial for Tesla.

2.2.2 The resource based view – Tesla's resources and capabilities

Strategy involves aligning a company's resources and abilities with the opportunities that emerge in the external market. This chapter shifts the focus from external factors to a more company-specific view, centering on the key elements that drive Tesla's value (Grant, 2018). The section will examine Tesla's key resources and capabilities. Following, a VRIO framework will identify those resources expected to give Tesla a sustained competitive advantage.

Human resources

Tesla's reputation for innovation in the automotive sector is well-established, driven by groundbreaking technology and design. Yet, a critical pillar of its success is its robust human resource management practices. According to Tesla's 2023 annual report, the company boasts a global workforce of 140,473 employees ((Tesla, 2023). Despite criticisms from the media about a challenging work environment, Tesla is evidently doing something right in terms of fostering a culture of growth. As highlighted in their latest report, nearly 65% of managers were promoted from within, moving up from non-managerial roles, and 43% of management staff have remained

with Tesla for over five years, indicating a strong internal career development framework and a significant level of employee loyalty and retention. Another important factor is Elon Musk himself, which through leadership has helped inspire and motivate employees to work towards a common goal. Musk's work ethic and motivational prowess have fostered a culture of innovation and excellence, further evidenced by Tesla's recognition as the second-most innovative company in 2023 trailing only behind Apple (Boston Consulting Group, 2023). In 2022, Tesla reported receiving roughly 3.6 million job applications and hired about 30,000 new employees annually (Kay, 2023), indicating that the likelihood of securing a position is less than 1%. Hence, gaining employment at Tesla is even more challenging than being admitted to Harvard (Chaturvedi, 2023). This gives an indication that Tesla is doing something right, which is incremental in a competitive industry where tech companies are fighting for skilled labor. The substantial number of applications received by Tesla can be viewed as a highly favorable situation for the company, offering them the advantage of selecting the most talented and capable individuals. Additionally, Tesla is ranked as one of the most desirable workplaces for engineering students, according to Universum's 2022 US rankings. It holds the number 2 spot, just behind another of Elon Musk's companies, SpaceX (Alvarez, 2023). Tesla also ranks in the top ten most attractive employers for computer science students, thanks to its emphasis on AI, Full Self-Driving (FSD) service, and the Optimus Bot program, which appeal to those who value innovation and new technologies (Klender, 2023). This vast pool of candidates positions Tesla well to continue driving innovation forward.

Technological advancement

Tesla's edge lies in its innovative and technological DNA. At the heart of Tesla's technological advancements are two primary forces: 1) their electric vehicles and 2) their advancements in artificial intelligence and robotics. Tesla has successfully transformed their vehicles into not only technological wonders but also trendy consumer products, earning them a prestigious brand premium (Wang, 2024).

As Tesla has experienced significant growth in recent years, the company has been able to allocate more resources to its R&D efforts (Tesla, 2023). This investment fuels the development of new

products, transitioning electric vehicles from a niche to a mainstream market. This strategic approach has led to the creation of highly successful models, enhancing economies of scale, reducing costs, and boosting profits (Wang, 2024). Tesla has maintained its R&D spending at 4% of its revenue for both 2022 and 2023, ensuring that R&D investments grow proportionally with overall revenue (Tesla, 2023). Tesla's strategy to broaden their range of products and enhance their technological edge is getting recognition. According to a recent report from Quant IP, a data and analytics firm, Tesla ranks number 9 in the *"Competitive Technology Benchmarking",* scoring well in terms of patent portfolio, size and quality (QUANTIP , 2024). Its most active fields are semiconductors and solid state developments, batteries and electric energy distribution. Tesla was given a quality rating of AA, meaning that on average Tesla's patents are better than 80,9% of competitors (Ibid). Additionally, QUANT IP has made an overview of the most important technological fields, including size, growth and invention counts, where batteries, emission reduction in energy and climate change in transport are the top areas of growth, indicating that Tesla are operating within high growth areas.

The continuous evolution of intelligent technologies not only enhances the user experience but also allows software service revenues to make a more significant contribution to profits. Furthermore, this foundational progress in AI technology is a key factor attracting substantial investment from those who believe strongly in Tesla's AI potential (Ibid)

Dojo, the supercomputer of Tesla, is at the heart of its AI endeavors. This powerhouse serves as the technological foundation for autonomous driving, humanoid robots, and other smart applications (Dicksen, 2023). A fascinating aspect of Tesla's approach is their use of the extensive fleet of Tesla vehicles as a real-world training ground to enhance their AI systems. Each additional Tesla vehicle on the road not only supplements their artificial intelligence capabilities but also provides Tesla with critical data. Tesla is at the forefront of autonomous driving technology and is on track to be among the world's first companies to deploy Level 4 autonomous driving on a grand scale (Wang, 2024). This breakthrough could herald the introduction of the Robotaxi sector, poised to radically transform the taxi industry by eliminating labor costs, lowering service fees, and enabling 24/7 operation, marking a significant leap forward in transportation. With significant enhancements in FSD software, Tesla is expected to introduce a new revenue model in the future. This model will be represented by the formula: total revenue = (vehicle unit price x sales) +

(software payment x units owned). This approach clearly highlights the dual sources of revenue from both vehicle sales and software subscriptions (Ibid).

Tesla is advancing with several other remarkable technologies, notably their integration of ternary lithium batteries that offer exceptionally high energy densities, surpassing many in the industry and significantly enhancing vehicle driving ranges (Ibid). They are also at the forefront of manufacturing innovation with their adoption of single piece die casting techniques for vehicle bodies. This approach streamlines production by reducing the number of necessary components, thereby cutting costs. Moreover, by establishing a widespread Supercharging network, Tesla is effectively tackling the common consumer concern of charging anxiety, ensuring greater convenience and confidence for electric vehicle owners (Tesla, 2023). Tesla has remarkable technological capabilities, which currently are reflected in their cars, but there are much more potential to be realized moving ahead.

Inbound Logistics

Several raw materials are critical to Tesla's production, especially for battery-cell manufacturing. This includes lithium, nickel, and cobalt, which together account for a significant part of the battery cell costs. Tesla sources these the materials directly from mining and refining companies, instead of relying on an intermediary, which is the case for many competitors (Tesla, 2022). According to their impact report (2022), Tesla sources 95% of the Lithium Hydroxide, 45% of the Nickel and 55% of the Cobalt, used in its battery cells, directly from suppliers. Considering the risk of raw-material access and China's control of many critical raw materials covered in Porter's Five Forces, this sourcing strategy help Tesla safeguard its supply chain and reduce risk of bottlenecks. It also ensures more transparency, enabling the company to monitor quality closely and ensure responsible environmental and social conditions. Currently, Tesla is sourcing cells from Japanese Panasonic, South Korean LG Energy Solutions and Chinese CATL an BYD (Pistilli, 2024). This reflects a regional approach, where some batteries are used for models in China, others in Europe and so on. However, despite reducing the risk by sourcing directly from miners and refineries, 40% of Tesla's battery supply chain rely on China (Nikkei, 2023). This exposes the company, to the increasing geopolitical tensions between the US and China mentioned in the external analysis, and the protective economic measures made by the two countries. Tesla seems well aware of this,

and as a solution, the company has invested $375 million in a Texas lithium refinery, projecting that the facility can produce enough for 1 million EV's in 2025 (Nikkei, 2023).

Production Facilities

Tesla manufactures inhouse, at 8 global factories. The vehicles are manufactured at the Fremont site, Gigafactory Nevada, Gigafactory Shanghai, Gigafactory Texas and Gigafactory Berlin. Additionally, the Kato and Lathrop factories deals with battery development and pilot product production and Gigafactory New York builds solar roofs, panels and components for superchargers (Tesla, 2024). Tesla has been ramping up production with incredible speed, now having a current capacity to produce over 2 million vehicles annually (Kane, 2024). The rising scale of their production has led to significant efficiency gains and cost advantages. From 2018-2022, Tesla reduced the variable production cost per vehicle, by 50% and aims at reducing this by another 50% with the introduction of their next gen platform (Tesla, 2022). This pace is unprecedented, and an element providing Tesla with a clear cost advantage over competitors, in an industry where affordability for customers is key. Tesla's operations also proved to be very agile in its production, during the global semiconductor shortage, when it successfully redesigned its software to support alternative chips, thereby reducing delays in vehicle deliveries to customers (Emmer, Forbes, 2024). With its new Gigafactory in Mexico, currently waiting to be build, the company will further increase its capacity and strengthen its supply chain in the Americas. See the figure below which illustrates the decline in COGS.

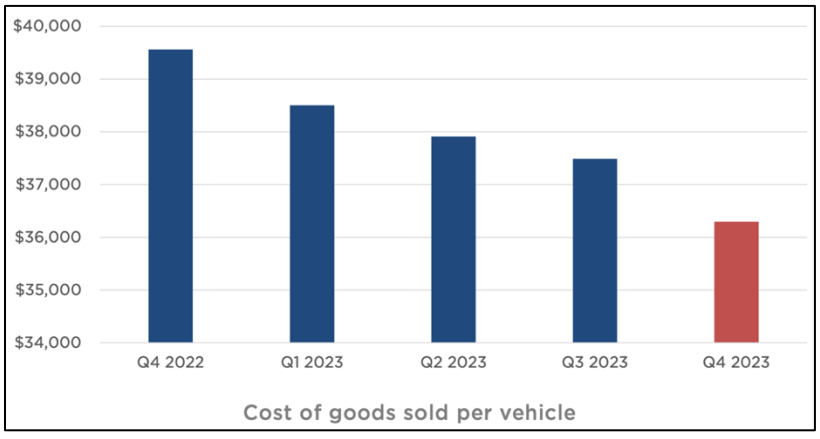


Figure 26: *Data retrieved from* (Tesla, 2023)

Marketing & Sales

On the contrary to most automotive and EV manufacturers, Tesla takes a direct sales approach, instead of relying on external dealerships or franchised stores. It has an international network of company owned Tesla stores, where customers can see, try and purchase their vehicles. Including showrooms and service facilities, Tesla currently has 823 locations worldwide (Zucchi, 2022). This approach gives it proximity to customers and enable a strong customer experience. The stores are mostly located in urban areas, and the company has from the beginning been inspired by the Apple store concept, emphasized by hiring former Apple employee George Blankenfield who was involved in the roll-out of Apple stores (Lindberg, 2014). Online sales are also key to the business model of Tesla. In a study conducted by consultancy BearingPoint in 2023, tesla came out on top as the global champion of online vehicle sales (Bock, 2023). Tesla has been a revolutionizer in the way vehicles are sold and has achieved a strong lead in global online sales. However, competitors are increasingly offering similar online sales models, with Polestar closing in on Tesla's lead (Bock, 2023).

From a marketing standpoint, Tesla also differentiates from the rest of the industry. Tesla is notorious for low spend on marketing and adds. Historically, they have mostly relied Elon Musk and his celebrity status, as well as the hype of the stock price. From a cost-perspective, this has been widely successful, as they have avoided huge spending on television adds, expensive campaigns and costly sponsorships, while still being capable of driving up sales. According to Vice, by May last year, Tesla had spent 0$ on advertising in its 15year history (Gordon, 2023). However, at a shareholder meeting last year, Musk indicated that Tesla would start advertising, but on a small scale (Associated Press, 2023). Like earlier mentioned, once again the influence and importance of Elon Musk remains a risk. Without him, it's reasonable to believe that the company wouldn't be able to maintain a zero-spend marketing approach, as the brand is strongly associated with Musk.

Service

Like the first parts of the value chain, Tesla has also integrated after sales services into its model. It owns and operates service centers worldwide to support customers after the purchase. This is highly unique, with most other automotive and EV companies outsourcing service activities (Evans, 2022). On top of the service centers, Tesla also operates a mobile repair setup, where customers can order a mobile Tesla technician to show up, wherever you are parked, and they will fix the issue on the spot (Tesla, 2024). Tesla also has a pioneering over-the-air (OTA) software capability, enabling the company to carry out software updates via WIFI for the existing fleet, thanks to its technologically advanced software systems (Tesla, 2024). Combined, the physical service center network, mobile service fleet and OTA capabilities, provide great flexibility for customers, however it also challenges Tesla to keep up, as its vehicle fleet grows.

Currently, its "services and other revenue" segment account for 9% of revenue (see figure 2), which includes part sales, used vehicle sales, merchandise sales and pay-per-use supercharging, and Tesla expects the segment to "*become a more meaningful driver of profit generation*" (Tesla, 2023). Tesla owns and operates the world's largest fast charging network, consisting of more than 50.000 superchargers located all over the world (Tesla, 2023).

Elon Musk

Elon Musk elicits a wide range of opinions, yet it's hard to dispute his genius. There's speculation among analysts that Tesla's valuation includes an *"Elon Musk premium,"* though measuring Musk's exact contribution as CEO is challenging (Monica, 2024). Despite the varied perceptions of him, it's reasonable to suggest a strong connection between Musk's persona and the Tesla brand. This person specific analysis aims to explore Elon Musk's profound influence on Tesla, supporting the notion that the stock price reflects an *"Elon Musk premium."*

In Tesla's 2023 annual report, the company outlines its reliance on Elon Musk, particularly emphasizing this point in the section addressing potential risks. The company voices its concerns regarding how Musk allocates his time, noting that his significant involvement with Tesla does not equate to full-time dedication due to his other major commitments:

"We are highly dependent on the services of Elon Musk…Although Mr. Musk spends significant time with Tesla and is highly active in our management, he does not devote his full time and attention to Tesla." (Tesla, 2023).

Tesla's reliance on Musk represents both a strength and a vulnerability for the company. Musk's role is fundamentally intertwined with Tesla's narrative. As described by a finance professor from NYU Stern School of Business, Tesla exemplifies a *"story stock"* (Denning, 2018). Such stocks are valued based on anticipated future growth, their aim at capturing significant market share, and the CEO's integral role in the company's identity (Ibid). Quantifying Elon Musk's value is challenging, yet it's undeniable that his bold promises have a significant appeal, particularly to retail investors. These expectations are driven by his ambitious forecasts regarding fully autonomous vehicles, robotaxis, humanoid robots, and a surge in EV sales due to an upcoming, more affordable model. All areas where Musk's tendency to overpromise is particularly evident and forms a key aspect of his approach (Ibid). This situation places Tesla in a precarious position, with its stock trading at a premium largely due to these ambitious goals, yet Elon Musk's track record of fulfilling promises on time is notably weak. This contradiction is precisely what renders Tesla so volatile since a potential loss of confidence in Elon Musk by the investment community could have catastrophic effects on the company's stock price.

The critical issue at hand is determining whether the substantial *"key person risk"* represents an advantage or disadvantage for Tesla as a company. In a 2023 report, Morningstar analyst Norton L. (2023) pointed out a notable risk for Tesla if Musk were to reduce his day-to-day involvement with the company. This observation stems from a detailed analysis of how Musk's decisions, such as the purchase of Twitter, have directly impacted Tesla's stock price. Moreover, the fluctuating market reactions to Musk's tweets, which seem to mirror his personal sentiments, underline the significant sway that Elon Musk holds over the company's financial performance (Ibid).

Musk recently shared his apprehensions about his ownership stake, emphasizing his unease about expanding Tesla's footprint in AI and robotics without maintaining a 25% voting control. He also hinted at the possibility of developing the AI and robotics venture independently of Tesla, a move that could negatively impact the company and its stock value (Levin, 2024). This concern arises from the fact that a significant portion of Tesla's valuation is attributed to optimistic growth projections in these areas, which are reflected in the stock price.

It's evident that Elon Musk's fate is deeply intertwined with that of Tesla, and his significant financial stake in the company's stock makes his departure unlikely. Musk's pivotal role in steering Tesla towards future achievements has essentially created an 'Elon Musk premium' in its valuation. However, his unpredictable actions could gradually erode this premium. Moreover, the string of ambiguous promises might have already started to be reflected in the stock price, as seen in the considerable decline in the company's share price since 2021.

2.2.2.1 Sub-conclusion: Resources and capabilities

Drawing from the insights of the resource-based view, it is evident that Tesla boasts formidable resources and capabilities. The analysis reveals Tesla's high degree of vertical integration, spanning from raw material refinement to customer service, being present across all layers of the supply chain. This comprehensive integration grants Tesla significant control and ensures a reliable supply, thereby mitigating the risk posed by China's dominance. Nevertheless, Tesla remains heavily dependent on China for battery cells, exposing the company to geopolitical liabilities. Being forward integrated, provides close proximity to the customer, but also puts pressure as its fleet of cars continue to expand.

At the heart of Tesla's value chain lies its state-of-the-art Gigafactories, pivotal to the company's operational prowess in meeting demand efficiently and cost-effectively. Tesla's consistent reduction of COGS per vehicle enables it to engage in price wars with competitors like BYD while maintaining profitability. As the company gears up to introduce a more affordable model and compete with low-priced Chinese rivals, the efficacy and cost-effectiveness of its production facilities emerge as crucial resources.

Tesla has forged a distinctive brand closely tied to its CEO Elon Musk. This branding strategy has spared Tesla expenditures on marketing and PR, leveraging Musk as the public face. However, it also poses a risk, as the company's may become exposed without Musk's leadership. Musk's role in driving Tesla's innovation is undeniably significant, amplifying the company's capabilities and leveraging his track record in transforming advanced technologies into commercial successes, evident in endeavors like SpaceX and Tesla.

Technology stands as a cornerstone of Tesla's resource portfolio, with its advanced AI capabilities and complex data processing holding the key to unlocking potential in autonomous driving and humanoid robots, promising avenues for future growth. Tesla's unparalleled technological competencies, coupled with its presence in the automotive industry, distinguish it from other manufacturers. No other car-manufacturer seems to have as effective data gathering from its fleet of vehicles as Tesla do. This differentiator could give them an advantage in the race to develop fully autonomous vehicles.

2.2.3 VRIO

The VRIO framework is visually represented below. It categorizes resources and capabilities into those that offer temporary versus sustained competitive advantages, as determined through the strategic analysis. See illustration below:

VRIO FRAMEWORK					
Resources/Capabilities	Valuable	Rare	Hard to imitate	Exploited by Organization	Advantage
Human Resources	Yes	No	Yes	Yes	Temporary
Technology	Yes	Yes	Yes	Yes	**Sustained**
Vertical integration	Yes	No	Yes	Yes	Temporary
Innovation	Yes	Yes	Yes	Yes	**Sustained**
Brand	Yes	Yes	Yes	Yes	**Sustained**
Inbound Logistics	Yes	No	No	No	Temporary
Production facilities	Yes	Yes	Yes	Yes	**Sustained**
Sales	Yes	Yes	No	Yes	Temporary
Sevices	Yes	No	Yes	Yes	Temporary
Elon Musk	Yes	Yes	Yes	Yes	**Sustianed**

Figure 27: *Authors own creation based on strategic analysis*

Five resources and capabilities are considered sustained: technology, innovation, brand, production facilities and Elon Musk.

2.3 Summarization on strategic analysis using SWOT

The illustration below summarizes the key strengths, weaknesses, opportunities, and threats identified in the strategic analysis. This serves as a concise overview of the most significant findings. Further details and elaborations will be provided in the final conclusion.

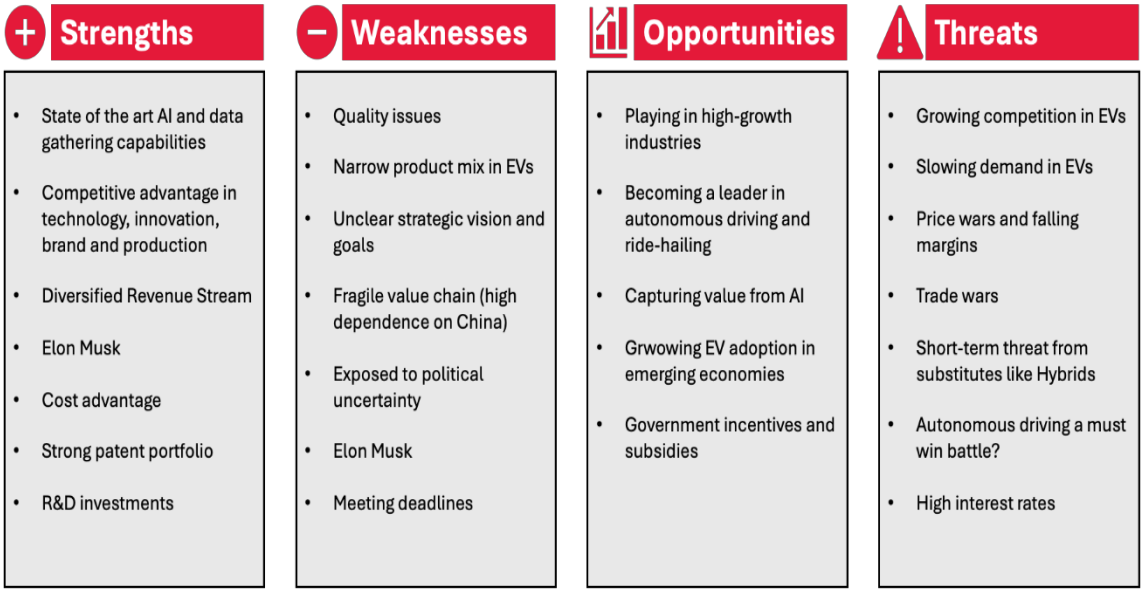


***Figure 28**: Own creation based on strategic analysis*

3. Financial Analysis

3.1 Introducing the Financial Analysis

This analysis embarks on a comprehensive examination of Tesla's financial landscape from 2019 to 2023, focusing on a detailed review of its income statements and balance sheets. By reformulating the income statement and balance sheet, we aim to isolate Tesla's core operational earnings and scrutinize its financial metrics to assess the company's true profitability and operational efficiency. This examination aims to shed light on Tesla's financial stability, assessing its ability to manage through a market characterized by heightened price competition, macroeconomic challenges, and significant volatility. Through this analysis, the paper will explore Tesla's revenue growth trajectory, liquidity management, profitability and cash flow management, aiming to determine its viability as an investment case. Ultimately, this should lead to an improved comprehension of what drives Tesla forward, alongside an awareness of the potential risks and opportunities embedded within its financial statements. Together with the insights from the strategic analysis, this will enhance the understanding of Tesla as a company and an investment opportunity, offering greater transparency.

3.1.1 Reformulated Income Statement

The analytical income statement (appendix 1) offers significant insights into Tesla's operational earnings, highlighting the profitability of its core business. Initially, earnings before interest, taxes, depreciation, and amortization (EBITDA) are calculated. The EBITDA is a useful measure for both the calculation of the cash flow statement as well as for valuation purposes (Plenborg & Petersen, 2017). It's important to note that Tesla employs an accounting approach (GAAP) that incorporates depreciation and amortization into their operating expenses. This means that the EBITDA figure would be lower if it were adjusted to exclude this factor. The total depreciation and amortization are found in Tesla's consolidated cash flow statement (Tesla, 2023).

Another factor to consider, is the income tax. The income tax expenses in Tesla's income statement do not differentiate between operating and financing taxes, necessitating the segregation of income tax expenses into taxes on operations and taxes on financing for the analytical income statement. It's essential to distinguish clearly between the company's core operations effectiveness, excluding financial elements, to ensure a precise understanding of its performance.

The tax rate selected for analysis can be either the marginal tax rate or the effective tax rate (Plenborg & Petersen, 2017). Choosing the effective tax rate is logical because Tesla operates globally under various local tax rates. The effective tax rate considers the diverse tax rates across the group. The effective tax rate is calculated as the provision from income tax divided by earning before tax. Hence, the effective corporate tax rate is determined by taxing the EBIT and accounting for the tax expenses or tax shield associated with net financial income/expenses. The tax shield represents the opportunity to decrease taxable income through tax deductions on interest-bearing debt. The tax shield is calculated by multiplying the effective tax rate with the net financial expenses.

It's important to highlight that Tesla underwent a notable change in its effective tax rate, shifting from an 8% expense to a 50% benefit in 2023 relative to 2022. This substantial shift can be traced back to the company's reevaluation of its deferred tax assets, resulting in the release of $6.54 billion from the valuation allowance tied to U.S. federal and state deferred tax assets (Tesla, 2023). Essentially, deferred tax assets represent a balance sheet item that could potentially be utilized to lower future tax obligations. From the analytical income statement, it is evident that the favorable tax treatment on EBIT is the key factor behind Tesla's NOPAT for 2023 surpassing that of 2022.

However, when examining the core operations (EBIT) prior to the tax benefits, it becomes clear that Tesla's earnings from its primary activities were notably lower than the previous year.

3.1.2 Reformulated Balance Sheet

Within the analytical framework for the balance sheet, like the income statement, elements are systematically classified into either operating or financing categories (appendix 2). This reorganization is instrumental in determining Tesla's invested capital, indicative of the aggregate funds earmarked for operational pursuits. This figure is determined by the subtraction of operating liabilities from operating assets, where operating liabilities serve to mitigate the necessity for external financing. Adhering to the methodologies explained by Petersen & Plenborg (2017), this delineation separates assets and liabilities into operational, fundamental for ongoing functions, and financial, supporting the operational financing. Some of the classifications may need some explanation:

Cash and cash equivalents: Cash and cash equivalents are typically viewed as excess resources, which a company can direct towards dividends, share buybacks, or reducing debt without affecting its primary operations. The consolidated cash flow statement of Tesla reveals a notable presence of such excess resources (Appendix 12). A portion of this cash is identified as restricted, earmarked for debt repayment, collateral, and letters of credit. In the investment section of the cash-flow statement, a significant allocation of approximately $19.112 billion was made to *"purchase of investments"*. This indicates Tesla's strategy to deploy its surplus funds into short-term investments aimed at generating short-term returns, a tactic underscored by their growing financial income over successive years. Furthermore, Tesla's cash reserves have shown remarkable stability over the last four years. Petersen and Plenborg (2017) argue that this consistency lends support to the approach of viewing cash and cash equivalents as excess funds, thereby classifying them within financing activities. It's crucial to acknowledge that a portion of the cash may be operational. However, distinguishing this without the company explicitly doing so can be challenging (Ibid).

Digital Assets: Tesla currently holds $184 million in digital assets, predominantly Bitcoin, along with some Dogecoin (Matney, 2022). It is unclear whether these assets are held for speculative purposes or for operational transactions. Tesla's website does mention that Dogecoin can be used to purchase some of their products, indicating a functional use. However, Bitcoin makes up the majority of their digital asset holdings. According to Tesla's cash flow statement, the company sold $936 million worth of digital assets at the end of 2022 and purchased approximately $1.5 billion worth in 2021 (Tesla, 2023). The relatively short-term holding of these assets, combined with the acceptance of Dogecoin for payments, suggests these might be used for operational purposes. Consequently, this is classified as operational activity.

Operating Lease Vehicle: Tesla provides a resale value guarantee, allowing customers to sell their vehicle back to the company after three years at a predetermined price (Tesla, 2023). The difference between the initial purchase price and the resale value (operating lease vehicle) is accounted for in automotive sales revenue. Should the customer determine to keep their vehicle beyond the three-year mark, the value of the operating lease vehicle is still recorded in automotive sales. On the other hand, if Tesla reacquires the vehicle and fails to resell it for the initially recognized revenue amount, any shortfall represents a loss and will lead to a reduction in revenues in the subsequent year. Consequently, operating lease vehicles are an integral component of the company’s operational framework.

Deferred tax assets**:** Deferred tax assets, arise from tax loss carry forwards or assets that are recognized at a lower value in the balance sheet than for tax purposes. Deferred tax assets do not earn an interest and therefore do not share the same characteristics as other financial items, which is why it is classified as operational (Plenborg & Petersen, 2017).

Short term investments: Recent years have witnessed a significant increase in short-term investments, such as U.S. government securities, debt securities, certificates of deposit, and commercial paper (Tesla, 2023). Tesla's consolidated cash flow statement clearly shows a substantial portion of its cash being allocated to these short-term investments (appendix 12).

Additionally, a review of the financial statement reveals that this strategy has notably enhanced Tesla's net financial income in recent years, as detailed in appendix 1. These instruments typically offer a fixed interest rate over their duration and are thus classified as financing activities.

Other long-term liabilities: Other Long Term Liabilities consist of operating lease liabilities, accrued warranty reserves and other non-current liabilities.

Operating Lease Liabilities: These liabilities arise from lease agreements where the company does not purchase the assets but instead secures the right to use them. Consequently, operating lease right-of-use assets are recognized on both the asset and liability sides of the balance sheet. While these liabilities finance the use of assets, they typically do not carry interest in the conventional sense; rather, the interest component is implicitly factored into the lease payments. As such, these are classified under operating activities instead of financing activities.

Warranty Reserves: Warranty reserves are an accounting mechanism designed to estimate the future costs associated with product warranties. They represent provisions set aside to cover potential future expenses for repairing or replacing products under warranty, thus categorizing them as operating activities.

Non-Current Liabilities: The nature of other non-current liabilities is not explicitly detailed on the balance sheet, posing challenges for precise classification. However, without clear evidence of these being interest-bearing, they are grouped with other operational liabilities in operating activities for consistency and clarity.

It's essential to recognize that the process of reformulating financial statements often involves a degree of subjective judgment, which may lead to differences in interpretation among analysts (Plenborg & Petersen, 2017). As such, there's an inherent risk that the reformulated financial statements might not fully align with the perspectives of other analysts. Nevertheless, this

reformulation effort is grounded in a detailed examination of Tesla's annual reports and is informed by the insights provided by Plenborg & Petersen.

3.2 Financial Performance and Stability of Tesla

The financial performance of Tesla is examined across a wide range of dimensions: revenue growth and profitability, short-term and long-term liquidity, and cash flow management. This analysis will exclusively concentrate on Tesla, highlighting the financial indicators critical for its ongoing operations. The goal is to gain an in-depth understanding of Tesla's financial development and health, focusing not only on its ability to generate profit but also on its cost management. Another key consideration is Tesla's positioning regarding liquidity risk. This is crucial in an industry marked by political scrutiny and intense competition, necessitating both short-term and long-term liquidity to navigate unforeseen challenges effectively. Lastly, the cash flow analysis provides an overview of how effectively Tesla manages its cash inflows and outflows. The financial metrics employed are detailed in Appendix 6, along with the formulas used.

3.2.1 Revenue growth and profitability

Revenue growth and gross profit

Examining Tesla's profitability requires consideration of its revenue growth, indicative of market demand for its products. The following figure presents an overview of Tesla's various revenue streams and development in percentages the last five years. The KPIs are calculated using both appendix 4 and 5.

KPIs for profitability					
Years	2019	2020	2021	2022	2023
Revenue % automotive y-o-y		31%	73%	51%	15%
Revenue % energy generation y-o-y		30%	40%	40%	54%
Revenue % services y-o-y		4%	65%	60%	37%
Gross Profit% automotive	21%	26%	29%	28%	19%
Gross Profit% energy generation and storage	12%	1%	-5%	7%	19%
Gross Profti% services and other	-24%	-16%	-3%	3%	6%
Overall Gross Profit%	17%	21%	25%	26%	18%
EBIT %	0%	6%	12%	17%	9%
Net gain/loss %	-4%	2%	10%	15%	15%
ROA	-3%	1%	9%	15%	14%
ROE	-13%	3%	18%	28%	24%

Figure 29: *Own creation*

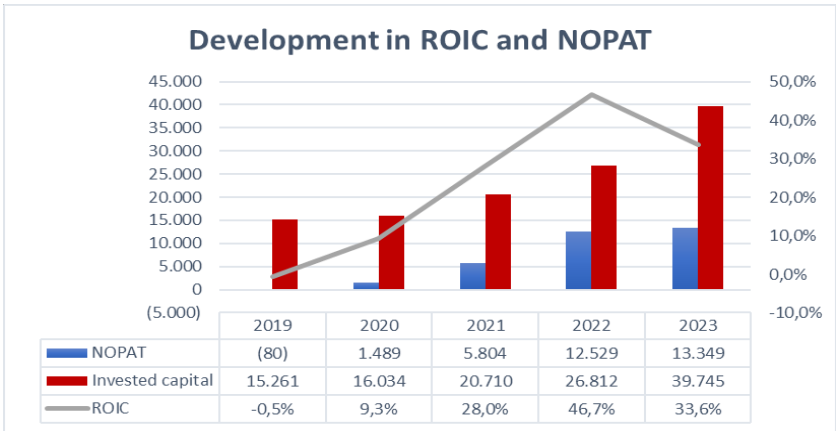
An analysis of year-on-year revenue growth in the automotive sector shows a significant decline, with growth rates falling from 51% in 2022 to around 15% in 2023. Conversely, the energy generation and storage sector has shown remarkable growth, with a 54% increase in year-on-year change in 2023 compared to 2022. While the services and other segment has experienced significant growth in recent years, there's a slight decrease in its year-on-year growth rate from 2022 to 2023. Nevertheless, this segment currently accounts for 9% of Tesla's total revenue and is expected to expand as Tesla continues to increase its market presence by distributing more vehicles, meaning more revenue from services.

Reviewing the gross profits reveals that both the energy generation and storage segment and the services and other segments have experienced growth. This aligns with the strategic analysis, highlighting a robust market potential for the battery energy storage segment. The increase in gross profits suggests Tesla is gradually enhancing its operational efficiency in these areas, with sales revenue increasing at a greater pace than the related costs. In contrast, the automotive section experienced a decrease in its growth rate, dropping from 28% to 19% from 2022 to 2023. This decline has also impacted the overall gross profit negatively, largely due to the automotive segment's substantial contribution to revenue. The decline in automotive gross profit is attributed to the current price competition, notably intensified by Chinese rival BYD, as highlighted in the Porters Five Forces analysis. This challenge is central to Tesla's concerns, as margins revert to standard levels typical of the automotive industry.

Return on invested capital (ROIC)

When evaluating Tesla's financial performance, a crucial indicator to consider is the return on invested capital (ROIC). Businesses that achieve a higher ROIC are typically seen as having a more sustainable competitive edge and effective management. Warren Buffett highlighted the significance of this metric in one of his shareholder letters, emphasizing that: *"A truly exceptional company must possess a lasting 'moat' that safeguards its superior returns on invested capital"* (Berkshire Hathaway, 2007). Fundamentally, ROIC measures how effectively a company can generate profits from its capital investments. The interplay between ROIC and growth determines a company's future free cash flow, which in turn influences its market valuation. In the case of Tesla, the analysis reveals that their ROIC experienced a remarkable turnaround, from a negative

0.5% in 2019 to a peak of 46.7% by the end of 2022, before slightly declining to 33.6% at the close of 2023. Despite this recent decrease, Tesla's ROIC remains impressively high, underscoring the company's successful capitalization on its early first mover advantage in the EV market. Such strong ROIC numbers significantly surpass the industry average (Damodaran, 2024), showcasing Tesla's operational efficiency and market leadership. It's crucial to note that the ROIC figures are higher due to the previously mentioned tax benefits. This aspect will be thoroughly addressed in the following section, which examines the ROIC before tax.



	2019	2020	2021	2022	2023
NOPAT	(80)	1.489	5.804	12.529	13.349
Invested capital	15.261	16.034	20.710	26.812	39.745
ROIC	-0,5%	9,3%	28,0%	46,7%	33,6%

Figure 30: *Own creation based on Tesla annual reports (2019-223)*

Earnings Before Interest and Tax

For a deeper insight into the company's financial health, analyzing earnings before interest and tax (EBIT) is crucial. This approach is particularly important due to the tax factor, which, as shown in appendix 1, exhibits considerable volatility. In 2023, Tesla capitalized on significant tax benefits, which, although legal, may skew perceptions of its profitability. By adjusting the analysis to focus on EBIT, it becomes clear that Tesla's earnings have decreased, with the NOPAT only appearing to surpass the 2022 levels because of these tax benefits. Analyzing the trend in Tesla's ROIC before tax adjustments, reveals a substantial decline, a reflection of the lower EBIT in 2023 compared to the earnings in 2022. Additionally, it's noticeable that the invested capital has been rising annually, characterizing the EV industry as one that is capital-intensive. It appears that, at least in the short term, Tesla has encountered challenges in achieving returns on these escalating capital investments. The invested capital is expected to rise in the future, driven by Tesla's investments in productions

facilities, robot taxis, humanoid robots and AI. Therefore, it's crucial for Tesla to maintain a strong ROIC to sustain its growth.

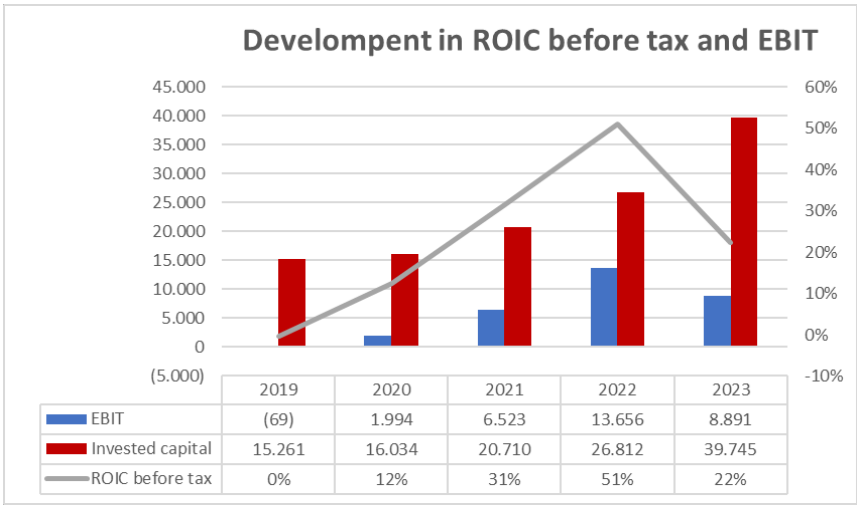


Figure 31: *Own creation based on Tesla annual reports (2019-223)*

Operating margin before tax

Exploring Tesla's profitability further, it's useful to consider the operating margin, specifically using EBIT to mitigate the significant influence of tax benefits previously discussed. As a frontrunner in the EV market, Tesla has achieved considerable economies of scale through increased production and market share expansion. This efficiency has allowed Tesla to maintain operating margins that surpass those of its competitors. However, as indicated by the graph, Tesla's robust operating margin began to diminish towards the end of 2022, dropping from 16.8% to 9.2%, nearly halving. This decrease in operating margin suggests that Tesla's costs are converging with its revenue, reflecting the intensifying competition and a shift in pricing strategy. Elon Musk has openly committed to reducing prices in response to "turbulent times," indicating a strategic decision to accept lower margins in favor of producing more vehicles. This approach aims to fill the market with more affordable cars, thereby securing a stronger market presence in the future (Cabral, 2023). However, utilizing this mass production strategy could become problematic due to the demand issues outlines in the strategic analysis. Maintaining this approach is unsustainable over the long term. Should it persist, Tesla will find itself operating with margins comparable to the industry average, making it increasingly challenging to justify its valuation.

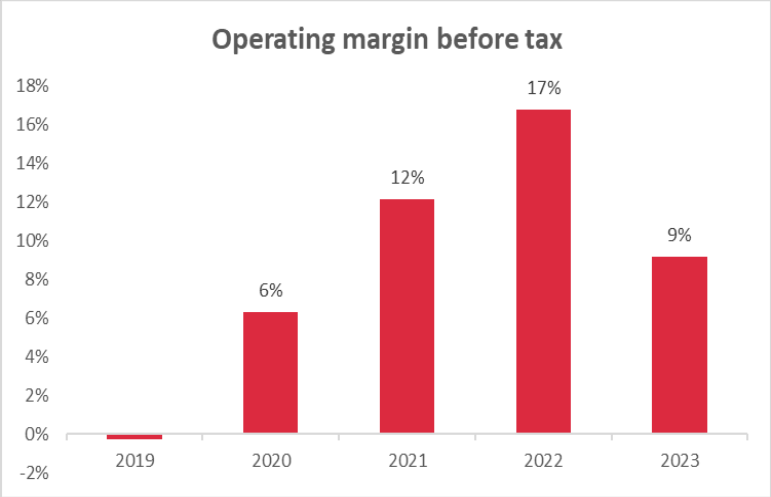


Figure 32: *Own creation based on Tesla annual reports (2019-223)*

3.2.2 Liquidity analysis

Liquidity is a crucial subject for any business. Without it, it cannot pay its bills or carry out profitable investments and in the most severe cases the company will go bankrupt (Plenborg & Petersen, 2017). In this section the short- and long-term liquidity of Tesla will be analyzed.

3.2.2.1 Short term liquidity

Current ratio

When evaluating short-term liquidity risk, the current ratio is frequently utilized to assess how effectively a company, can settle its short-term obligations using its short-term assets. For 2023, Tesla's current ratio stood at 1.73, which is acceptable. However, the traditional current ratio may not always provide an accurate picture since it treats all current assets as equally liquid, which isn't always the case. This brings into focus the importance of the modified current ratio, which focus on financial assets like cash and securities to gauge a company's ability to fulfill its immediate financial commitments without resorting to selling fewer liquid assets. The calculation is straightforward: financial assets divided by financial liabilities, see appendix 6. In 2023, Tesla's modified current ratio was an impressive 5.56, highlighting its effective debt management and

minimal short-term risk. Tesla has a significant amount of cash on hand, but also short-term securities that can be liquidated fast making the company very financially flexible.

Cash flow from operations (CFO) to debt ratio

Examining Tesla's Cash Flow from Operations (CFO) ratio reveals a robust and steady inflow from operational activities, albeit with a slight dip from 2022 to 2023, decreasing from $14,724 million to $13,256 million. Despite this minor decrease, Tesla's CFO ratio stood at 2.53 in 2023, as detailed in Appendix 6. This indicates that Tesla could cover its short-term and long-term debts 2.5 times over with its operating cash flow, showcasing a strong financial standing. The robust cash flow from operations (CFO) ratio reveals that Tesla demonstrates high operational efficiency, effectively turning its revenue into cash via its primary business activities and does so without depending heavily on external financing.

Capital expenditure ratio

The Capital Expenditure (CapEx) Ratio highlights the balance between the cash flow generated from operating activities and the capital expenditures, essentially the net cash used for investing activities. The analysis of Tesla's investing activities reveals significant investments in property and equipment, underscoring their substantial commitment to expanding production capacity. From 2022 to 2023, Tesla's CapEx Ratio decreased from 1.23 to 0.851, suggesting that Tesla's investment exceeds the cash flow from its operating activities in this period. However, historically, Tesla's CapEx Ratio has been above 1, indicating that they typically have sufficient operational cash flow to support their investment activities. This temporary deviation does not present a concern, given Tesla's substantial cash reserves, which buffer against liquidity risks. A high CapEx ratio should not be seen as an issue for Tesla, given their proven ability to efficiently transform these investments into cash. In essence it is a huge advantage that a company can turn their CapEx into cash generation.

3.2.2.2 Long term liquidity

Equity ratio

Tesla's equity ratio has experienced a notable rise, advancing from 19% in 2019 to 59% by 2023. This upward trend suggests that a substantial share of Tesla's assets is financed through shareholders' equity instead of debt, aligning with the observation that Tesla carries minimal debt, as reflected in the notably low interest payments on its income statement. This shift towards equity financing substantially diminishes the risk of insolvency, presenting a lower financial risk profile for the company. In the dynamic and uncertain EV market, possessing robust long-term liquidity is crucial. Tesla's high equity position enables it to more effectively deal with losses and navigate the market's volatility and external shocks, ensuring a balanced financial foundation during volatile times.

Financial leverage (analytical)

The analytical financial leverage is calculated as:

$$Analytical\ financial\ ratio = \frac{Net\ interest\ bearing\ liabilites}{Stockholders\ Equity}$$

This ratio has shifted from 1.08 in 2019 to -0.38 in 2023. A negative ratio is seen as a positive indicator, reflecting a robust financing structure, a favorable risk profile, and significant operational flexibility. The negative value arises from the company's substantial cash, cash equivalents, and short-term investments surpassing its financial liabilities, resulting in negative net interest-bearing liabilities. In essence, Tesla is in a position where it could instantaneously clear all its debt if needed. This highlights that Tesla possesses sufficient equity and liquid assets to underpin its operations. For investors, this scenario is highly appealing as it places Tesla in a strategic position to leverage its surplus cash and equity to pursue potentially higher returns in the future.

3.2.3 Cash flow analysis

The cash flow (CF) analysis is also an important aspect when looking at Tesla and its financial attractiveness. The CF analysis helps portray a clearer picture of the amount of money that Tesla

has available to run business operations and complete transactions. The following cash-flow analysis will look into three areas, which is cash flow from operations, cash flow from investing and finally financing activities. For this analysis appendix 12 and 13 are used.

Cash flow from operations

Tesla has maintained a robust operational cash flow and seen considerable growth since 2019. However, 2023 marked a minor setback, with a 10% decline from the previous year. A closer examination of the cash flow statement (see Appendix 12) offers a clearer view of Tesla's operational dynamics. While the income statement suggests an increase in net income, this is somewhat misleading as it includes the realization of tax assets. These are adjusted in the cash flow statement due to their non-cash nature, resulting in a $6.3 billion deduction from the net income for 2023. This adjustment indicates that, for the first time since 2019, Tesla has experienced a downturn in its operational activities. Additionally, Tesla has faced negative working capital over the last two years, driven by high inventory levels in 2022 and decreased accounts payable, accrued, and other liabilities in 2023, further impacting cash flow. Despite these challenges, Tesla continues to generate strong cash flow from its operations.

Cash flow from investing activities

As illustrated in Appendix 12 Tesla's capital expenditures have increased over the years, with the CapEx-to-revenue ratio remaining relatively stable in recent years. In 2023, Tesla's capital expenditures amounted to $8.9 billion, primarily for purchasing properties and equipment. This aligns with Tesla's significant investments in new production facilities, as detailed in the strategic analysis. The fact that Tesla's CapEx investments maintain a consistent percentage of revenue suggests that the company is heavily investing in growth, which is crucial for justifying its high market valuation. High CapEx is essential for Tesla to sustain its market leadership by investing in the latest technologies and facilities. In fiscal 2023, Tesla also allocated about $19 billion to the purchase of investments, which are securities intended to generate returns. This substantial investment has significantly impacted the cash flow from investing activities in 2023 and is the primary driver behind the net increase in cash used in financing activities. From an investor's

perspective, one might question whether these funds could yield a higher return if invested elsewhere, rather than in securities. This could also indicate some restraint to invest in the operations, due to high uncertainty in the current market.

Cash flow from financing activities

When examining the financing activities, Tesla recorded a positive cash flow from financing activities of $2.6 billion in 2023. This positive figure was primarily driven by the issuance of new debt totaling $3.9 billion, which temporarily lifted the cash flow. However, it's important to note that such boosts can be misleading due to their short-term nature. Issuing too much debt can escalate the debt burden and increase interest expenses. Despite these risks, Tesla has effectively managed its debt levels, as demonstrated in Appendix 13, which shows significant debt reduction over the years. This effective debt management is why Tesla's cash flow from financing activities was negative in 2021 and 2022. Tesla's adeptness at reducing debt has solidified a strong foundation, contributing to a robust balance sheet. As highlighted earlier in the financial analysis, Tesla's low financial risk makes it an attractive prospect due to its strong financial position.

Free cash flow (FCF)

Free cash flow (FCF) is a crucial financial metric that provides insight into the actual amount Tesla generates from its operations, available for unrestricted spending. Since 2019, Tesla has maintained positive FCF, with notable growth from 2019 to 2022. However, in 2023, FCF declined by 42% from the previous year's levels. This decrease was due to lower operating cash flow combined with higher capital expenditures. Maintaining a positive FCF is critical for Tesla, as it is necessary to fund the expansion of operations and continue innovating new products to enhance future profits. Despite the decline in FCF in 2023, the overall trend from 2019 to 2023 has been strong, demonstrating Tesla's ability to generate value beyond its capital expenditures. This reflects their historically strong profit margins and efficient asset management. Nonetheless, the drop in 2023 suggests that Tesla is facing challenges, including slower growth, reduced demand, and increased competition. These issues have also led to price reductions on their vehicles and a decline in profit margins.

Cash flow analysis					
	2019	2020	2021	2022	2023
Operating activites					
Operating cash flow	2.405	5.943	11.497	14.724	13.256
Operating cash flow growth		147,1%	93,5%	28,1%	-10,0%
Investment activities					
Capital expenditures	(1.432)	(3.232)	(6.514)	(7.163)	(8.899)
CAPEX growth		126%	102%	10%	24%
CAPEX as percentage of revenue	6%	10%	12%	9%	9%
Financing activities					
Issuances of debt	10.669	9.713	8.883	—	3.931
Repayment of debt	(9.161)	(11.623)	(14.167)	(3.364)	(1.351)
Other debt related cost	(747)	(584)	(457)	(502)	(493)
Deb issued/paid	761	(2.494)	(5.741)	(3.866)	2.087
Net cash flow					
Free Cash Flow	973	2.711	4.983	7.561	4.357
Free Cash Flow Growth		179%	84%	52%	-42%
Free Cash Flow Margin	4,0%	8,6%	9,3%	9,3%	4,5%

Figure 33: *Own creation based on Tesla annual reports (2019-223)*

3.2.4 Sub-conclusion on financial analysis

Tesla is experiencing a decline in growth within its automotive segment, with a notable decrease in revenue growth from 2022 to 2023. Conversely, Tesla's energy business is thriving, achieving a 54% growth rate over the same period. The gross margins tell a similar story; profitability in the car segment is declining, while the energy storage sector is becoming increasingly profitable. Additionally, Tesla's operating margin has fallen from 17% to 9%, aligning the company more closely with its automotive peers in terms of profitability.

In terms of Return on Invested Capital (ROIC), Tesla saw rapid growth from 2019 to 2022, although there was a downturn in 2023. Despite this, with an ROIC of 33.6% in 2023, Tesla remains highly effective at generating returns on invested capital. However, this figure was bolstered by the release of deferred tax assets, which inflated the ROIC. When adjusting for this tax benefit, the pre-tax ROIC drops to 22% from 51% in 2022, a significant decline.

The liquidity analysis indicates that Tesla faces very low short-term liquidity risk. It maintains a strong current ratio and has the ability to leverage its substantial cash reserves and short-term securities to meet its current liabilities when necessary. Additionally, Tesla can cover its short-term and long-term debts 2.5 times over with its operating cash flow for 2023. Long-term liquidity risk is also low, evidenced by an equity ratio of 59%, showing a strong reliance on equity rather than debt. Essentially, Tesla is in a robust financial position to clear all its debts if necessary.

Finally, Tesla's free cash flow has been consistently strong, remaining positive from 2019 through 2023, demonstrating the company's capability to generate value beyond its capital expenditures. However, 2023 saw a 42% reduction in free cash flow growth, attributed partly to a slowdown in operational cash flow and significantly high capital expenditures.

Overall, Tesla is an excellent company with a robust balance sheet. They are well-equipped to handle the challenges outlined in the strategic analysis. Additionally, their solid financial foundation allows for significant investment in AI and autonomous driving technologies, without fearing insolvency.

3.3 Peer group valuation

To effectively analyze Tesla's performance development, this paper employs a relative valuation approach, utilizing multiples based on the relative pricing of peer companies earnings (Plenborg & Petersen, 2017). Central to this method is the "law of one price," which asserts that similar assets should command similar prices (Mirzayev, 2022). This relative valuation method aims to determine whether Tesla is fairly valued compared to its competitors by applying different valuation metrics. Combined with insights from the strategic analysis, this approach will shed light on Tesla's financial attractiveness from an investment standpoint as compared to its peers, and shed light on whether their valuation can be justified or not.

Peers, valuation metrics and limitations using the relative valuation approach

Given that Tesla offers vehicles across various price segments (see Appendix 8), and is expected to introduce models priced around $25,000, the company is effectively positioning itself within the mass market for EVs. This wide price range positions Tesla against a significant number of direct competitors. To ensure a thorough analysis, this study includes key automotive players from America, Europe, and Asia. American companies presented are Ford and General Motors, while European representatives are Volkswagen Group, BMW Group, and Mercedes Group. The analysis also considers BYD and Geely Group from China and Toyota from Japan, covering a

broad spectrum of major global automotive companies. The chosen companies shares the same characteristic regarding their main revenue stream, which stems from automotive sales.

However, it is acknowledged that accounting practices do vary significantly over regions (Plenborg & Petersen, 2017). The fact that the chosen companies operates with different accounting practices can influence the value measurements of assets, tax rules and the recognition of revenue, expenses and depreciation, which is a weakness of the analysis (Ross, 2023). To mitigate errors stemming from accounting practices, varied multiples are included, to get a more comprehensive overview of the different actors, including ratios such as Price/Earnings, Price/Book and EV/EBITDA. The analysis adopts a forward-looking approach by utilizing forward multiples from analysts, while also incorporating historical and current estimates. This comprehensive method aims to determine whether Tesla is trading at a premium compared to its peers. The rationale for selecting the above multiples are detailed in the methods section.

In this peer group analysis, BYD emerges as Tesla's main competitor, having sold 1,589,571 Battery Electric Vehicles (BEVs) in 2023 (see appendix 14). Including hybrids, BYD's total sales reached 3,024,427 units. Very similar to Tesla, around 80% of their revenue stems from automobiles and related products (BYD, 2023). Similarly, the Volkswagen Group has made significant strides in the BEV market, selling 771,000 BEVs in 2023, which accounts for approximately 8.1% of the global EV market. Other competitors, including Hyundai Motor Group, GAC AION, SAIC-GM-Wuling, BMW Group, and Mercedes-Benz Group, are also included in this comparative analysis due to their significant growth rates in BEV deliveries.

Additionally, data from the group known as the *"magnificent seven"* has been incorporated into the peer group analysis. This inclusion is motivated by Tesla's classification within this cluster (Duggan, 2024), making it fascinating to determine whether Tesla's trading patterns align more closely with the tech companies in the magnificent seven or with its automotive peers. While it may seem far-fetched to compare Tesla with clean tech companies, doing so provides a nuanced perspective to the analysis.

Benchmark Performance Analysis

The benchmark analysis is structured into various sections, each followed by a comparison of the selected multiples. The methodology section details each multiple, providing explanations and demonstrating the calculations to justify why these specific multiples were deemed most suitable for this analysis. The primary focus of this analysis is on forward-looking multiples, which are considered more accurate predictors of value according to Goedhart (2005). All the multiples below are retrieved from the Bloomberg Terminal (Bloomberg, 2024).

Enterprise Value (EV)

Enterprise value (EV) serves as a measure of a company's total market value, providing a more accurate reflection of its overall worth. While enterprise value alone may not be very informative, it is valuable when used with other financial metrics (CFI, 2024). The data shows that as of April 24, 2024, Tesla's enterprise value is trading 4,1x higher than its industry peers, with only Toyota surpassing it. Notably, Tesla's EV has more than halved since 2021, with a significant drop from 2023 when it traded at 13.3x higher than its peers. The significant fluctuations in Tesla's EV highlight its volatility compared to its competitors, who have shown more stability in their EVs in the period. The Enterprise Value metric forms the basis for some of the applied metrics, and will not be discussed in further detail.

Enterprise Value (billions)	2021	2022	2023	24-04-2024
BYD	114	92	72	72
Volkswagen Group	102	48	37	42
Geely Group	24	12	8	10
BMW Group	51	49	60	61
Mercedes Benz Group	57	45	40	50
Toyota	193	225	165	523
Ford	67	34	40	46
General Motors	89	45	44	53
Average Peer	87	69	58	107
Tesla	1.084	374	773	441
Tesla vs peers	12,4	5,4	13,3	4,1

Figure 34: *Own creation, retrieved from Bloomberg*

EV/EBITDA

The EV/EBITDA metric is particularly insightful as it bypasses some of the variances in accounting practices. It focuses on earnings before interest, taxes, depreciation, and amortization,

which offers a clearer view of a company’s operational cash flow, less distorted by different accounting methods (Maverick, 2021). Tesla, as of April 4, 2024, is trading at a significant premium compared to its peers, with an EV/EBITDA ratio of 35,9, while the average for its peers stands at 4,3. This reveals that Tesla's ratio is 8,3x higher than its peers. When compared to its biggest rival, BYD, Tesla trades at a multiple that is 5.3x higher, highlighting the substantial growth expectations factored into Tesla's valuation. Consensus estimates suggest that Tesla will continue to outperform its competitors, maintaining an average EV/EBITDA ratio of 29,4 from 2024 to 2026, compared to an average of around 4 for its competitors.

This high valuation likely reflects Tesla's strong growth expectations, robust market positioning, and unique competitive edge, all of which is expected to improve their cash flow from operations in the upcoming years. Even when compared to the "magnificent seven" tech stocks in 2023, Tesla demonstrated a higher EV/EBITDA ratio, as noted in appendix 17. However, when it comes to profit margins, Tesla does not match the performance of these top tech companies. According to appendices 15 and 17, while the average gross margin for these tech giants was 62% in 2023, Tesla's was only 18%, showing a downward trend. Consensus estimates only forecast a modest improvement to about 20% by 2027, still well below their peak of 25% in 2021. This gap highlights that although Tesla is valued similarly to tech companies, its profitability metrics fall short of those typically seen in the tech sector. This comparison should be approached with caution, as tech companies generally benefit from lower costs of goods sold (COGS). This discrepancy is intended to underline that Tesla has not yet achieved the same level of profitability as tech or software companies in terms of margins.

The relatively slow consensus growth in margins is a consequence of the highly competitive nature of the EV industry, which has pressured Tesla to lower its prices, thereby reducing profitability per car as pointed out in the strategic analysis. Over time, however, Tesla could potentially justify its current valuation through advancements in self-driving technology, battery innovations, renewable energy solutions, and a shift towards software, which is less capital intensive and can yield higher margins. Tesla's diversification into multiple revenue streams makes it a more speculative investment but also offers significant scalability if some of its innovations succeed, which eventually some of them will. In our view, Tesla's diverse revenue streams are what set the company apart, enabling it to scale rapidly across multiple segments.

EV/EBITDA	2021	2022	2023	24-04-2024
BYD	35,4	15,5	6,5	6,7
Volkswagen Group	2,0	0,9	0,7	0,8
Geely Group	15,6	7,1	4,9	5,4
BMW Group	2,3	2,0	2,0	2,1
Mercedes Benz Group	2,3	1,7	1,5	2,0
Toyota	5,6	5,7	4,6	11,6
Ford	5,5	2,4	2,9	3,6
General Motors	4,1	2,1	2,0	2,4
Average Peer	9,1	4,7	3,1	4,3
Tesla	107,8	20,6	52,5	35,9
Tesla vs peers	11,9	4,4	16,8	8,3

EV/EBITDA	2024	2025	2026
BYD	7,01	5,83	4,9
Volkswagen Group	1,18	1,11	1,09
Geely Group	5,01	4,2	3,74
BMW Group	2,24	2,22	2,08
Mercedes Benz Group	1,89	1,9	1,88
Toyota	12,06	11,5	11,37
Ford	2,72	2,88	3,25
General Motors	2,67	2,75	2,62
Average Peer	4,35	4,05	3,87
Tesla	37,66	28,45	22,36
Tesla vs Peers	8,66	7,0	5,8

Figure 35: *Own creation, retrieved from Bloomberg*

Price/Earnings (P/E)

Historically, Tesla's P/E ratio has been significantly higher than that of its industry peers. As of April 24, 2024, Tesla's P/E ratio was 7,1x higher than its industry counterparts. This high P/E ratio shows that the sentiment and valuation surrounding Tesla have been positive, reflecting strong past performance and growth. With a P/E ratio of 65x in April 2024, investors were prepared to pay $65 for every $1 of Tesla's earnings. In contrast, Tesla's closest competitor, BYD, traded at a P/E of 18x, indicating that investors were willing to pay 3.6 times more for Tesla's future earnings compared to BYD's. This appears to conflict somewhat with the strategic analysis, which highlighted BYD's stronger car delivery growth of 72%, compared to Tesla's 38% (appendix 14). Additionally, BYD offers vehicles priced as low as $10,200, broadening its market reach. Despite this, consensus forecasts suggest that BYD's revenue growth will slow to 10% in 2026, whereas

Tesla's is projected to increase to 22%. This projection suggests that while Tesla's growth is currently stagnant, it is expected to accelerate in the coming years, likely influenced by analysts factoring in the production of the low-cost car to be delivered soon.

Analysts covering Tesla predict that the company's revenue growth will decline from 19% in 2023 to just 4% in 2024. This slowdown also aligns with our strategic view, which indicates that Tesla may be in between a second growth phase driven by their cheaper model. The plans for uncovering the new low-cost car priced at $25,000 aimed at the mass market, are expected to be in the second half of 2025 (Tesla, 2024). Currently, Tesla is facing demand issues, evidenced by having more cars in inventory than they sell, and is likely to experience little to no growth in 2024 (Tesla, 2024). Analyst projections then anticipate that Tesla will resume an average revenue growth rate of 19% from 2025 to 2027, while the average growth for its peers is projected at 4% during the same period. Based on the findings in the strategic analysis, it seems relatively optimistic that Tesla's growth rate will jump from 4% in 2024 to 18% in 2025. Elon Musk's history of overly optimistic forecasts presents a real risk that the rollout of Tesla's new low-cost vehicle might extend beyond 2025. Remember, Elon Musk initially promised an affordable car priced around $35,000 in his first Master Plan back in 2006, a goal he has yet to achieve. Additionally he promised to build the $25,000 car in 2020, a plan he later shelved and then revised (White, 2024). This situation mirrors that of the Cybertruck, which was scheduled to start production in 2021 but only began deliveries in 2023 amid ongoing production challenges. The investment community seems to consistently overlook these delays, highlighting the significant influence Elon Musk has, regardless of the accuracy of his forecasts.

Another potential catalyst for the anticipated revenue growth is the robotaxi segment, which expects a reveal in August 2024 (Tempelton, 2024). However, as our analysis suggests, Tesla is not yet operationally ready in this field, facing regulatory hurdles, permissions, and technical challenges. This means that the reveal might be more of a demonstration than a substantive breakthrough. Nonetheless, if Tesla manages to exceed expectations regarding its progress, it could positively impact the stock price but not the revenue growth in the coming years.

When discussing the P/E ratio, the net income is a critical factor. In 2023, Tesla's net income margin was 2.7 times that of its peers. However, this margin is expected to decrease from 15% in 2023 to 8% in 2024, a forecast we consider to be realistic. The improved net income margin in

2023 was partly due to a deferred tax asset. Looking ahead, the consensus is that Tesla's net income margin will stabilize between 9% and 11% from 2025 to 2027. Given the on average slim margins in this industry, Tesla's projected net income margins seem acceptable. However, to justify Tesla's high P/E ratio relative to its peers, it would need to achieve significantly higher revenue growth than is currently projected in consensus estimates. Though, these projected revenue growth rates could materialize further in the future. Their realization heavily depends on the success of Elon's robotaxi venture, a cheaper car, but also the scalability of the energy segment.

Overall, the P/E ratio suggests that Tesla is overvalued relative to its peers. The question remains whether the premium paid is justified. Our strategic analysis shows a highly competitive EV industry, with intense pricing pressures from competitors likely to continue impacting margins and market share for Tesla. In the short term, it is unlikely that Tesla can justify trading at a P/E ratio seven times higher than its peers based solely on its EV business. To justify such a valuation, significant breakthroughs in its robotaxi segment, which holds considerable market potential, would be necessary. Moreover, Tesla needs to introduce a budget-friendly car as promised soon, or it risks eroding investor confidence in its business case.

Price/Earnings	2021	2022	2023	24-04-2024
BYD	205,0	29,8	18,9	18,0
Volkswagen Group	8,7	5,0	3,7	4,4
Geely Group	36,2	19,8	15,3	16,2
BMW Group	4,7	3,1	5,7	6,0
Mercedes Benz Group	6,8	4,5	4,7	5,5
Toyota	10,7	10,8	10,5	10,6
Ford	13,0	6,1	6,0	6,8
General Motors	8,3	4,8	4,7	5,7
Average Peer	36,7	10,5	8,7	9,1
Tesla	217,4	33,7	95,6	65,1
Tesla vs peers	5,9	3,2	11,0	7,1

Figure 36: *Own creation, retrieved from Bloomberg*

Price/Book (P/B)

In line with its P/E ratio, Tesla also exhibits a notably high P/B ratio compared to its industry counterparts. As of April 4, 2024, Tesla's P/B ratio stood at 7,2, which is 5,5x higher than that of its peers. This implies that Tesla was valued at 7,2x the actual asset values recorded on its balance sheet, indicating a substantial market premium (Mcclure, 2023). Many of Tesla's peers, trading below their book value, might be considered undervalued, suggesting that the market assesses

them as worth less than their recorded asset values (Ibid). Looking at the forward estimates, Tesla anticipates maintaining a P/B ratio of approximately 6,8 from 2024 to 2027, while the average for its peers is expected to be around 1. Tesla's high P/B ratio reflects strong market expectations for future asset returns and significant optimism about the company's profitability prospects.

The P/B ratio serves as a practical tool for investors seeking growth at a reasonable price. It is frequently assessed alongside return on equity (ROE), a dependable indicator of growth. In 2023, Tesla posted a robust ROE of around 24%, which consensus forecasts expect to drop to 12% in 2024, and then stabilize at 14% from 2025 to 2027 (appendix 18). Significant gaps between the P/B ratio and ROE could raise concerns (Fernando, 2024), and it appears that Tesla's ROE may not perform exceptionally well in the upcoming years.

Strategically, this high ratio represents not only the value of current physical assets but also a broader investment in Tesla's potential beyond just manufacturing cars. When analyzing the forward consensus P/B estimates, Tesla is expected to maintain a premium valuation compared to its peers, with an anticipated P/B ratio of 6,27 in 2026, which is 6,56x higher than its peers. Notably, the average peer group is expected to trade under 1. According to our strategic findings, Tesla's high valuation is underpinned by strong investor confidence, with investors viewing Tesla as more than a car company.

According to appendix 17, Tesla's valuation parallels that of technology companies rather than traditional automotive firms, reflecting broader market sentiment. The investment case rests on Tesla's ability to generate substantial returns on assets and equity, leading to significant cash flows. Although 86% of Tesla's revenue currently comes from car sales, its technological knowhow and the market enthusiasm driven by Elon Musk set expectations for high future investment returns, as supported by all the analyzed multiples.

The P/B ratio might indicate that Tesla is overvalued. However, as previously noted, Tesla maintains a robust balance sheet, featuring a highly valued patent portfolio and intangible assets whose full value may not be completely reflected on the balance sheet.

Price/Book	2021	2022	2023	24-04-2024
BYD	6,7	4,5	4,1	3,9
Volkswagen Group	1,0	0,5	0,4	0,4
Geely Group	2,7	1,4	1,0	1,1
BMW Group	0,8	0,6	0,7	0,8
Mercedes Benz Group	1,0	0,8	0,7	0,8
Toyota	1,0	1,2	0,9	1,5
Ford	1,7	1,1	1,1	1,2
General Motors	1,5	0,7	0,7	0,8
Average Peer	2,0	1,3	1,2	1,3
Tesla	36,2	8,7	12,6	7,2
Tesla vs peers	17,7	6,5	10,5	5,5

Price/Book	2024	2025	2026
BYD	3,66	2,94	2,46
Volkswagen Group	0,37	0,32	0,29
Geely Group	1,07	0,97	0,91
BMW Group	0,68	0,65	0,62
Mercedes Benz Group	0,79	0,73	0,65
Toyota	1,53	1,37	1,26
Ford	1,06	0,98	0,91
General Motors	0,74	0,62	0,55
Average Peer	1,24	1,07	0,96
Tesla	8,67	7,49	6,27
Tesla vs Peers	7,0	7,0	6,6

Figure 37: *Own creation, retrieved from Bloomberg*

3.3.1 Sub-conclusion on peer group analysis

Tesla's valuation appears significantly higher than that of its peers, as evidenced by its P/E and P/B ratios. Despite this, there are concerns about Tesla's future growth potential, particularly due to the forecasted slowdown in 2024 and the seemingly stagnant projected revenue growth in the upcoming years. Tesla's high valuation reflects not only its current automotive revenue but also investor anticipation of its future technological innovations and expanded market presence, especially with the upcoming introduction of lower-priced models and advancements in areas like robotaxis and renewable energy solutions.

The analysis has highlighted Tesla's strong investor confidence, often comparing it more to tech giants than traditional automotive companies. However, this has led to a valuation that seems stretched by traditional automotive industry standards. The EV/EBITDA ratio particularly underscores the premium investors are willing to pay for Tesla's growth prospects.

In summary, while Tesla is positioned uniquely at the intersection of technology and automotive industries, its valuation carries high expectations for future growth and profitability. Investors should be aware of the speculative nature of Tesla's current market premiums, driven by its innovative potential but tempered by real operational and competitive challenges. This analysis suggests a cautious optimism, advising close monitoring of Tesla's strategic execution and market

developments to gauge the sustainability of its premium valuation. However, if Tesla achieves a breakthrough in robotaxis, the current forward estimates may be too conservative. Being a pioneer in this field could potentially lead to extremely high growth rates for Tesla.

4. Discussion

The discussion will explore the findings in greater detail, offering the reader a more comprehensive understanding of the primary factors influencing Tesla's current standing in the EV market, as well as the main factors shaping its future attractiveness as an investment case.

Tesla Maintains Strength in EV Market Despite Rising Global Competition

The analysis revealed significant developments in Tesla's external environment, particularly regarding China's evolving role in the global automotive sector, especially in EVs. Over recent years, China has established itself as a dominant force in the EV market, controlling crucial elements of the value chain and housing some of the fastest-growing players globally. Although the analysis indicates that Tesla may lose market share in China and is vulnerable to geopolitical tensions due to its heavy reliance on Chinese battery-cell supply, it's important to recognize China's relatively open stance towards Tesla. Notably, Tesla was the first foreign automaker permitted to establish its own manufacturing facility in China without forming a joint venture with a local company. Additionally, Tesla's significant role as a customer for Chinese suppliers grants it some bargaining power, a factor not to be underestimated. Moreover, there is speculation from the EU and experts that Chinese state subsidies are artificially sustaining local EV manufacturers, a strategy that prioritizes market share over profitability and raises questions about the sustainability of such support. It remains uncertain how long these Chinese competitors will require state assistance to stay afloat or how close they are to achieving profitability independently.

Despite facing challenges in the EV market, Tesla remains highly competitive and continues to be one of the leading companies. Its strong first-mover advantage, stemming from being the first company to develop a mass-market EV car, has provided it with a significant edge. This early

market entry has helped Tesla establish a well-known brand, enhance production capacity, achieve cost advantages, and gain control over the supply chain. Although this first-mover advantage may be diminishing as other automakers ramp up their investment in EVs, its impact should not be underestimated. While competitors are catching up, achieving the necessary scale to meet demand, securing reliable supply contracts (especially challenging given China's dominance), and realizing cost advantages and production efficiencies typically require time, experience, and scale.

Tesla is expected to continue excelling in the EV segment, and the introduction of the new low-cost car is anticipated to catalyze a second wave of growth. However, we believe that the company's future momentum will likely be driven by non-core segments, some of which are not yet visible on the income statement.

Shifting Gears: Tesla's Focus on Non-core Segments

Full self-driving services

The analysis put strong emphasis on the great potential for Tesla in autonomous driving. It points at Tesla as one of the 2-3 companies who will capture a dominant share of this market in the future. This is primarily due to two factors, which provide the company with an edge over competitors. First, its existing fleet of millions of Tesla cars on the road gathers real-world driving data every single second from around the globe, sends it directly to the Tesla HQ where it is diligently processed by the Dojo supercomputer and analyzed by a team of data scientists. No other company gathers data at this scale, using their existing fleet of vehicles. Second, Tesla's choice to base its autonomous driving technology on cameras only, is a much more scalable approach than competitors, who use a combination of different factors, and operate only in carefully pre-mapped areas. Even if these competitors might develop the technology faster than Tesla, scaling it for global or even country-wide usage, will be slow and challenging. Technology wise, this essentially means that once Tesla's camera-only self-driving capability works in one area, it works everywhere, regardless of which city, country or continent. The thesis expresses confidence in Musk's ability to commercialize autonomous driving, citing his proven track record of transforming technologically advanced products, initially unattractive from a business standpoint, into profitable, high-revenue enterprises.

However, there are major hurdles to Tesla solving autonomy. From a technological standpoint, it's difficult for any outsider without technical expertise to assess whether Tesla's camera-only approach will solve autonomy, or whether the multi-faceted approach mixing camera, radar, lidar and pre-mapped areas, applied by its competitors is better. It is unusual that Tesla chooses to rely solely on cameras, and one concern could be that the competitors approach reduces risk, and is technologically more robust. Using for example lidar might be costly, as Elon states, but if it is necessary to reach full autonomy, Tesla's approach will fail. This brings us to the issue of safety, which is critical to get regulatory approval. A fear could be that competitors may have regulators on their side, due to their more comprehensive approach. Strong technology itself is irrelevant if regulators aren't satisfied, so addressing this is critical for Tesla.

If Tesla solves autonomy, it plans on deploying Tesla robotaxis into a ride-hailing network, similar to that of Uber's, and won't allow the robotaxis to operate on any other platform than Tesla's own. This an aggressive and bold strategy, as it places them as a direct competitor to Uber and other ride-hailing platforms instead of for example licensing their robotaxis to these platforms, which several other manufacturers will do. On the one hand, this allows Tesla to establish a new revenue stream. If they solve autonomy before the manufacturers that will supply to the competing ride-hailing platforms, they could take significant market share, especially due to the robotaxis being much cheaper for the end-consumer than Ubers. On the other hand, when other manufacturers solve autonomy, and sells or license their product to ride-hailing platforms, these platforms have a significant advantage, as they already have the ecosystem. Developing this will take a long time for Tesla, which put doubt on whether their strategy for ride-hailing is the right one. Another approach, could be to allow their robotaxis to operate on Uber and other platforms, thereby getting direct access to an enormous customer base, without having to develop the ecosystem themselves.

Tesla's strategy could be successful if they are the sole manufacturer, or one of a select few, to achieve autonomy. This would allow them time to establish a fleet capable of competing with other platforms. However, if Uber gains access to autonomous vehicles at the same time or before Tesla perfects its technology, Tesla's ride-hailing platform may struggle to compete. Customers might not have a compelling reason to choose Tesla over Uber, as the pricing would likely be similar and Uber's larger fleet could offer greater convenience.

Energy storage

The energy storage sector represents a rapidly expanding area for Tesla, as highlighted in the financial and strategic analyses of the company. While energy storage might seems a bit outside Tesla's scope on electric vehicles, recent strategic plans and announcements indicate a shift towards diversifying beyond purely electric vehicles, especially when interpreting their latest Master plan 3. The energy storage segment is one of Tesla's most reliable segments within its non-core areas, primarily because its success is not a subject to speculation or regulatory approvals. Instead, it is demonstrating visible growth and robust profitability. Referring to Appendix 7, which demonstrates the significant progress in the area, shifting from negative to double-digit margins within just the last two years. Although this segment currently contributes only about 6% to Tesla's total revenue, considering market projections, Tesla's upward growth trajectory, enhanced margins, current market share, and the wider shift towards a greener economy with increased demand for energy storage, this sector is believed to exceed the EV segment in the future. For example, assuming a conservative growth rate and that the recent 54% increase from 2022 to 2023 continues, Tesla could match its car revenue with that from energy storage in six years. However, with high demand for products like Tesla's Megapack, actual growth rates are expected to far surpass 54% in the coming years. Tesla's early recognition and engagement with this trend have secured them a profitable position, which will undoubtedly yield significant future benefits.

Humanoid robots

While Humanoid robots remains an interesting segment, with high project growth rates, their projected market size over the next decade, remains very low to the other industries Tesla is playing in. The technological gap between existing solutions and those needed to be attractive for the mass-market, is huge. Hence from a market attractiveness standpoint, this isn't as interesting for Tesla as other segments. However, considering the potential of robots on a long-term 10-20 year basis, the market could be huge. Tesla makes a smart choice by continuing to develop this product, and prepare for the future, even though that the short-term opportunity may be limited. The company indeed have the technological capabilities and the AI expertise to become a player in this space in the future. These capabilities, in general open up opportunities for possible other products and revenue streams Tesla could establish via its AI and data capabilities. There are still

many questions related to AI, what the use-cases are and so on, but it seems evident that it is only just getting started, and that the potential is vast.

There appears to be a discrepancy between Elon Musk's vision for humanoid robots and market expectations. For instance, Goldman Sachs forecasts the humanoid robot market to reach $38 billion by 2035, a figure relatively modest compared to other segments Tesla is involved in. Nonetheless, Elon Musk has suggested that this could become Tesla's most profitable sector in the future, implying the market value far exceeding $38 billion by 2035. However, our analysis suggests that it might be overly optimistic to expect humanoid robots to be Tesla's largest profit generator. This skepticism stems from the established presence of companies like Boston Dynamics, which has years of experience in robotics, and the competition from niche startups supported by major tech firms such as Nvidia and Amazon. These companies are intensely focused on robotics, possibly giving them a competitive edge over Tesla's broader product range. Despite these challenges, there is a belief that humanoid robots will eventually work alongside humans to address labor-intensive tasks, given their ability to work longer hours and at lower costs than human labor. Consequently, this sector is anticipated to become profitable for Tesla, but likely not until after 2030, making it difficult to assess the investment potential within this field at present. Nevertheless, it is an exciting area, and Tesla is among the leading contenders in humanoid robotics. This segment is anticipated to contribute to Tesla's revenue stream, but its impact is expected several years from now.

Divergence in Strategic Vision

The new mission statement of Tesla, *"accelerate the world's transition to sustainable energy",* presented in in 2023 as part of their master plan 3, is questionable. On the one hand, it allows the company to play broadly in different industries and with various product, not limiting it to a specific area. It also incorporates one of our times' megatrends, climate change, encouraging Tesla to capitalize on this. However, on the other hand, the statement seems to be misaligned with some of the projects Tesla is working on. Autonomous driving and humanoid robots, arguably has little to do with accelerating the worlds transition to sustainable energy. This is also odd, considering the company and in particular Musk emphasizing that Tesla is an AI and robotics company, and that one shouldn't be an investor in Tesla, if they don't believe that it can solve autonomy. For a

diversified company like Tesla, the thesis acknowledges that it is difficult to reduce the mission of the business into one sentence, that encapsulates everything. However, when comparing the statement, with Musk's communication, there is a discrepancy, that can be misleading towards investors, and create uncertainty on what exactly the company pursues and what kind of investment case it is. This isn't exactly new, as discussions among investors and media regarding what kind of company Tesla is, has been ongoing for a long time. It is a fair observation, that Tesla could increase its diversification into different sectors, and become an actual conglomerate in the future. Looking at some of its Tech peers, like Alphabet and Amazon this wouldn't be unusual.

5. Conclusion & Recommendation

It can be concluded that Tesla faces challenges in the EV core business, and it is expected that it will lose market share over the next years, especially to BYD and other Chinese rivals. Their new affordable model could be key to protecting volumes and maintaining market share, however Chinese rivals seem to have an edge, as they are less concerned over profitability, and more focused on volume, signaling superior performance in the price-wars characterizing the market.

Tesla has the resources and capabilities to capitalize on the opportunities within autonomous driving and energy storage and is well-positioned to become a top contester in these markets. This significantly increases its attractiveness from an investor perspective. Its current revenue split, is expected to change significantly over the next decade, and become much more diversified, especially due to growth in the energy segment and progress in self-driving technology. However, success in the autonomous driving area involves high uncertainty, and relies on multiple factors, including technological prowess and regulatory hurdles. Despite this, the thesis bets on Tesla as one of the two to three companies who will dominate the industry and expect that the company will obtain significant financial gains from this.

Investors should expect volatility and low growth on the short term, driven by the named challenges in the EV core business. However, on a long-term 5–10-year horizon the stock has strong potential, driven by expected growth in autonomous driving, energy storage, AI and robotics. If Tesla succeeds in its non-core segments, it could generate returns comparable to major

tech companies as it becomes more of a software company than an EV maker. This will increase its attractiveness as a long-term investment opportunity.

The competitive landscape surrounding Tesla has changed, driven by external trends. Rivalry in the EV market is intensifying, due to traditional car-makers gradually transitioning from ICEs, as well as emerging Chinese players. Additionally, the increasing integration of software into vehicles is attracting various tech companies to the industry. Consequently, Tesla is seeing more collaborations between automakers and technology companies, while the company itself primarily relies on in-house development. This strategy heightens risks but can also expand rewards, since Tesla retains all the value created without needing to share it with partners.

Tesla maintains a strong competitive position across multiple segments. Its degree of vertical integration affords it substantial control over the supply chain and close customer relationships. However, its reliance on Chinese suppliers for battery cells leaves it vulnerable to geopolitical tensions. Despite these challenges, Tesla's strong foothold in the EV industry is reinforced by its scale, cost efficiencies, and well-established brand. Technologically, Tesla has an edge over competitors, fueled by its advanced AI and data capabilities from its DOJO computer. Specifically, the data gathered by its existing fleet of millions of vehicles sets the company apart and will be crucial in achieving autonomy. The camera-vision only approach, further makes the product much more scalable than competitors. The data resources will also be useful for Tesla's humanoid robots segment, though the potential in this area is considered less significant and is expected to arrive in some years from now. In the energy storage sector, Tesla is well-positioned and this area is anticipated to become a major growth driver for the company, potentially surpassing the EV segment.

Examination of Tesla's financial performance, showed a noticeable slowdown in revenue growth within its automotive segment, consistent with strategic findings. Between 2022 and 2023, Tesla experienced a decline in revenue, gross margin, and operating margin in its automotive sector.

However, its energy and storage segment saw a revenue growth of 54% and at the same time improved operational efficiency. Tesla's ROIC remains relatively high, indicating that the company has historically been effective at generating returns on its invested capital.

Tesla has a solid balance sheet, with low short- and long-term liquidity risk. It has substantial cash-reserves and short-term securities, which easily could cover the short term liabilities if necessary. The company has maintained a strong free cash flow from 2019 to 2023, showcasing its ability to create value that surpasses its capital investments. However, in 2023, there was a 42% decline in free cash flow growth, due in part to a deceleration in operational cash flow and notably high capital expenditures, which is believed to be a consequence of heightened competition.

Tesla has superior valuation multiples relative to its peers. The analysis indicated that Tesla is subject to high growth expectations, with growth rates significantly surpassing those of its competitors. However, consensus estimates also indicated a sharp decline in growth for Tesla in 2024, which matches our strategic analysis. In the subsequent years, however, Tesla is expected to rebound with double-digit revenue growth rates. This forecast largely relies on Tesla's ability to scale its low-cost EV model, enhance its energy storage solutions, and develop its autonomous driving products.

In sum, investing in Tesla essentially depends on the increasing importance of AI and software, especially the success of its robotaxi initiative, which could shift the company towards a more software-oriented business model. The thesis holds a strong belief in this strategic pivot and, as a result, recommends that long-term investors should consider purchasing the stock.

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Appendix:

Appendix 1: Reformulated income statement

Analytical income statement	2019	2020	2021	2022	2023
Effective corporate tax rate	*-17%*	*25%*	*11%*	*8%*	*-50%*
Revenue	24.578	31.536	53.823	81.462	96.773
-Operating expenses	22.493	27.220	44.389	64.059	83.215
EBITDA	**2.085**	**4.316**	**9.434**	**17.403**	**13.558**
-Depreciation & Amortization	2.154	2.322	2.911	3.747	4.667
Operating profit (EBIT)	**(69)**	**1.994**	**6.523**	**13.656**	**8.891**
-Tax on EBIT	11	505	719	1127	-4458
NOPAT	**(80)**	**1.489**	**5.804**	**12.529**	**13.349**
Financial Income	44	30	56	297	1.066
Financal expenses	(685)	(748)	(371)	(191)	(156)
Other income/expenses	45	(122)	135	(43)	172
Net financial income/expense b. tax	**(596)**	**(840)**	**(180)**	**63**	**1.082**
Tax on interest/tax shield	(99)	213	20	(5)	543
Net Earnings	**(775)**	**862**	**5.644**	**12.587**	**14.974**
Minority interest	(87)	(141)	(125)	(31)	23
Net Earnings after minorities	**(862)**	**721**	**5.519**	**12.556**	**14.997**

Source: Own creation, adapted from Tesla annual report 2019-2023

Appendix 2: Reformulated Balance Sheet

Reformulated Balance Sheet					
Operating activties	**2019**	**2020**	**2021**	**2022**	**2023**
Accounts receivable, net	1.324	1.886	1.913	2.952	3.508
Inventory	3.552	4.101	5.757	12.839	13.626
Prepaid expenses and other current assets	959	1.346	1.723	2.941	3.388
Operating lease vehicles, net	2.447	3.091	4.511	5.035	5.989
Solar energy systems, net	6.138	5.979	5.765	5.489	5.229
Property, plant and equipment, net	10.396	12.747	18.884	23.548	29.725
Operating lease right-of-use assets	1.218	1.558	2.016	2.563	4.180
Digital assets, net	0	313	1.260	184	184
Intangible assets, net	339	0	257	215	178
Goodwill	198	207	200	194	253
Defered tax assets	0	0	0	328	6.733
Other non-current assets	1.470	1.536	2.138	3.865	4.531
Accounts payable	-3.771	-6.051	-10.025	-15.255	-14.431
Accrued liabilities and other	-3.222	-3.855	-5.719	-7.142	-9.080
Deferred revenue	-1.163	-1.458	-1.447	-1.747	-2.864
Customer deposits	-726	-752	-925	-1.063	0
Defered revenue, net of current portion	-1.207	-1.284	-2.052	-2.804	-3.251
Other long-term liabilities	-2.691	-3.330	-3.546	-5.330	-8.153
Invested capital	**15.261**	**16.034**	**20.710**	**26.812**	**39.745**
Financing Activities	**2019**	**2020**	**2021**	**2022**	**2023**
Total Stockholders equity + minority	8.110	23.730	31.583	45.898	63.609
Current portion of detb and finance leases	1.785	2.132	1.589	1.502	2.373
Debt and finance leases, net of current portion	11.634	9.556	5.245	1.597	2.857
Short term investments	0	0	-131	-5.932	-12.696
Cash and cash equivalents	-6.268	-19.384	-17.576	-16.253	-16.398
Invested capital	**15.261**	**16.034**	**20.710**	**26.812**	**39.745**
Equity	**8.110**	**23.730**	**31.583**	**45.898**	**63.609**

Source: Own creation, adapted from Tesla annual report 2019-2023

Appendix 3: Analytical balance sheet, including Net Interest Bearing Liabilities

Analytical balance sheet					
Net operating assets	**2019**	**2020**	**2021**	**2022**	**2023**
Total assets	34.309	52.148	62.131	82.338	106.618
-Financial assets	-6.268	-19.384	-17.707	-22.185	-29.094
Operating assets	28.041	32.764	44.424	60.153	77.524
-Operating liabilities	-12.780	-16.730	-23.714	-33.341	-37.779
Invested capital	15.261	16.034	20.710	26.812	39.745
Equity and NIBL	**2019**	**2020**	**2021**	**2022**	**2023**
Equity	8.110	23.730	31.583	45.898	63.609
Financial liability	13.419	11.688	6.834	3.099	5.230
- Financial assets	-6.268	-19.384	-17.707	-22.185	-29.094
Net interest-bearing liabilities	7.151	-7.696	-10.873	-19.086	-23.864
Invested capital	15.261	16.034	20.710	26.812	39.745

Source: Own creation, adapted from Tesla annual report 2019-2023

Appendix 4: Income statement, Tesla

P&L Input TESLA

In billions usd	2019	2020	2021	2022	2023
Automotive revenues	19.358	24.604	44.125	67.210	78.509
Automotive regulatory credits	594	1.580	1.465	1.776	1.790
Automotive leasings	869	1.052	1.642	2.476	2.120
Total automotive revenues	**20.821**	**27.236**	**47.232**	**71.462**	**82.419**
Energy generation and storage	1.531	1.994	2.789	3.909	6.035
Services and other	2.226	2.306	3.802	6.091	8.319
Total revenue Energy and Services	**3.757**	**4.300**	**6.591**	**10.000**	**14.354**
Automotive sales	15.939	19.696	32.415	49.599	65.121
Automotive leasings	459	563	978	1.509	1.268
-Total automotive COGS	**16.398**	**20.259**	**33.393**	**51.108**	**66.389**
Energy generation and storage cost of revenues	1.341	1.976	2.918	3.621	4.894
Services and other cost of revenues	2.770	2.671	3.906	5.880	7.830
-Total energy and services COGS	**4.111**	**4.647**	**6.824**	**9.501**	**12.724**
Gross profit	**4.069**	**6.630**	**13.606**	**20.853**	**17.660**
Research and development	1.343	1.491	2.593	3.075	3.969
Selling, general and administrative	2.646	3.145	4.517	3.946	4.800
Restructuring and other	149	-	(27)	176	-
-Total operating expenses	**4.138**	**4.636**	**7.083**	**7.197**	**8.769**
EBIT	**(69)**	**1.994**	**6.523**	**13.656**	**8.891**
Interest income	44	30	56	297	1.066
Interest expense	(685)	(748)	(371)	(191)	(156)
Other income (expense), net	45	(122)	135	(43)	172
-Loss before income taxes	**(596)**	**(840)**	**(180)**	**63**	**1.082**
Earning before tax (EBT)	**(665)**	**1.154**	**6.343**	**13.719**	**9.973**
Provision for income taxes	(110)	(292)	(699)	(1.132)	5.001
Net income incl. minority interests	**(775)**	**862**	**5.644**	**12.587**	**14.974**
Minority interests	(87)	(141)	(125)	(31)	23
Net income	**(862)**	**721**	**5.519**	**12.556**	**14.997**

Source: Own creation, adapted from Tesla annual report 2019-2023

Appendix 5: Balance sheet, Tesla

Balance sheet Tesla

(in thousands)	2019	2020	2021	2022	2023	
Cash and cash equivalents	6.268	19.384	17.576	16.253	16.398	O
Short term investments	-	-	131	5.932	12.696	F
Accounts receivable, net	1.324	1.886	1.913	2.952	3.508	O
Inventory	3.552	4.101	5.757	12.839	13.626	O
Prepaid expenses and other current assets	959	1.346	1.723	2.941	3.388	O
Total current assets	**12.103**	**26.717**	**27.100**	**40.917**	**49.616**	
Operating lease vehicles, net	2.447	3.091	4.511	5.035	5.989	O
Solar energy systems, net	6.138	5.979	5.765	5.489	5.229	O
Property, plant and equipment, net	10.396	12.747	18.884	23.548	29.725	O
Operating lease right-of-use assets	1.218	1.558	2.016	2.563	4.180	O
Digital assets, net	-	313	1.260	184	184	O
Intangible assets, net	339	-	257	215	178	O
Goodwill	198	207	200	194	253	O
Defered tax assets	-	-	-	328	6.733	O
Other non-current assets	1.470	1.536	2.138	3.865	4.531	O
Total non-current assets	**22.206**	**25.431**	**35.031**	**41.421**	**57.002**	
Total assets	**34.309**	**52.148**	**62.131**	**82.338**	**106.618**	
Accounts payable	3.771	6.051	10.025	15.255	14.431	O
Accrued liabilities and other	3.222	3.855	5.719	7.142	9.080	O
Deferred revenue	1.163	1.458	1.447	1.747	2.864	O
Customer deposits	726	752	925	1.063	-	O
Current portion of detb and finance leases	1.785	2.132	1.589	1.502	2.373	F
Total current liabilities	**10.667**	**14.248**	**19.705**	**26.709**	**28.748**	
Debt and finance leases, net of current portion	11.634	9.556	5.245	1.597	2.857	F
Defered revenue, net of current portion	1.207	1.284	2.052	2.804	3.251	O
Other long-term liabilities	2.691	3.330	3.546	5.330	8.153	O
Total long term liabilies	**15.532**	**14.170**	**10.843**	**9.731**	**14.261**	
Total liabilities	**26.199**	**28.418**	**30.548**	**36.440**	**43.009**	
Total stockholders' equity	**6.618**	**22.225**	**30.189**	**44.704**	**62.634**	
Redeemable noncontrolling interest in subsidiaries	643	655	568	409	242	F
Noncontrolling interests in subsidiaries	849	850	826	785	733	F
Total liabilities and equity	**34.309**	**52.148**	**62.131**	**82.338**	**106.618**	F

Source: Own creation, adapted from Tesla annual report 2019-2023

Appendix 6: Financial metric Tesla, with formulas

Key financial indicators						
Years	**2019**	**2020**	**2021**	**2022**	**2023**	**Formulas**
Profitablitiy ratios %						
ROIC	-0,5%	9,3%	28,0%	46,7%	33,6%	*Nopat/Invested capital*
EBIT	-0,5%	12,4%	31,5%	50,9%	22,4%	*EBIT/Invested capital*
Operating margin	-0,3%	6,3%	12,1%	16,8%	9,2%	*EBIT/Revenue*
Net proift margin	-3,5%	2,3%	10,3%	15,4%	15,5%	*Net income/Total revenue*
Return on Equity	-13,0%	3,2%	18,3%	28,1%	23,9%	*Net income/Total equity*
Return on Assets	-2,5%	1,4%	8,9%	15,2%	14,1%	*Net income/Total assets*
Growth ratios %						
Sales growth	14,5%	28,3%	70,7%	51,4%	18,8%	*(Sales) Ending value/beginning value-1*
EBITDA growth	37,8%	107,0%	118,6%	84,5%	-22,1%	*(EBITDA) Ending value/beginning value-1*
Net income growth	10,9%	183,6%	665,5%	127,5%	19,4%	*(Net income) Ending value/beginning value-1*
Short-term liqudity, absolute						
Current ratio	1,13	1,88	1,38	1,53	1,73	*Total current assets/Total current liabilities*
Adjusted current ratio (analytical)	0,47	1,66	2,59	7,16	5,56	*Financial assets/Financial liabilities*
Cash flow from operations to debt ratio	0,179	0,508	1,682	4,751	2,535	*Cash flow from operations/Financial liabilities*
Capital expenditure ratio	1,675	1,898	1,461	1,230	0,851	*Cash flow from operations/Investing activities*
Long -term liquidty, absolute						
Equity ratio	0,19	0,43	0,49	0,54	0,59	*Total equity/Total equity and liabilities*
Financial leverage (analytical)	1,08	(0,35)	(0,36)	(0,43)	(0,38)	*Net interest bearing liabilities/Total equity*

Source: Own creation, adapted from Tesla annual report 2019-2023

Appendix 7: KPI's for profitability analysis

KPIs for profitability					
Years	2019	2020	2021	2022	2023
Revenue % automotive y-o-y		31%	73%	51%	15%
Revenue % energy generation y-o-y		30%	40%	40%	54%
Revenue % services y-o-y		4%	65%	60%	37%
Gross Profit% automotive	21%	26%	29%	28%	19%
Gross Profit% energy generation and storage	12%	1%	-5%	7%	19%
Gross Profti% services and other	-24%	-16%	-3%	3%	6%
Overall Gross Profit%	17%	21%	25%	26%	18%
EBIT %	0%	6%	12%	17%	9%
Net gain/loss %	-4%	2%	10%	15%	15%
ROA	-3%	1%	9%	15%	14%
ROE	-13%	3%	18%	28%	24%

Source: Own creation, adapted from Tesla annual report 2019-2023

Appendix 8: Tesla model description

Model	Description	Latest selling price (RMB)	Picture
Model S	The latest Model S Plaid was delivered in the third quarter of 2022. This medium-large EV includes a three-motor all-wheel drive system, battery capacity of 100kWh, driving range of 637km, 0-60 mph acceleration in less than 2 seconds, a top speed of 322 km/h.	$88,490-$113,240	
Model X	The latest version was delivered in the first quarter of 2023. This full-size SUV EV includes driving ranges of 380-400km (standard)/ 470-500km (performance); dual-motor all-wheel drive technology; 0 to 100km acceleration time of 2.9 seconds, and top speed of 250 km/h.	$98,490-$130,740	
Model Y	The latest model was delivered in the fourth quarter of 2023. It is a medium-size SUV, using 75% of the same parts and production line as Model 3, has a driving range of 525-594km and 0 to 100km acceleration time of 5.9 seconds.	$47,740-$73,990	
Model 3	The latest version was delivered in the third quarter of 2023. This entry-level, a medium-size sedan EV has a range of 713km under standard conditions and 559km under WLTP conditions, and a 0 to 100km acceleration time of 4.4 seconds.	$40,240-$71,240	
Roadster	The latest version can be pre-ordered in 2024. This pure electric sports car will be equipped with a three-motor all-wheel drive system, range up to 800km, top speed of 400 kilometers/h, and 0 to 100km acceleration in 2 seconds.	$50,000 to reserve, full price undisclosed	
Cybertruck	The first delivery took place in 4Q23. Cybertruck is equipped with a three-motor all-wheel drive system with a range of 800km and top speed of 160km/hr. As of 2023, more than 1.9 million orders have been placed for this model. Given the ultra-hard stainless steel welding bottleneck and 4680 battery capacity constraints, there is no large-scale production.	$81,895-$101,985	
Semi	The last version was delivered in 4Q22, with 35 vehicles recalled by Tesla in Mar 23 due to a software update. Equipped with a three-motor all-wheel drive system, Semi has a range of 800km and a top speed of 160 km/h. There are more than 500 reservations for the next version of this model, but due to the limited capacity of the 21700-model battery, it has not been mass-produced.	$150,000-$200,000	

Source: Retrieved from (Wang, 2024) – adjusted by authors

Appendix 9: List of EVs eligible for the US Federeal Tax Credit (effective Jan 1, 2024)

Model	Model year	Tax credit amount
Chevrolet Bolt EV	2022-2023	US$7,500
Chevrolet Bolt EUV	2022-2023	US$7,500
Chrysler Pacifica Plug-in Hybrid	2022-2024	US$7,500
Ford Edge Plug-in Hybrid	2022-2024	US$3,750
Ford F-150 Lightning (Long Range)	2022-2024	US$7,500
Ford F-150 Lightning (Standard Range)	2022-2024	US$7,500
Jeep Grand Cherokee 4xe PHEV	2022-2024	US$3,750
Jeep Wrangler 4xe PHEV	2022-2024	US$3,750
Lincoln Corsair Grand Touring	2022-2024	US$3,750
Rivian R1S Dual Large	2023-2024	US$3,750
Rivian R1S Quad Large	2023-2024	US$3,750
Rivian R1T Dual Large	2023-2024	US$3,750
Rivian R1T Dual Max	2023-2024	US$3,750
Rivian R1T Quad Large	2023-2024	US$3,750
Tesla Model 3 Performance	2023-2024	US$7,500
Tesla Model X Long Range	2023-2024	US$7,500
Tesla Model Y All-Wheel Drive	2023-2024	US$7,500
Tesla Model Y Performance	2023-2024	US$7,500
Tesla Model Y Rear-Wheel Drive	2024	US$7,500

Source: Retrieved from (Wang, 2024)

Appendix 10: Large-scale Battery Energy Storage Systems (BEES) comparison

	Fluence	Tesla	BYD
Product name	Gridstack Pro	Megapack	MC Cube ESS
Capacity	Delivering 2MW-500+MW of power for options of 2-hour/4-hour power supply	Each Megapack unit offers 3.9MWh energy and can integrate up to 1,000 units in the same location	Four models are available, delivering power of 3.54 MWh /3.91 MWh /4.66 MWh /5.37MWh, respectively
Selling price	N/A	US$2.60mn per set	N/A
Inverter R&D	External	In-house	In-house
Picture			
Launch time	Oct 2023	Aug 2022	May 2023
Battery supplier	Assembled with LFP batteries and nickel manganese cobalt (NMC) batteries supplied by the US subsidiary of Envision AESC	Assembled by the US Magafactory with NMC batteries supplied by Panasonic, and by the Shanghai Megafactory with LFP batteries from CATL	LFP batteries produced in-house.

Source: Retrieved from (Wang, 2024)

Appendix 11: Development stages of humanoid robots (L0 to L5)

Development stage	Timeline	Robot features	Landmark events	Picture
L0 (Remote operation)	1947-1948	Robots can only rely on human commands for structural drive, without any intelligent design.	In 1947, the world's first telemanipulator was born, developed by the US Argonne National Laboratory.	
L1 (Fixed action)	1956-1962	The robot can actuate joints for functions such as drag and drop, recording and playback.	In 1956, the world's first robotics company Unimation was founded.	
L2 (Action feedback)	1966-1972	Algorithm-driven planning of trajectories and paths to accomplish specific actions.	In 1966, the Stanford Research Institute (SRI) developed Shakey, which was the world's first mobile robot (also known as "the first electronic person").	
L3 (Preset intelligence)	2013 to date	Sensory capabilities: utilize sensors to acquire environmental information; able to autonomously recognize, understand, and provide feedback on pre-programmed actions.	Boston Dynamics debuted the world's first L3-level humanoid robot Atlas on Jul 11, 2013.	
L4 (Autonomous intelligence)	N/A	Cognitively able to reason autonomously through observation, measurement, and preconceptions to accomplish tasks without frequent human intervention.	N/A	
L5 (Innovative intelligence)	N/A	Fully human in thinking and creativity, capable of autonomous judgment, decision making and execution of complex tasks.	N/A	

Source: Retrieved from (Wang, 2024)

Appendix 12: Cash flow statement

Cash Flow Statement					
12 months ended:	Dec 31, 2019	Dec 31, 2020	Dec 31, 2021	Dec 31, 2022	Dec 31, 2023
Net income (loss)	(775)	862	5.644	12.587	14.974
Depreciation, amortization and impairment	2.154	2.322	2.911	3.747	4.667
Stock-based compensation	898	1.734	2.121	1.560	1.812
Inventory and purchase commitments write-downs	193	202	140	177	463
Foreign currency transaction net unrealized (gain) loss	(48)	114	(55)	81	(144)
Deferred income taxes	—	—	(149)	(196)	(6.349)
Non-cash interest and other operating activities	520	525	245	340	81
Digital assets (gain) loss, net	—	—	(27)	140	—
Operating cash flow related to repayment of discounted convertible senior notes	(188)	—	—	—	—
Accounts receivable	(367)	(652)	(130)	(1.124)	(586)
Inventory	(429)	(422)	(1.709)	(6.465)	(1.195)
Operating lease vehicles	(764)	(1.072)	(2.114)	(1.570)	(1.952)
Prepaid expenses and other assets	(173)	(595)	(1.540)	(3.713)	(2.652)
Accounts payable, accrued and other liabilities	583	2.604	5.367	8.029	2.605
Deferred revenue	801	321	793	1.131	1.532
Changes in operating assets and liabilities	**(349)**	**184**	**667**	**(3.712)**	**(2.248)**
Adjustments to reconcile net income (loss) to net cash provided by operating activities	**3.180**	**5.081**	**5.853**	**2.137**	**(1.718)**
Net cash provided by operating activities	**2.405**	**5.943**	**11.497**	**14.724**	**13.256**
Purchases of property and equipment excluding finance leases, net of sales	(1.327)	(3.157)	(6.482)	(7.158)	(8.898)
Purchases of solar energy systems, net of sales	(105)	(75)	(32)	(5)	(1)
Purchases of digital assets	—	—	(1.500)	—	—
Proceeds from sales of digital assets	—	—	272	936	—
Purchase of intangible assets	(5)	(10)	—	(9)	—
Purchases of investments	—	—	(132)	(5.835)	(19.112)
Proceeds from maturities of investments	—	—	—	22	12.353
Proceeds from sales of investments	—	—	—	—	138
Receipt of government grants	46	123	6	76	—
Business combinations, net of cash acquired	(45)	(13)	—	—	(64)
Net cash used in investing activities	**(1.436)**	**(3.132)**	**(7.868)**	**(11.973)**	**(15.584)**
Proceeds from issuances of common stock in public offerings, net of issuance costs	848	12.269	—	—	—
Proceeds from issuances of debt	10.669	9.713	8.883	—	3.931
Repayments of debt	(9.161)	(11.623)	(14.167)	(3.364)	(1.351)
Collateralized lease repayments	(389)	(240)	(9)	—	—
Proceeds from exercises of stock options and other stock issuances	263	417	707	541	700
Principal payments on finance leases	(321)	(338)	(439)	(502)	(464)
Debt issuance costs	(37)	(6)	(9)	—	(29)
Purchase of convertible note hedges	(476)	—	—	—	—
Proceeds from issuance of warrants	174	—	—	—	—
Proceeds from investments by noncontrolling interests in subsidiaries	279	24	2	—	—
Distributions paid to noncontrolling interests in subsidiaries	(311)	(208)	(161)	(157)	(144)
Payments for buy-outs of noncontrolling interests in subsidiaries	(9)	(35)	(10)	(45)	(54)
Net cash provided by (used in) financing activities	**1.529**	**9.973**	**(5.203)**	**(3.527)**	**2.589**
Effect of exchange rate changes on cash and cash equivalents and restricted cash	8	334	(183)	(444)	4
Net increase (decrease) in cash and cash equivalents and restricted cash	**2.506**	**13.118**	**(1.757)**	**(1.220)**	**265**
Cash and cash equivalents and restricted cash, beginning of period	4.277	6.783	19.901	18.144	16.924
Cash and cash equivalents and restricted cash, end of period	**6.783**	**19.901**	**18.144**	**16.924**	**17.189**

Source: Own creation, adapted from Tesla annual report 2019-2023

Appendix 13: Cash flow analysis metrics

Cash flow analysis					
Years	**2019**	**2020**	**2021**	**2022**	**2023**
Operating activites					
Operating cash flow	2.405	5.943	11.497	14.724	13.256
Operating cash flow growth		147,1%	93,5%	28,1%	-10,0%
Investment activities					
Capital expenditures	(1.432)	(3.232)	(6.514)	(7.163)	(8.899)
CAPEX growth		126%	102%	10%	24%
CAPEX as percentage of revenue	6%	10%	12%	9%	9%
Financing activities					
Issuances of debt	10.669	9.713	8.883	—	3.931
Repayment of debt	(9.161)	(11.623)	(14.167)	(3.364)	(1.351)
Other debt related cost	(747)	(584)	(457)	(502)	(493)
Deb issued/paid	761	(2.494)	(5.741)	(3.866)	2.087
Net cash flow					
Free Cash Flow	973	2.711	4.983	7.561	4.357
Free Cash Flow Growth		179%	84%	52%	-42%
Free Cash Flow Margin	4,0%	8,6%	9,3%	9,3%	4,5%

Source: Own creation, adapted from Tesla annual report 2019-2023

Appendix 14: Top 10 Battery Electric Vehicle players:

Top 10 BEV Players

Company	Tesla	BYD	Volkswagen Group	Geely Group	Hyundai Motor Group	GAC Aion	SAIC-GM-WULING	BMW Group	Stellantis	Mercedes-Benz Group
Market share, %	19%	17%	8%	6%	5%	5%	5%	4%	3%	2%
Deliveries, millions	1,8	1,6	0,8	0,6	0,5	0,5	0,5	0,4	0,3	0,2
Share of total deliveries, %	100%	53%	8%	22%	7%	100%	33%	15%	5%	9%
Delivery growth 2022-23, %	38%	73%	35%	51%	N/A	77%	4%	74%	21%	73%

Note: Globally, full year 2023

Source: Own creation

Appendix 15: Automotive multiples peers (2021-2024) and margins/growth rates (2021-2023)

Multiples (2021-2024)				
Price/Earnings	2021	2022	2023	24-04-2024
BYD	205,0	29,8	18,9	18,0
Volkswagen Group	8,7	5,0	3,7	4,4
Geely Group	36,2	19,8	15,3	16,2
BMW Group	4,7	3,1	5,7	6,0
Mercedes Benz Group	6,8	4,5	4,7	5,5
Toyota	10,7	10,8	10,5	10,6
Ford	13,0	6,1	6,0	6,8
General Motors	8,3	4,8	4,7	5,7
Average Peer	36,7	10,5	8,7	9,1
Tesla	217,4	33,7	95,6	65,1
Tesla vs peers	5,9	3,2	11,0	7,1
Price/Book	2021	2022	2023	24-04-2024
BYD	6,7	4,5	4,1	3,9
Volkswagen Group	1,0	0,5	0,4	0,4
Geely Group	2,7	1,4	1,0	1,1
BMW Group	0,8	0,6	0,7	0,8
Mercedes Benz Group	1,0	0,8	0,7	0,8
Toyota	1,0	1,2	0,9	1,5
Ford	1,7	1,1	1,1	1,2
General Motors	1,5	0,7	0,7	0,8
Average Peer	2,0	1,3	1,2	1,3
Tesla	36,2	8,7	12,6	7,2
Tesla vs peers	17,7	6,5	10,5	5,5
Enterprise Value (billions)	2021	2022	2023	24-04-2024
BYD	114	92	72	72
Volkswagen Group	102	48	37	42
Geely Group	24	12	8	10
BMW Group	51	49	60	61
Mercedes Benz Group	57	45	40	50
Toyota	193	225	165	523
Ford	67	34	40	46
General Motors	89	45	44	53
Average Peer	87	69	58	107
Tesla	1.084	374	773	441
Tesla vs peers	12,4	5,4	13,3	4,1
EV/EBITDA	2021	2022	2023	24-04-2024
BYD	35,4	15,5	6,5	6,7
Volkswagen Group	2,0	0,9	0,7	0,8
Geely Group	15,6	7,1	4,9	5,4
BMW Group	2,3	2,0	2,0	2,1
Mercedes Benz Group	2,3	1,7	1,5	2,0
Toyota	5,6	5,7	4,6	11,6
Ford	5,5	2,4	2,9	3,6
General Motors	4,1	2,1	2,0	2,4
Average Peer	9,1	4,7	3,1	4,3
Tesla	107,8	20,6	52,5	35,9
Tesla vs peers	11,9	4,4	16,8	8,3
EV/Sales	2021	2022	2023	24-04-2024
BYD	3,4	1,5	0,9	0,9
Volkswagen Group	0,4	0,2	0,1	0,1
Geely Group	1,5	0,6	0,3	0,4
BMW Group	0,4	0,3	0,4	0,4
Mercedes Benz Group	0,4	0,3	0,2	0,3
Toyota	0,8	0,9	0,6	1,8
Ford	0,5	0,2	0,2	0,3
General Motors	0,7	0,3	0,3	0,3
Average Peer	1,0	0,5	0,4	0,6
Tesla	20,1	4,6	8,0	4,7
Tesla vs Peers	20,2	8,7	21,8	8,4

Growth rates and margins (2021-2023)			
Revenue Growth %	2021	2022	2023
BYD	41%	96%	42%
Volkswagen Group	12%	12%	15%
Geely Group	10%	46%	21%
BMW Group	12%	28%	9%
Mercedes Benz Group	10%	12%	2%
Toyota	-9%	15%	18%
Ford	7%	16%	11%
General Motors	4%	23%	10%
Average Peer	11%	31%	16%
Tesla	71%	51%	19%
Tesla vs peers	6,4	1,7	1,2
Gross Margin %	2021	2022	2023
BYD	13%	17%	20%
Volkswagen Group	19%	19%	19%
Geely Group	17%	14%	15%
BMW Group	20%	17%	19%
Mercedes Benz Group	23%	23%	22%
Toyota	18%	19%	17%
Ford	12%	11%	9%
General Motors	21%	19%	18%
Average Peer	18%	17%	17%
Tesla	25%	26%	18%
Tesla vs peers	1,4	1,5	1,0
Net Income Margin %	2021	2022	2023
BYD	1%	4%	5%
Volkswagen Group	6%	6%	5%
Geely Group	5%	4%	3%
BMW Group	11%	13%	7%
Mercedes Benz Group	17%	10%	9%
Toyota	8%	9%	7%
Ford	13%	-1%	2%
General Motors	8%	6%	6%
Average Peer	9%	6%	6%
Tesla	10%	15%	16%
Tesla vs Peers	1,2	2,5	2,8

Source: Own creation, retrieved from Bloomberg Terminal (Bloomberg, 2024)

Appendix 16: Forward multiples peers (2024-2026) and margins/growth rates (2024-2027)

Forward multiples - consensus (2024-2026)			
Enterprice Value (billions)	2024	2025	2026
BYD	84	84	84
Volkswagen Group	62	62	62
Geely Group	10	10	10
BMW Group	59	59	59
Mercedes Benz Group	48	48	48
Toyota	533	533	532
Ford	43	43	43
General Motors	52	52	52
Average Peer	111	111	111
Tesla	569	569	568
Tesla vs Peers	5,1	5,1	5,1
Price/Book	2024	2025	2026
BYD	3,66	2,94	2,46
Volkswagen Group	0,37	0,32	0,29
Geely Group	1,07	0,97	0,91
BMW Group	0,68	0,65	0,62
Mercedes Benz Group	0,79	0,73	0,65
Toyota	1,53	1,37	1,26
Ford	1,06	0,98	0,91
General Motors	0,74	0,62	0,55
Average Peer	1,24	1,07	0,96
Tesla	8,67	7,49	6,27
Tesla vs Peers	7,0	7,0	6,6
EV/EBITDA	2024	2025	2026
BYD	7,01	5,83	4,9
Volkswagen Group	1,18	1,11	1,09
Geely Group	5,01	4,2	3,74
BMW Group	2,24	2,22	2,08
Mercedes Benz Group	1,89	1,9	1,88
Toyota	12,06	11,5	11,37
Ford	2,72	2,88	3,25
General Motors	2,67	2,75	2,62
Average Peer	4,35	4,05	3,87
Tesla	37,66	28,45	22,36
Tesla vs Peers	8,66	7,0	5,8
EV/Revenue	2024	2025	2026
BYD	0,82	0,69	0,63
Volkswagen Group	0,18	0,17	0,16
Geely Group	0,34	0,29	0,26
BMW Group	0,35	0,34	0,33
Mercedes Benz Group	0,29	0,29	0,28
Toyota	1,84	1,77	1,71
Ford	0,26	0,26	0,26
General Motors	0,3	0,29	0,29
Average Peer	0,55	0,51	0,49
Tesla	5,67	4,82	3,96
Tesla vs Peers	10,4	9,4	8,1

Forward margins/growth rates (2024-2026)				
Revenue Growth, %	2024	2025	2026	2027
BYD	21%	19%	10%	10%
Volkswagen Group	1%	5%	4%	4%
Geely Group	17%	15%	11%	2%
BMW Group	0%	3%	3%	2%
Mercedes Benz Group	-1%	2%	3%	1%
Toyota	5%	4%	3%	-1%
Ford	4%	1%	0%	-3%
General Motors	2%	1%	2%	2%
Average Peer	6%	6%	5%	2%
Tesla	4%	18%	22%	17%
Tesla vs Peers	0,7	2,8	4,8	7,2
Gross Margin, %	2024	2025	2026	2027
BYD	20%	20%	20%	21%
Volkswagen Group	20%	20%	20%	19%
Geely Group	16%	16%	16%	16%
BMW Group	19%	19%	20%	20%
Mercedes Benz Group	21%	21%	22%	22%
Toyota	20%	21%	21%	21%
Ford	15%	16%	16%	16%
General Motors	17%	16%	18%	15%
Average Peer	18%	19%	19%	19%
Tesla	18%	19%	20%	20%
Tesla vs Peers	1,0	1,0	1,0	1,1
Net Income Margin, %	2024	2025	2026	2027
BYD	5%	5%	5%	5%
Volkswagen Group	5%	5%	5%	5%
Geely Group	3%	4%	4%	5%
BMW Group	7%	6%	6%	6%
Mercedes Benz Group	8%	8%	8%	8%
Toyota	11%	10%	10%	10%
Ford	4%	4%	3%	3%
General Motors	6%	6%	5%	4%
Average Peer	6%	6%	6%	6%
Tesla	8%	9%	11%	11%
Tesla vs Peers	1,3	1,5	1,8	1,9

Source: Own creation, retrieved from Bloomberg Terminal (Bloomberg, 2024)

Appendix 17: Magnificent seven multiples (2021-2024) and margins/growth rates (2021-2023)

MAG 7 - Multiples (2021-2024)				
Price/Earnings	**2021**	**2022**	**2023**	**24-04-2024**
Apple	26,3	24,6	27,9	26,0
Meta	24,54	11,95	20,66	28,77
Microsoft	34,2	28,02	34,69	36,87
Alphabet	28,82	18,14	22,83	26,58
NVIDIA	57,38	78,69	50,73	68,34
Amazon	71,53	113,85	51,92	61,33
Average Peer	**40,5**	**45,9**	**34,8**	**41,3**
Tesla	**217,35**	**33,66**	**95,6**	**65,09**
Tesla vs Peers	**5,37**	**0,73**	**2,75**	**1,58**
Price/Book	**2021**	**2022**	**2023**	**24-04-2024**
Apple	38,3	47,3	42,8	34,8
Meta	7,38	2,5	5,92	8,29
Microsoft	14,35	11,51	12,27	12,71
Alphabet	7,62	4,43	6,14	6,96
NVIDIA	21,51	22,72	34,99	47,25
Amazon	12,28	5,89	7,81	9,23
Average Peer	**16,9**	**15,7**	**18,3**	**19,9**
Tesla	**36,16**	**8,72**	**12,64**	**7,17**
Tesla vs Peers	**2,14**	**0,55**	**0,69**	**0,36**
Enterprise value (billions)	**2021**	**2022**	**2023**	**24-04-2024**
Apple	2359	2362	2624	2729
Meta	888	301	879	1161
Microsoft	1989	1891	2499	3100
Alphabet	1807	1050	1658	2008
NVIDIA	563	501	1489	2289
Amazon	1733	945	1645	2032
Average Peer	**1557**	**1175**	**1799**	**2220**
Tesla	**1084**	**374**	**773**	**441**
Tesla vs Peers	**0,70**	**0,32**	**0,43**	**0,20**
EV/EBITDA	**2021**	**2022**	**2023**	**24-04-2024**
Apple	19,4	17,8	20,5	19,3
Meta	15,79	7,63	14,65	20,51
Microsoft	23,75	18,85	23,74	25,29
Alphabet	19,25	11,21	16,65	19,03
NVIDIA	49,46	84,04	42,85	58,87
Amazon	26,06	15	17,13	20,12
Average Peer	**25,6**	**25,8**	**22,6**	**27,2**
Tesla	**20,58**	**52,54**	**35,93**	**28,87**
Tesla vs Peers	**0,80**	**2,04**	**1,59**	**1,06**
EV/Sales	**2021**	**2022**	**2023**	**24-04-2024**
Apple	6,5	6,0	6,9	6,5
Meta	7,53	2,58	6,52	9,12
Microsoft	11,83	9,54	11,79	13,44
Alphabet	7,01	3,71	5,4	6,17
NVIDIA	20,92	18,57	24,44	33,58
Amazon	3,69	1,84	2,86	3,36
Average Peer	**9,6**	**7,0**	**9,6**	**12,0**
Tesla	**20,14**	**4,6**	**7,99**	**4,65**
Tesla vs Peers	**2,10**	**0,65**	**0,83**	**0,39**

MAG 7 - Growth rates and margins (2021-2023)			
Revenue Growth %	**2021**	**2022**	**2023**
Apple	33,3%	7,8%	-2,8%
Meta	37,2%	-1,1%	15,7%
Microsoft	17,5%	18,0%	6,9%
Alphabet	41,2%	9,8%	8,7%
NVIDIA	61,4%	0,2%	125,9%
Amazon	37,6%	21,7%	9,4%
Average Peer	**38%**	**9%**	**27%**
Tesla	**71%**	**51%**	**19%**
Tesla vs Peers	**1,86**	**5,47**	**0,69**
Gross margin %	**2021**	**2022**	**2023**
Apple	42%	43%	44%
Meta	81%	78%	81%
Microsoft	69%	68%	69%
Alphabet	57%	55%	57%
NVIDIA	65%	57%	73%
Amazon	42%	44%	47%
Average Peer	**59%**	**58%**	**62%**
Tesla	25%	26%	18%
Tesla vs Peers	**0,43**	**0,44**	**0,30**
EBITDA margin %	**2021**	**2022**	**2023**
Apple	33%	34%	33%
Meta	48%	34%	44%
Microsoft	50%	51%	50%
Alphabet	36%	33%	32%
NVIDIA	42%	22%	57%
Amazon	14%	12%	17%
Average Peer	**37%**	**31%**	**39%**
Tesla	19%	22%	15%
Tesla vs Peers	**0,50**	**0,72**	**0,39**
Net Income margin %	**2021**	**2022**	**2023**
Apple	26%	25%	25%
Meta	33%	20%	29%
Microsoft	36%	37%	34%
Alphabet	30%	21%	24%
NVIDIA	36%	16%	49%
Amazon	7%	-1%	5%
Average Peer	**28%**	**20%**	**28%**
Tesla	**10%**	**15%**	**16%**
Tesla vs Peers	**0,36**	**0,78**	**0,56**

Source: Own creation, retrieved from Bloomberg Terminal (Bloomberg, 2024)

Appendix 18: Forward estimates Tesla: ROA & ROE (2024-2026)

Forward estimates, Tesla (ROA & ROE)				
Years	2024	2025	2026	2027
ROA	8,48%	10,31%	10,46%	11,47%
ROE	12,61%	14,02%	14,54%	14,60%

Source: Own creation, retrieved from Bloomberg Terminal (Bloomberg, 2024)