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Crisis at Volkswagen: Families, Firms, and Germany-style Capitalism

Matthias Müller, the Chief Executive of the Volkswagen Group (VW), had just returned from the annual Frankfurt Auto Show, where he had announced VW's plans for electric vehicles (EVs) and autonomous vehicles. It was an exciting moment to be the CEO of the world's largest automotive company: after a century of incremental innovation, the sector was being transformed by new technologies. The strategy that Müller was formulating would determine whether VW could successfully make the transition into this new era. As he looked out of his office window over the town of Wolfsburg, Müller could not help but wonder whether VW was ready for the challenges ahead. His key concern was not so much about the required technology, but the organisational strength required. Only two years prior, VW was on the brink of collapse as a result of the diesel emissions scandal. Many believed that this scandal was the result of weak corporate governance and cultural problems that lay deep at the heart of the VW Group. Had VW drawn the right lessons from the crisis? Were the changes VW made sufficient?

The German Auto Industry

In a world where countries often agonise over losing manufacturing jobs to low-cost competitors, Germany has continued to excel at manufacturing. In 2015, manufacturing value-added as a percentage of gross domestic product in Germany was 23%, almost twice the share of manufacturing in the US economy (and just behind China).¹

The German auto industry is a symbol of the country's manufacturing prowess, recognised around the world for its excellence in engineering, quality, innovation, safety, and design. In 2015, German manufacturers produced over 15m vehicles, more than 19% of total global production. Further, in 2015 Germany exported approximately 79% of cars produced domestically.² That same year, it was the largest employer in Germany, directly or indirectly employing one in seven workers, and contributed 20% of total German industry revenue.³ Needless to say, the industry is crucial to the overall health of the German economy.

The German auto industry has close ties to the German government. Not only are there financial ties – for example the Quandt family of BMW gave €690,000 to Ms Merkel's party in 2013 – but there is a revolving door between industry and government. Eckart von Klæden,

Professors Eric Thun and Chris McKenna with Scarlett Mansfield, a researcher in the Global History of Capitalism project, at the University of Oxford prepared this case based on published secondary materials.

a former senior official in Ms Merkel's chancellery, for example, is now chief lobbyist for Daimler.⁴

The government, as a whole, has often sought to protect the interests the auto industry. In 2007, following backlash from German car lobbies and the Merkel government, the EU amended the limit of average carbon dioxide emissions of new vehicles sold in the EU from the proposed 120g/km to 130g/km. Implementation deadlines were also pushed back. In February 2011, Jürgen Resch, the head of Deutsche Umwelthilfe, a non-profit environmental and consumer protection association, met with officials from the German transport ministry. They passed on their suspicions about certain German car models and said the 'tests indicated the possible use of defeat devices. Mr Resch says the officials failed to act.'⁵

Volkswagen and Porsche

The Volkswagen Group has a long and tumultuous history as a family-owned company. Its founder, Ferdinand Porsche, was born in 1875 in Maffersdorf, part of the Austrian Empire. With a keen interest in engineering, Ferdinand moved to Stuttgart, Germany in the 1920s to work for Daimler. By the 1930s he had enough money to start his own business and in 1931 founded *Dr Ing. H. c. F. Porsche GmbH* (known as Porsche). Rather than building cars under its own name, Porsche offered vehicle consulting and development work.

Owing to the poor German economy, Porsche's growth was initially slow. However, in 1933 Adolf Hitler announced his intention to motorise the nation and unveiled a new program to design a "people's car" (translated as "Volkswagen"). In June 1934, Porsche received the contract to design the car that came to be known as the VW Beetle (initially called the Porsche 60). In Berlin 1937, Ferdinand Porsche then co-founded Volkswagen and manufactured the car for widespread distribution.

In the years that followed, despite officially being separate companies, Porsche and Volkswagen frequently collaborated. In 1939, for example, Porsche developed the Porsche 64 using many components found in the Volkswagen Beetle. In 1945, at the end of World War Two, the French imprisoned Ferdinand Porsche on war crime charges. During this time, his son, Ferdinand 'Ferry' Porsche took control of the company.

In 1947, Ferdinand's children, Louise Piëch and Ferry Porsche founded Porsche Konstruktionen GesmbH, headquartered in Salzburg, Austria. In 1949, this centre became home to the Austrian importer of Porsche and VW products. Run primarily by Louise and her husband, this business focused on marketing and trading. Despite their association with the Nazi's, the business grew to be the largest private enterprise in Austria. Meanwhile, Ferry ran the German side of Porsche and developed its production capabilities. Both stayed with the same parent company.

Ferdinand Porsche died in 1951. Despite tradition, he chose to split his inheritance equally between his two children. He valued the accomplishments of Louise and Ferry: the two had worked alongside one another to achieve huge successes. Problems, however, began as the third generation of the family came of age. Emotional turmoil, billions of euros, and vast levels of power meant that familial feuds were amplified. **Exhibit 1** provides an overview of the Porsche-Piëch family tree.

Ferry and Louise raised their children with fundamentally different mentalities. Louise and her husband sent the Piëch children to boarding school; they left with a mistrust of others, a sense that you could only achieve things by doing them yourself. Ferry, on the other hand, sent the Porsche children to a Waldorf School; their education stressed principles of love and freedom.⁶

Ferry's son, also called Ferdinand Porsche but nicknamed "Butzi", strayed from the traditional path of engineering set by his father and grandfather. Instead, Butzi chose a more 'artistic' route and worked on the appearance of products; he became the designer of the Porsche 911 and 904. His brother, Wolfgang Porsche, trained as a metalworker and received a degree in Business Administration. Instead of starting off in the family-business, he established his own business importing motorbikes to Austria.

Louise's son, Ferdinand Piëch, followed in his grandfather's footsteps and became an engineer. He became very interested in Porsche's sports race car program in the 1960s and helped develop the Porsche models that led to the successful Porsche 917. In the 1970s, Piëch became technical director at Porsche and grew famous for utilising the best technology regardless of costs. Though he enhanced Porsche's reputation for technical excellence, many believed he wasted money doing so.

Ferdinand Piëch (whom his cousin Wolfgang Porsche likes to refer to as a "non-name bearer") became a central and divisive figure in the family.⁷ He had twelve children with four different partners. In 1972, he had an affair with Marlene Porsche, the wife of his cousin, Gerhard Porsche. Naturally, this worsened tensions between the two families and damaged the relationship further. Ferdinand dated her for twelve years and fathered two children with her before leaving her for the nanny.

In 1972, believing the company had outgrown a feasible family operation, and inspired by Honda's "no family" policy, Ferry Porsche decided to ban family involvement in the day-to-day management of Porsche. This led to a supervisory board that consisted largely of family members, while the management board became flooded with outsiders.

The corporate governance structure established at Porsche reflected the broader practices of German industry. In contrast to an Anglo-American approach to corporate governance, all public companies in Germany with over 500 workers have a dual-board structure. The supervisory board represents the interests of the company's financial and commercial relationships and provides a broad set of stakeholders with a voice in the company.⁸ The management board runs the day-to-day activities of the company

According to German law and the principle of "co-determination", companies must reserve a significant number of seats on the supervisory board for trade union representatives (about half of the seats for companies with over 2,000 workers and one-third for companies with 500 to 2,000 workers). Shareholders, including family members, occupy the other seats. This rule helps maintain balance between family-owners and the wider German industrial system.

BMW

VW and Porsche are not the only family-controlled German auto firm: the Quandt family control BMW. The family patriarch, Herbert Quandt, had three wives and six children. Quandt controlled companies in a variety of industries, and in order to avoid dispute within the family, upon his death in 1982 he left each of his families shares in different companies. Herbert gave his final wife, Johanna Quandt, and their children, control of BMW. Johanna had a 17% stake in BMW, and took a seat on the supervisory board after Herbert's death (and retained this seat until 1997), while his children Stefan Quandt and Susanne Klatten inherited 17.4% and 12.5% respectively.

The Quandt family are media-shy. Johanna Quandt took care to instil the values of modesty and discretion in her children.⁹ For example, despite being the deputy chairman of the supervisory board for several years, 2015 marked the first time Stefan Quandt spoke at

an annual general meeting. Even then, it was only to underline his support for BMW's existing management. This led BMW shareholder, Hans-Martin Buhlmann, to praise the 'family's smooth running of the succession process'.¹⁰ The family typically remains in the background of the company's business dealings.

After Johanna's death in 2015, her children inherited her stake, thus retaining the family's combined 47% holding. According to BMW's CEO Harold Krüger, Johanna helped provide the company with "support and stability" through her position on the supervisory board and graced the company with her "warm and uncomplicated manner". Further, Johanna gave BMW a 'conservative mindset typical of a German family-owned company.' As a result, BMW 'declined to match the high executive salaries paid by US companies, for example.'¹¹

The Quandt family have played a crucial role in BMW's success. First, on two occasions the family has prevented BMW's downfall – once, by saving the company in 1959, and again after the failed acquisition of British Rover Group in 1994. With a firm footing, the Quandt's showed there should be no uncertainty about their ownership at BMW and in doing so helped to quell rumours of a takeover.

Second, the family has set the strategic direction of BMW through their position on the supervisory board. By refusing to allow any CEO to become comfortable in their position, the Quandt family enable greater levels of innovation. For example, despite successful contributions to BMW, the family replaced CEO Helmut Panke when he turned 60. They chose Norbert Reithofer to take his place, head of production and an engineer.¹² This ultimately helped BMW's growth and status.

In more recent years, the family's emphasis on innovation has been clear. This has been particularly reflected by BMW's push into electric vehicles. Stefan Quandt, for example, had been preparing 'for a battery boom long before Elon Musk announced his entry into the market.'¹³ As one commentator observed, 'BMW has lately had more freedom to pursue innovative but not immediately profitable ventures, such as the i3 and i8 carbon-fibre electric vehicles'.¹⁴ While the Quandt family sets strategic directions, they do not interfere with management.

Mittelstand Firms: Germany's "Hidden champions"

Though brands such as Porsche, Volkswagen, and BMW are among the most famous brands in the world, and are industrial giants, largely invisible companies occupy the heart and soul of the German economy. These are the so-called 'Mittelstand' firms, and include companies such as Koenig & Bauer (producing printing presses), Bosch Auto Parts (producing spark plugs), Faber-Castell (producing pencils), Zwilling J. A. Henckels (producing knives), Körber (producing cigarette machines), Märklin & Cie (producing model railways), and Webasto (producing sunroofs). Behind every industrial giant in Germany is a supply network of Mittelstand firms.

Though the term Mittelstand is difficult to translate, these are generally small to medium-sized companies. They are usually family-owned and typically share a common set of values and management practices. Common traits include generational continuity and a long-term focus, emotional attachment to the firm, investment in the workforce, independence, nimbleness, flexibility, innovation, social responsibility, strong regional ties, and a heavy customer focus.

Geography is also an important aspect of Mittelstand firms. Most are located in small towns and villages. The leadership style in these firms is one of "enlightened patriarchy": the owners and the workers live in close proximity; their children attend school together; the

owners join and lead community associations and clubs.¹⁵ Women are often heavily involved in Mittelstand firms as well— as shown by Louise Piëch’s contributed to Porsche. Overall, the owners of the firms are deeply embedded in their communities; the relationship with workers is long-term and highly cooperative.

This type of company date back centuries in Germany. As the economist Kaevan Gazdar writes:

‘The term Mittelstand dates back to the Middle Ages when craftsmen in the cities began to assert their independence from feudal ties... By the Nineteenth Century, the term Mittelstand encompassed a cultural bourgeoisie, traders, and financially well-situated burghers. However, the heart of the Mittelstand remained the craftsmen. United Germany’s [first] Chancellor, Otto von Bismarck, recognised their political importance as a counterbalance to the rising class of industrialists and bankers. As early as 1849, he hailed the craftsmen as constituting the backbone of the German state.’¹⁶

These companies survived both World War I and II and provided the backbone of Germany’s economy as the country emerged as a global manufacturing power in the post-war era. Firms of this sort combine the technical expertise required to design and manufacture world-class products with a commitment to service that is essential in a business-to-business relationship. In many cases, the bulk of a firm’s revenue might be from the after-sale service relationship established with a customer.

The high level of technical proficiency in German firms is made possible by an educational system that places a strong emphasis on vocational training. The German government, the private sector, and German trade unions developed the “dual educational system” in the 1960s. Dual education combines apprenticeships in a company with vocational education. When it comes to the car industry, for example, this enables Germany to have some of the best and most qualified technicians and engineers specifically trained to excel in their jobs and match the changing needs of the labour market.¹⁷ Like in Japan, it is common in Germany for employees to spend their entire career at a single company; employers are willing to invest heavily in worker education and training as a result. As sociologist John Beck recently put it: “In Germany, a sense of fairness is high, and individuality is low.”¹⁸

The financing system also supports a long-term perspective, and is primarily debt provided by banks. The capital provided by local and regional banks is generally more “patient” than might be obtained by public markets.

Overall, the Mittelstand companies are large enough to gain economies of scale but reactive enough to respond flexibly to customer demands (and 90% are business-to-business). They avoid direct competition with global giants by focusing on extremely niche products. As Hermann Simon argues, these firms are highly successful because they “combine strategic focus with geographic diversity.” While China may be the factory to the world, the Mittelstand firms produce the machine tools that fill these factories and provide the technicians that service them.¹⁹

Relentless growth: Volkswagen under Piëch

Owing to a crisis at Porsche, in the 1990s the family agreed to suspend the rule against family members so as to allow Ferdinand Piëch to return. However, Piëch, by this point in 1992, had just concluded a successful career at Audi and become the chairman of Volkswagen’s management board. He consequently rejected the offer put forth by family members.

At the time, Volkswagen was on the brink of bankruptcy and was in dire need of a dramatic re-energising campaign. Through Porsche Holdings SE, the Porsche and Piëch families continued to have a controlling interest in Volkswagen. The State of Lower Saxony, within which lies VW's Wolfsburg base, had a share of roughly 20%, and in accordance with German law, the employees controlled half of the seats on the Supervisory Board. (Note, in 2009, when VW was in need of a capital infusion, Qatar Holdings purchased a €7 billion stake in the company).

Piëch became a central figure in turning the company around and orchestrating its success. "Only when a company is in severe difficulty do they let in someone like me," Piëch later wrote. "In normal, calm times I never would have gotten a chance."²⁰ Piëch served as the CEO of VW from 1993 until 2002, but even after company policy forced him to retire from the Management Board at the age of 65, he continued to use his position as the Chairman of the Supervisory Board to dominate the company.

Piëch was undeniably an outstanding engineer, and he was meticulous in his attention to detail. He noticed product flaws that others missed, and he was credited with numerous innovations in both Audi and VW cars (e.g. four-wheel drive in all Audi cars, turbocharged direct injective for diesel engines).²¹ He was also able to rein in the power of VW's many brands and use common "platforms" across the brands, allowing the group to offer a wide variety of products while lowering design and manufacturing costs. Piëch's emphasis on engineering permeated every aspect of the VW Group.

Under Piëch's direction, Volkswagen AG aggressively moved into new markets. The group came to cover all segments of the market. To appeal to the wealthy, the group purchased, Lamborghini, Bentley, and Bugatti in 1998. To the price-conscious consumer, Volkswagen AG acquired Skoda in 2000. They also began to produce trucks under the MAN and Scania name (2000) as well as the motorcycle manufacturer Ducati (2012).

Piëch's goal was to replace Toyota as the world's largest automaker. As Piëch famously stated: "I don't like coming in second."²²

Piëch's leadership was also notoriously aggressive. He became renowned for his hard-line attitude towards mistakes. He would only accept the best possible results, and was an extremely demanding man. Engineer Emanuela Montefrancesco commented that "at Volkswagen in the last few years, we have forgotten to say: 'I won't do this. I cannot. I am sorry'"²³.

Piëch prolifically fired subordinates and became famous for his ousting of Bernd Pischtrider in 2006 (Volkswagen's former CEO), as well as Wendelin Wiedeking (Porsche's CEO). Der Spiegel magazine produced what became a well-known description of the company: "You have to obey."²⁴ "VW might be one of the world's largest car companies....," one observer commented, but "[it] is also the last principality on German soil."²⁵ Or as one former employee described it, VW was "like North Korea without labour camps."²⁶

After the investment by Qatar Holdings in 2009, the Porsche family held five of the 20 seats on the Supervisory Board, employee representatives controlled 10, and the state of Lower Saxony and Qatar Holding each held two. There was one external on the board. The three main shareholders controlled more than 90 percent of the voting rights in the company. Only 12 percent of Volkswagen shares traded on the stock market.²⁷ **Exhibit 2** provides an overview of the Volkswagen Group ownership at this time.

Piëch was often accused of pursuing relentless growth at the expense of profitability (and his goal of becoming the world's largest auto firm was achieved in 2011—7 years

ahead of his original target). **Exhibit 3** shows the growth of VW relative to its primary rivals. This criticism became especially poignant when the company began to struggle with its core brands. In 2015, sales rose 2% in the quarter worldwide, but the growth came from Audi, Porsche, and Skoda. Sales of cars with the Volkswagen emblem slipped 1.3%, suggesting that the core brand was losing sales to its newly acquired siblings. In fact, the Porsche division, with sales in 2014 of approximately 200,000 vehicles, earned more profit than Volkswagen branded cars, with sales of more than six million.²⁸

There were similar questions about productivity within the group. In 2014, VW employed 600,000 workers in order to make about 10 million vehicles, while Toyota employed 240,000 workers to make just under 9 million vehicles.²⁹

VW also continued to have difficulty making the adjustments that were necessary for success in the American market (see **Exhibit 4**). Diesel engines, a VW strength, have the advantage of burning fuel more efficiently than petrol engines (reducing both the carbon dioxide emissions and the expense of running the car), but emit higher levels of oxides of nitrogen (collectively known as NOx), which have harmful environmental effects at the local level. Controlling these emissions is expensive, particularly in the US, where NOx standards are higher. Sales of diesel cars in the US have always been much lower than in Europe (see **Exhibit 5**).³⁰

Despite the critics, Piëch made little effort to slow growth. Perhaps the most famous example of his relentless style was VW's acquisition of Porsche. Starting in 2005, Porsche began efforts to acquire VW, but following the financial crash and consequent recession of 2008, the sports car maker had to abandon the effort, and was on the verge of bankruptcy.³¹ Ironically, it was VW that saved them. In December 2009, Volkswagen acquired a 49.9% stake in Porsche AG from Porsche SE. In August 2012, Volkswagen absorbed Porsche AG completely and became its parent company.³²

Piëch's leadership style eventually backfired, however. Before the emissions scandal became public knowledge, Piëch butted heads again with his cousin Wolfgang Porsche over whether to oust the Volkswagen Group CEO Martin Winterkorn. Piëch initiated a crisis at the company when he told German media that he was "distancing [him]self from Winterkorn." After much manoeuvring, including an effort by Piëch to force the Executive Committee to extend his Chairmanship of the Supervisory Board in exchange for his support for Winterkorn, Piëch was forced to resign from the Supervisory Board (along with his wife).³³

Emissions Crisis

The emissions crisis began when researchers at West Virginia University (WVU) published a report in 2014 documenting a strange anomaly in the emissions from VW's diesel cars. The VW Jetta and Passat passed the laboratory test of emissions conducted at a California Air Resources Board facility, but when the researchers tested the same cars on the road, the Jetta exceed US emissions limits by 'a factor of 15 to 35' and the Passat exceeded the limit 'by a factor of 5 to 20'.³⁴

Investigators identified a piece of software code in the electronic control unit of the engines, a so-called "defeat device", and this curbed the emissions while the tests were being conducted. On 18 September 2015, the US Environmental Protection Agency (EPA) served a Notice of Violation (NOV) on the Volkswagen Group alleging that they had sold approximately 480,000 Audi and VW vehicles in the US between 2009 and 2015 with defeat devices installed.

When confronted with evidence of the anomalies, rather than admit wrongdoing, VW employees questioned the results, provided alternative technical data in an effort to obscure

the results, and did everything possible to avoid responsibility and obstruct the course of justice.³⁵ Even when Volkswagen recalled 280,000 vehicles and updated the engine software, they did not remove the code. In fact, they used the opportunity to enhance the software so as to better recognise when a car was being tested.³⁶

Ultimately, the United States presented VW with \$22 billion in fines and legal settlements. The stock price plummeted (see **Exhibit 6**), and the reputation of the company was badly damaged. In a 2016 Harris Poll, Volkswagen ranked last in a survey of American attitudes towards the 100 most visible global companies.³⁷

The Porsche and Piëch families remained in the background during the crisis. One observer noted that Ferdinand Piëch's generation has "stayed on the horse so long that the younger generation cannot really get up to speed... succession should have been prepared 5 to 10 years ago."³⁸

Response to the crisis

In the wake of the scandal, VW CEO Martin Winterkorn resigned, and the task of rebuilding VW's trust with governments, regulators, customers, and investors fell to the new CEO, Matthias Müller.

Müller vowed to de-centralise VW. This would involve shifting power away from Wolfsburg, giving more power to VW's brands, and de-centralising the managerial structure at VW. Müller believed de-centralisation would distribute power more widely and lead to a less authoritarian corporate culture.

In particular, Müller hoped managerial changes would "speed up the decision-making process, reduce complexity and increase efficiency."³⁹ One thing Müller specifically aimed to tackle was the top-down 'command-and-control' management style at VW. He wanted to 'empower senior engineers to control budgets and deadlines' and 'ensure the best qualified people handled responsibilities.'⁴⁰ In doing so, VW 'almost halved the number of senior managers reporting directly to Matthias Müller.'⁴¹ The number of corporate committees was also to be reduced by a third.⁴²

Müller also wanted to combat the lack of outside scrutiny at the executive level. He vowed to appoint 'more independent directors to oversee executives' and 'hire more managers from outside the group rather than filling top jobs with company veterans'.⁴³ In addition, owing to pressure from minority investors, VW vowed to cap pay for high-level executives. The existing pay scheme, according to the activist investor Chris Hohn, demonstrated "corporate excess on an epic scale" and played a contributing cause to the emissions scandal.⁴⁴

The Volkswagen Group has also made efforts to change the corporate culture within the group. The Chairman of VW workers' council, Bernd Osterloh, wrote a letter to staff stating: "We need in the future a climate in which problems aren't hidden but can be openly communicated to superiors." Similarly, Mr Müller stated that he 'does not want to be surrounded by "yes" men but rather by people who "follow their instincts, and are not merely guided by the possible consequences of impending failures."' ⁴⁵ VW sold the private corporate jet and opened the Wolfsburg executive dining room up to factory workers.⁴⁶

Finally, VW made efforts to restore the public image of the company, including the offer to fix all affected vehicles, and ambitious plans for the development of electric vehicles.

Nevertheless, outside observers questioned the ability of VW "insiders" to dramatically transform the company. Müller had been at VW for forty years, and new Chairman of the

Supervisory Board, Hans-Dieter Poetsch, was also a long-time employee VW. Christian Strenger, a corporate governance expert, commented: “I haven’t seen any material changes. Quite often the people—in terms of changing compliance—are people of the old guard, so it doesn’t look convincing.”⁴⁷ Institutional Shareholder Services, a UK-based proxy advisor, consistently gave VW its lowest corporate governance rating, citing “a lack of sufficient independent directors to oversee management.”⁴⁸

There was also potential opposition to decentralisation. Owing to the presence of the state of Lower Saxony (home to six VW plants with over 100,000 workers) on the supervisory board, as well as the policy of co-determination that guaranteed a strong voice to labour, shifting power away from the home base would not be easy.⁴⁹

Conclusion

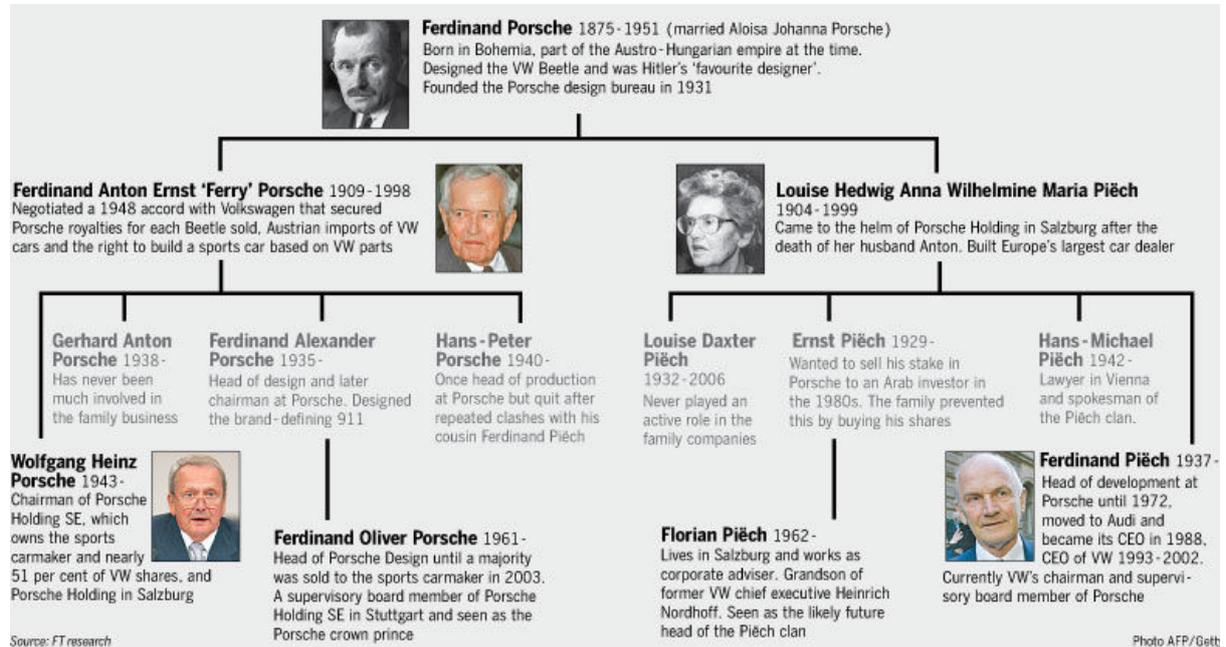
As Muller considered the path forward for VW, he had many reasons to be pleased with how the company had weathered the emissions crisis. While additional legal action was still possible, Volkswagen had managed to pay off two-thirds of the compensation and fines from improvements in cash flow and profitability; the stock price had rebounded (see **Exhibit 6**), market share was increasing, and the balance sheet was solid.

There continued to be risks, of course. The revelation that VW and other German automakers had tested emission systems on monkeys in January 2018 was a reminder that the scandal was still not completely over.⁵⁰ The release of the documentary “Dirty Money” in the same month on Netflix immortalised VW’s transgressions in the eyes of the public.⁵¹

Having survived an association with the Nazi’s during World War Two, the partitioning of Germany, oil crises, and familial feuds, VW had proven in the past that it was resilient, but the emissions crisis had revealed fundamental weaknesses in the company. Was the company prepared to compete in a global industry that was being transformed by technological change?

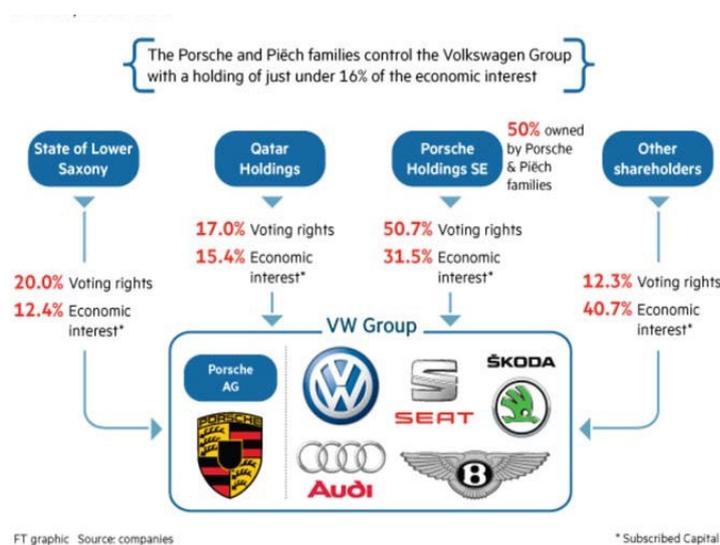
Exhibits

Exhibit 1: Porsche and Piëch family tree



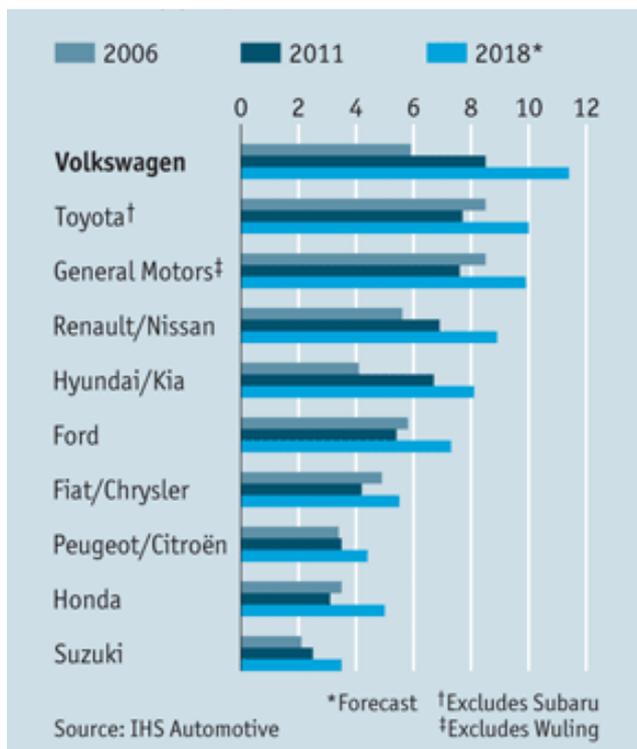
Source: *Financial Times*.

Exhibit 2: Volkswagen Group Ownership (at end of 2014 fiscal year)



Source: "Volkswagen: People's Cars, Family's Companies", *Financial Times*, 24th September 2015. Available: <https://www.ft.com/content/5f9efe12-6298-11e5-9846-de406ccb37f2>.

Exhibit 3: Carmaking groups' worldwide sales (in million units)



Source: *The Economist*, “VW conquers the world”, 7th July 2012. Available at <https://www.economist.com/node/21558269>.

Exhibit 4: Largest car manufacturers' vehicle sales in 2014, by region (in million units)



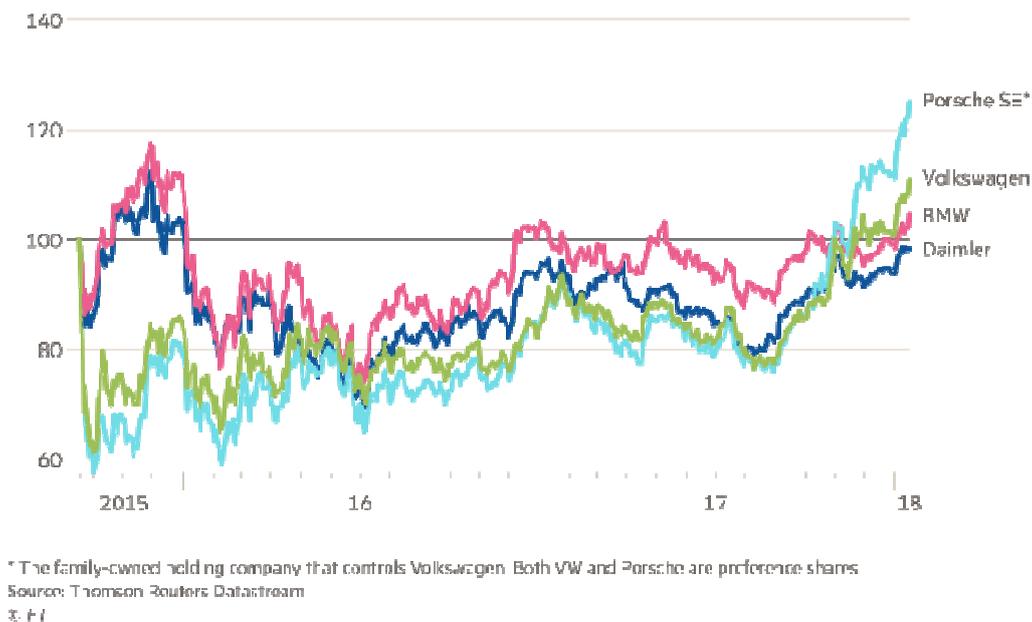
Source: *The Economist*, “The Volkswagen scandal: A mucky business”, 26th September 2015, Available at: <https://www.economist.com/news/briefing/21667918-systematic-fraud-worlds-biggest-carmaker-threatens-engulf-entire-industry-and>.

Exhibit 5: Diesel car sales, 2013 or latest (in million units)



Source: *The Economist*, “The Volkswagen scandal: A mucky business”, 26th September 2015, Available at: <https://www.economist.com/news/briefing/21667918-systematic-fraud-worlds-biggest-carmaker-threatens-engulf-entire-industry-and>

Exhibit 6: Share Price Performance after Crisis (rebased, Sep 17 2015 = 100)



Source: Patrick McGee, “What went so right with Volkswagen’s restructuring?,” *Financial Times*, 18 January 2018. Available at: <https://www.ft.com/content/a12ec7e2-fa01-11e7-9b32-d7d59aace167>

End Notes

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