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TITLE

Dieselgate

The regulatory consequences of the scandal and the new perspectives in the automotive industry

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INTRODUCTION

Dieselgate revolutionized the automotive industry. It can be considered as the emblem of the capitalist society which looks only for profit and does not care about the world wellbeing and its protection.

Analyzing a topic as this, does not means to disclose the huge penalties inflicted to the guilty parties, but it means to reveal all the vile behind the scandal and find a way to overcome the current negative situation, in terms of regulation as well as investigating the future perspectives of the automotive industry.

The mainly involved company in the scandal is the Volkswagen Group, the most important, for sales volume and history, and one of the most acknowledged within the auto industry. A scandal as Dieselgate, which directly involved the people who have bought faulty automobiles, people who were loyal to Volkswagen brand, shows the only thing that a big multinational company aims to: the profit. It is emblematic that the slogans of the company are: "the people's car" and "Volkswagen, Das Auto". Indeed, if the company assumes that its vehicles are made for the common people, being the brand associated with the Excellency car (Das Auto), Dieselgate has to be considered as the failure of that brand promise and of the ideology behind it.

The scandal is strictly related to the top of Volkswagen's management chain. It was the true source of Dieselgate birth. However, it is not possible to charge all the responsibilities of the scandal to a unique person or entity, but the investigation of all the causes needs to be extended to a broader horizon, above Volkswagen focus.

Thus, the following analysis takes into account also the fundamental role of the institutions in the scandal. US and European authorities are the two sides involved in the investigations. Entities as the Environmental Protection Agency,

in USA, and the European Commission had a significant role in the spread and success of the Volkswagen fraud and it is important to demonstrate what was wrong in the policies adopted, the gaps of the regulation, and how the flaw could be solved.

CHAPTER 1 The origins of the scandal

1.1 Diesel engine

Diesel vehicles give to their owners more benefits, compared to gasoline vehicles, which lead to an increase in sales for larger car manufacturers. These vehicles have benefits, such as:

- They are more durable to cut costs of early repairs
- They allow quick acceleration and powerful pulling capacity
- They drive up to 30% more miles per gallon of fuel than gasoline cars and more cost effective than hybrids
- They emit lower levels of carbon monoxide, hydrocarbons and carbon dioxide emissions than gasoline engines

Nevertheless, diesel vehicles have some disadvantages, such as:

- They require many changes of air and fuel filters
- They are more expensive to produce and purchase than gasoline counterparts because of the installation of the extra equipment to meet strict exhaust guidelines
- They are noisier and slower than gasoline vehicles

Many car manufacturers had an objective during the engineering plan for new launch of vehicles, which was to increase performance but at the same time reduce fuel consumption and emissions to guarantee the best product for the customers. This challenge has lead to continuous changes and improvements in terms of engineering and investments. Volkswagen developed turbochargers to improve combustion preciseness as well as technology to minimize nitrogen emissions. Volkswagen's diesel automobiles had a nitrogen oxide trap in their

exhaust system. A downside of the system was that it required more fuel to trap nitrogen oxides[1].

[1] Stapleton, S. "Diesel engines and how VW's defeat device worked", Fortune, 2015, September 21

1.2 Volkswagen's diesel emission inquiry

Diesel vehicles have been acknowledged as very harmful to the environment. These engines emitted dangerous substances such as nitrogen oxide (NOx) and nitric oxide that, mixed with other atmospheric chemicals, could produce damaging pollutants. Furthermore, NOx is known as bearer of respiratory complications and cancer[2].

Agencies in industrialised countries started to evaluate this environmental issue; in particular, in US, the International Council on Clean Transportation, a non-profit group association, made on road emission tests for vehicles. This was something new in the regulatory emission process. California regulators adhered to these initiatives, hoping that diesel vehicles in US emitted less chemical pollutants than in Europe by imposing more severe standards[3].

In May 2014, examinations started in California thanks to the job of the California Air Resources Board (CARB). Volkswagen diesel models were exposed to on road test and it was measured an excessive level of NOx emissions, about forty times higher than the established US threshold, by researchers at West Virginia University (see Appendix 1) . The results of the investigation in US was that Volkswagen diesel models were forbidden to be sold by a directive of the Environmental Protection Agency (EPA) assisted by the CARB[4].

[2] Gates, C., Keller, J., Russell, K., & Watkins, D., "How Volkswagen got away with diesel deception", New York Times, 2015, October 2

[3] Ewing, J., Hakim, D., & Kessler, A.M., "As Volkswagen pushed to be No. 1 ambitions fuelled a scandal", New York Times, 2015, September 26

[4] Associated Press, "EPA to change diesel tests to thwart VW-like cheating", New York Times, 2015, September 25

Another outcome of the US investigations was that a huge number, about 11 million, of Volkswagen diesel vehicles were equipped with a deceptive software that allow to reduce, during emissions test, the level of NOx released. The investigation lead Volkswagen to acknowledge that 5 million branded model were equipped with the illegal software while the remaining 6 million cars were subsidiary branded. It resulted that 2,1 million were Audi branded, 1,2 Skoda branded but, especially, it is important to underlie how in that "special list" are included models as: Beetle and Beetle Convertible (2012-2015), VW Passat (2012-2015), Jetta (2009-2014), Golf (2010-2015) and Audi A3 (2010-2015). These models are the most purchased by Volkswagen's customers and the fact that they are involved into the scandal is an important issue to consider in the next analysis, regarding customers trust after the scandal[5].

The 11 million vehicles incriminated is a number collected worldwide. In US, the EPA revealed that 500.000 Volkswagen diesel models were equipped with the illegal software, a small percentage compared to the rest of the world.

In Europe diesel engine vehicles represented the 41% of the entire number of cars sold, the data exhibit how the scandal, break out worldwide, affected particularly Europe than the rest of the world. In fact European Union had implemented a huge campaign to subsidize and incentivize purchase and production of diesel automobiles over gasoline vehicles. The outcome was that European countries were the most affected by defective diesel vehicles. In detail, in this particular rank, Germany with about 2,8 million models was at the first place; United Kingdom and France were at the second and third position, with 1,2 million and 984.000 diesel defective vehicles, respectively. US was situated at the fourth

[5] Statista, n.d, "Statistics and facts about Volkswagen"

position with, as known, 500.000 faulty models; finally, China exhibited only 1950 vehicles incriminated[6] (see Appendix 2).

[6] McHugh, J., "Volkswagen diesel scandal update 2015: Affected countries are largely in North America, Europe, but Asia not immune", International Business Times, 2015, October 12

1.3 The role of EPA and the Clean Air Act

The United States Environmental Protection Agency (EPA) is an agency of the Federal Government of Unites States. The EPA was planned by President Nixon in 1970 and it has the headquarter based in Washington, D.C. The mission of the agency is to protect human health and environment and EPA's purpose is to guarantee that:

- all Americans are protected from significant risks to human health and the environment where they live, learn and work
- national efforts to reduce environmental risk are based on the best available scientific information
- federal laws protecting human health and the environment are enforced fairly and effectively
- environmental protection is an integral consideration in U.S. policies concerning natural resources, human health, economic growth, energy, transportation, agriculture, industry, and international trade, and these factors are similarly considered in establishing environmental policy
- all parts of society, communities, individuals, businesses, and state, local and tribal governments, have access to accurate information sufficient to effectively participate in managing human health and environmental risks
- environmental protection contributes to making our communities and ecosystems different, sustainable and economically productive; and the United States plays a leadership role in working with other nations to protect the global environment[7].

[7] https://www.epa.gov/aboutepa/our-mission-and-what-we-do

EPA had a key role in Volkswagen diesel scandal, they found, in fact, which several Volkswagen models were equipped with a defective device that cheated on emissions level. In November 2015, the carmaker admitted that an illegal software affected almost 800.000 of its vehicles worldwide, but EPA demonstrated that these numbers were lower than reality; in fact, only in US they found irregularities in 482.000 vehicles. These results overcame the standards established by the Clean Air Act. The Clean Air Act is *"the comprehensive federal law that regulates air emissions from stationary and mobile sources. Moreover, this regulation empowers EPA to establish National Ambient Air Quality Standards (NAASQ) to protect public health and public welfare and to regulate emissions of hazardous air pollutants"*[8].

EPA's investigation fostered other countries to look at this scandal. The UK, France, Canada, Italy, South Korea and, naturally, Germany, started with investigations about this stinging topic. All around the world several agencies, politicians and regulators were examining the validity of Volkswagen's emissions testing. The consequence for the company after the emissions scandal was that it had to recall 8.5 million cars in Europe, including 2.4 million in Germany, 1.2 million in the UK, and 500,000 in the US. Furthermore, the company faced a fall in its market share of a third after the scandal began.

Governments, over the past decade, supported diesel vehicles because they were considered better for the environment compared to gasoline cars. Nowadays, experts' opinion is quite different and it is important to change the trend in the future, restricting diesel cars circulation in some cities. In fact, analysts confirmed that diesel vehicles sales were already slowing, before Dieselgate

[8] https://www.epa.gov/laws-regulations/summary-clean-air-act

came, and, as Richard Gane (automotive expert at consultants Vendigital) exposed, a sharp fall in demand for diesel engine automobiles is forecasted.

It is important to take into consideration that in US automotive market diesel cars share represents only the 1% of all new vehicles sales and that this data is unlike to increase in the short as well as in the medium term, because of the emissions scandal. In Europe, on the other hand, the market share of diesel cars is substantially higher, so, even if this scandal was born in US, it provoked its main consequences in Europe. This may arise doubts on the effectiveness of European emissions regulation and its control.

1.4 EU emission standards

EU regulatory framework states that Nitrogen oxides (Nox), non-methane hydrocarbons (NMHC), carbon monoxide (CO), total hydrocarbon (THC) and particulate matter (PM) emissions are regulated for cars, trucks, tractors and locomotives, excluding ships and airplanes. Compliance with European standards is guaranteed by an emission test which allow to verify the respect of precise emission levels for different vehicles or engines. Vehicles that do not meet the guideline cannot be sold in the European Union, but this rule does not apply to automobiles already on the road.

The EU regulatory framework entails different directives, each changes to the previous 1970 Directive 70/220/EEC. The most important list, where every car manufacturer have to comply, is the following:

- **Euro 1** (1993)[9]:
    - For passenger cars - 91/441/EEC.
    - Also for passenger cars and light trucks - 93/59/EEC.
- **Euro 2** (1996) for passenger cars - 94/12/EC (& 96/69/EC)[10]
    - For motorcycle - 2002/51/EC - 2006/120/EC

9 *"91/441/EEC Council Directive 91/441/EEC of 26 June 1991 amending Directive 70/220/EEC on the approximation of the laws of the Member States relating to measures to be taken against air pollution by emissions from motor vehicles"*. Eur-lex.europa.eu. *Retrieved 2011-02-02.*

10 *"Directive 2002/51/EC of the European Parliament and of the Council of 19 July 2002 on the reduction of the level of pollutant emissions from two- and three-wheel motor vehicles and amending Directive 97/24/EC"*. Eur-lex.europa.eu. *Retrieved 2011-02-02*

- **Euro 3** (2000) for any vehicle - 98/69/EC[11]
    - For motorcycle - 2002/51/EC - 2006/120/EC
- **Euro 4** (2005) for any vehicle - 98/69/EC (& 2002/80/EC)
- **Euro 5** (2009/9) for light passenger and commercial vehicles[12] - 715/2007/EC
- **Euro 6** (2014) for light passenger and commercial vehicles[13] - 459/2012/EC

EU limits on emission standards are the most inflexible of the world. This rigidity is completely in conflict with the uncertainty of the methods with which emissions are measured. From 2012, CO2 average emissions of cars registered by every carmaker (except the niche one, as Ferrari) has not to overcome 130g/km, otherwise a payment of a penalty is imposed. That situation favored electric and hybrid carmakers. Within 2021, the average level is forecasted to decrease to 95 g/km; at the beginning, the objective was fixed for 2021, but German carmakers lobby got a deferment. VDA, German carmakers association, says that if someone compare the limits in an international context, it is clear that EU has most ambitious objectives; in fact, in USA targets are 121 g/km in 2020, 117 in China and 105 in Japan.

[11] "Directive 98/69/EC of the European Parliament and of the Council of 13 October 1998 relating to measures to be taken against air pollution by emissions from motor vehicles and amending Council Directive 70/220/EEC". Eur-lex.europa.eu. Retrieved 2011-02-02.
[12] "Commission Regulation (EU) No 459/2012 of 29 May 2012 amending Regulation (EC) No 715/2007 of the European Parliament and of the Council and Commission Regulation (EC) No 692/2008 as regards emissions from light passenger and commercial vehicles (Euro 6)". Eur-lex.europa.eu. Retrieved 2012-06-01.
[13] "Commission Regulation (EU) No 459/2012 of 29 May 2012 amending Regulation (EC) No 715/2007 of the European Parliament and of the Council and Commission Regulation (EC) No 692/2008 as regards emissions from light passenger and commercial vehicles (Euro 6)". Eur-lex.europa.eu. Retrieved 2012-06-01.

Today, consumption and emission of new cars are homologated with Nedc (new European driving cycle), a test procedure on a kind of "tapis rulant" where there are three cycles: urban, extra-urban and mixed, the most relevant of the procedure. The examiners are private companies designated by EU that implement this practice to analyze the consumption and emissions. Indeed, the cycle allows to consume less fuel than in reality; this result comes from 11 km track length, maximum power employed of 46 CV, average speed of 34 km/h, acceleration only one time to 120 km/h, and the car is stopped for the 25% of the time. Moreover, the legal framework is quite lax: for instance, tricks such as blowing up tires below limits, substituting the engine oil with an extra fluid one or disabling secondary circuits, are allowed.

In USA gasoline engines were traditionally sold more than diesel one, moreover limits on CO2 are lesser than Europe, differently than NOx, which are produced in a larger quantity in diesel engines. Furthermore, the consumption measurement systems are more complex than Europe. EPA establishes federal tests and they foresee five different cycles: city, highway, high speed (up to 130 km/h), and air conditioner turned on (an important element because it changes the performance and consumption). Vehicles are tested by producers themselves that auto-certifies the results to the EPA; then, EPA give a sample to the National Vehicle and Fuel Emissions Laboratory (NVFEL) of 10-15% of the data.

In 2017 a new procedure should be introduced, that for the first time would be established at global level by all principals markets: Europe, US, Japan, China, Russia and India. It is named WTLP (worldwide harmonized light vehicles test procedure) and it would imply both "tapis rulant" system and on road procedures. The cycle on rolls would be longer than the current one, 23 km, and better structured, with 64 CV fully committed, average speed of 46,5 km/h and

acceleration at 131 km/h. However, the on road test, Real Driving Emissions test (Rde), is not already defined.

1.5 The illegal software

Volkswagen employed an illegal software to overcome environmental standards in 11 million vehicles: this passed in a "clear mode" when it identified the car was being tested for emissions. More details about this "defeat device" are contained in a letter from the EPA to Volkswagen emitted in September 18th.That letter had the aim to lead Volkswagen to admit that 500.000 Volkswagen and Audi vehicles in the US were polluting 10 to 40 times more than emission standards procedures exhibited.

According to the EPA's letter, several models of Volkswagen vehicles manufactured between 2009 and 2015 and subsidiaries branded models had a software installed in the electronic control system, that could switch on when an emission test started. Reporting the EPA declarations, *"the position of the steering wheel, vehicle speed, the duration of the engine's operation, and barometric pressure, all very specific operators of an emission test, acted as the activation switch for the defeat device. The vehicles' electronic control module was set to 'clean' mode during the emission test protocol. When the software started to work the vehicle electronic control module ran a separate 'road calibration' that reduced the effectiveness of the emission control system (explicitly, it reduce, cheating, the revelation of NOx emission)"*[14].

After the scandal several lawsuits were carried on in US and in other countries; the main accusation was that the polluted emissions undermined the lives of an indefinite number of people. As reported by Vox.com, a general interest news site, the amount of added NOx pollution from Volkswagen's US sold automobiles was from 5,800 to 14,200 tons to the atmosphere per year,

[14] https://www.techdirt.com/blog/?tag=epa

generating premature deaths going from 5 to 27, in USA, and from 74 to 404 all over the world, each year.

Bosch's electronic diesel control unit, called the EDC Unit 17, contains specific algorithms to adjust fuel levels, air pressure, recirculation of exhaust gas to lower NOx emissions, and injection rates of urea, the fluid used to break down NOx into harmless component parts before it is emitted from a car's tail pipe. EDC Unit 17 also is used on diesel vehicles from several manufacturers, including Volkswagen, BMW AG and Daimler AG's Mercedes-Benz.

A study conducted earlier this year by the German government concluded that most manufacturers were using software to manipulate toxic emissions from the diesel vehicles, although Volkswagen appeared to be the only one to install test recognition software.

1.6 The causes of the scandal

This section is going to discuss the causes of the scandal, analysing the corporate governance attitude of Volkswagen that could have sown the seeds for the scandal born.

There are three main factors that produced a climate for the scandal: austere leadership style, insular corporate governance and drawbacks from family feuds and nepotism.

The austere leadership style refers to the lack of innovative leading strategy of the company; the only important thing was to reach profit even if the business environment was changing. This kind of mentality was fixed by the history of Volkswagen, a company founded by a feudal family that have continuously driven the business.

Ferdinand Piëch, a grandson of Ferdinand Porsche, can be identified as the initiator of that leadership style. He operated as CEO for ten years at Volkswagen and, in 2002, became the chairman of the company's supervisory board. Piëch was characterized by a dictatorial and intimidating manner of approaching and managing his employees and this way of doing influenced his successors.

In 2007, Martin Winterkorn, a Piëch "disciple", took the place as CEO of Volkswagen and he gave continuation to its predecessor leadership style.

Winterkorn main management characteristics were his perfectionism and authoritarian style that lead to fear among employees and consequently lack of communication across the organization hierarchy. Probably, the high expectations and the huge pressure that Winterkorn had to sustain in order to reach Piëch ambition, to make Volkswagen the world's leading automotive

company, affected his leadership style, giving him substantial responsibility of ensuring the future of the company.

The austere leadership style applied by Winterkorn concentrated all company's efforts on diesel vehicles rather than betting on electric-hybrid models, as, its major competitor, Toyota, since they were giving higher profits to the company. The leader's strategy was to gain a higher market share in US market with the launch of new diesel vehicles promoted as low emissions vehicle and high performing (Appendix 3). European market was already been acquired, in terms of market share, by Volkswagen thanks to benefits that European Union granted to the buyers of these models. As a result of its vigorous marketing strategy, in 2015, Volkswagen passed Toyota as number one global annual car seller[15].

Nevertheless, Dieselgate determined Winterkorn's strategy failure. The leader was unsuccessful to sustain environmental regulations opting for the maximization of company's profit, neglecting emission standards procedure and innovation mentality. In fact, while competitors as Toyota and Tesla carried out new successfully and eco-friendly business strategies, Volkswagen concentrated its efforts only on current technologies[16]. Winterkorn's goal was only the cost compliance, limiting company's opportunities from developing new technologies and be ahead to its major competitors.

Volkswagen's distinctive insular governance culture is an obstacle to prevent repeated errors; in fact, the company already cheated on emissions standard. In

[15] Gates, C., Keller, J., Russell, K., & Watkins, D., "How Volkswagen got away with diesel deception", New York Times, 2015, October 2

[16] Meiners, J., "Piech vs Winterkorn: an epic battle unfolds for control of VW group", Car and Driver, 2015, April 13

the 1970', Volkswagen was already accused of equipping its automobiles with an illegal device to hide effective emission levels. The family owner company (the Porsche and Piëch families) created a powerful government board that passed on to future generations the mission of full employment and production[17].

The centralised management power surely contributed to the scandal broke. Volkswagen company culture lead the members of the supervisory board to take no actions against negative conducts, as cheating on emission standards, accepting only the directives from the top of the management chain. Winterkorn management style was in line with this traditional company culture, thus, even if he was recognized as the guilty party of the scandal, the real problem was at the roots of the company.

To summarize, Volkswagen culture pave the way to the scandal because of a clannish executive board with a centralised decision making power and an engraved culture of hostility against environmental regulation[18].

During Winterkorn's period as CEO, the company met several problems to keep low production costs to compete in the US market. The main issue was that the company, accomplishing the interests of German labour unions, increased labour force and consequently its cost. It was also another attempt to rise sales in the short term. The behaviour adopted by Volkswagen entailed to decrease investments in emission control technology, not complying with US government environmental regulations.

[17] Ruddick, G., "Volkswagen: a history of board-room clashes and controversy", The Guardian, 2015, September 23

[18] Stewart, J., "Problems at Volkswagen start in the boardroom", New York Times, 2015, September 24

Nepotism was another factor that lead to the scandal and it is another consequence of Volkswagen governance culture. An evidence of this behaviour is the appointment as member of the company supervisory board of Piëch fourth wife, in 2012 and since 2015. This decision lead to several doubts by many shareholders about the qualifications and objectivity of this choice, but the hostility was ignored by the Piëch family. The direct consequence of the nepotism was the strict bond between the company and the Piëch-Porsche family: the management power was always concentrated among few people belonging to the same family. The lack of external people in the decisions making process lead to rigidity and obsolescence in the strategic choices, since no one could provide a different and new perspective that, in last instance, may have avoided the scandal.

As seen, these three factors lead to the scandal born, due to an anarchical governance fixed on an old idealism of doing business. Nevertheless, this could not be the unique reason why the scandal happened, in fact, there are other factors to analyze, as the components providers role and the possible faults in the regulatory framework.

Chapter 2 Impact on multiple dimensions

2.1 Economic consequences

The scandal lead to huge economic damage for Volkswagen. After the scandal, the company showed a decrease in vehicle sales from 2,44 million to 2,35 million from 2014 to 2015 with a net loss of 2,83 billion dollars, caused by a decline in diesel vehicles sold from 40% to 30%[19]. Consequently, there was, at the scandal broke, a massive stock selling with a loss in market value equal to 16,9 billion dollars. As a UK price data firm revealed, the company diesel car value dropped by 0,2% in September, when the scandal born, during a period where, overall, the automotive market value was rising[20].

The consistency of economic consequences of this scandal is reported by the fact that after 15 years the car manufacturer announced a quarterly operating loss of about 3,9 billion dollars in the period from July to September.

The recall campaign was very expensive for the company, under a directive of the EPA, Volkswagen started a recall campaign concerning all the affected US diesel vehicles at its own expenses, and there were 8,5 million defected diesel cars to recall all over Europe. The cost of repairing these faulty models was expected to be millions of dollars and this process could take more than a year. This kind of costs are surely different between vehicles sold in USA and Europe. In fact, because of a different regulatory framework on diesel vehicles emissions,

[19] Boston, W., & Sahin, M., "Volkswagen is expected to post quarterly loss", Wall Street Journal, 2015, October 27

[20] Boyle, C., "VW's diesel debacle may already have hit sales", CNBC, 2015, October 1

in US Volkswagen would install a new purification system in the vehicles recalled while this procedure does not apply in Europe.

Furthermore, the violation of the Clean Air Act emission standards entailed a huge financial penalty for Volkswagen that was estimated to be as much as 37,500 dollars for each affected model (overall, about 18 billion dollars). The company calculated an amount of 6,5 billion euros (about 7,3 billion dollars) to spend on compliance with US penalties, but this amount was not enough because there were also several civil lawsuits on going that could lead to a higher amount[21].

Further losses were caused by customers' reaction and the negative impact on brand loyalty. Volkswagen clients were very disappointed by the stress of the recall campaign and by the implicit costs that this scandal brought (i.e. indeed the value of a defective car felt down, causing economic losses to the owners who intended to resell it). Other possible costs that customers faced regarded the performance, fuel efficiency and safety of their substituted of defective models. Moreover, possible negative results of company's substitute vehicles could lead to new expensive class action lawsuits, increasing the already high economic damage of the company.

Overall, the scandal caused an image damage for Volkswagen and the price of its automobiles was likely to decrease.

[21] Eddy, M., "Volkswagen to recall 8.5 million vehicles in Europe", New York Times, 2015, October 15

2.2 Political consequences

Dieselgate lead to several political consequences in different areas of interest.

In US Volkswagen handled inquiries by the Federal Trade Commission, the EPA and the US Department of Justice. The scandal brought to an enforcement of the regulatory framework especially in USA, while in Europe this process is still in progress.

About the EPA's role in the investigation, critics argue that the agency did not disclose the illegal behavior of Volkswagen for seven years, while researchers at Virginia University did it. After the scandal, the EPA extended its investigations to other automotive companies as FCA.

In Europe, the EU acknowledged the illegal behavior of Volkswagen but there were many special interests that hindered the criminal charges and the consequent reinforcement of the legal framework. Furthermore, not only US and European countries started examination against Volkswagen vehicles, but even many countries, such as South Korea, Mexico and China started investigations against those defective models[22] (Appendix 5).

Another area of interest regards the different approach between governments and Volkswagen powerful management board. Especially in Europe, there are special interests between big companies and government since these organizations provide many jobs and the proliferation of the economy. Volkswagen is very influent, principally in Germany, on the political decisions of the country and this is the reason why the country is the only one that have brought a defensive argument. Furthermore, the high power and importance that this country has on

[22] Clothier, M., "Diesel scandal undercuts one of VW's few strengths in showroom", Bloomberg Business, 2015, September 29,

the economic and political European Union decisions, surely affected the advancement of investigations.

2.3 Social consequences

Volkswagen scandal implicated also important social costs.

The scandal damaged German economy and principally the city of Wolfsburg where Volkswagen headquarter is located. Wolfsburg is acknowledged, with Stuttgart, as the capital of the German auto industry and it is one of the richest city in the country.

There is a high employment rate thanks to Volkswagen and other companies situated in the city, which certified about 72.000 car workers employed on the city.

After the scandal, the economy of Wolfsburg was seriously damaged. Klaus Mohrs, the mayor of the city, was worried about a transitory hiring interruption and a fall in corporate tax returns[23]. Last reporting from the company confirmed these expectations, in fact, after the scandal broke, it is scheduled a 30.000 employee reduction all over the world and the majority of these cuts are planned in Wolfsburg.

Another social consequence, and maybe the most important, is the implicit cost of the health damages. As known, diesel vehicles produced dangerous pollutants and this eventuality, in a public health perspective, could cost 100 million dollars[24].

[23] Bowley, C., & Eddy, M., "VW's emissions scandal has its German hometown facing an uneasy future", Wall Street Journal, 2015, October 27,

[24] Selin, N.F., "One of the biggest consequences of the Volkswagen diesel scandal", Fortune, 2015, September 30

CHAPTER 3. Who is responsible?

3.1 Volkswagen management responsibility

Dieselgate can be considered as a total failure in terms of Corporate Social Responsibility (CSR). Volkswagen applied an illegal strategy to gain an advantage over its competitors that guaranteed it to maintain its leadership into the market. The highest levels of the management chain were surely aware of that behavior and its real consequences - the company was effectively injuring the planet - were far away from the company's CSR mission: "to sell environmentally friendly vehicles".

The illicit conduct concerned especially ethical principles in Volkswagen engineering department and the outcome of the scandal was the resignations of a new CEO, but it concerned also subsidiaries companies as Audi, where the head of R&D department resigned, and Porsche, with the engine chief resignation. Every responsible can be recognized and researched at all levels throughout the company: in fact, every operator of the chain that directed the development of the illegal software is certainly on record and every test done on the vehicles is documented. The result is that it is impossible that CSR department did not know that inside the company no one was following its ethical standards.

Even the head of Volkswagen CSR did not acknowledge its awareness of the practice. All these situations lead to consider that in the company the CSR was considered only as a marketing exercise and not as an effective department.

This assumption unfortunately applies to the majority of companies, especially in automobile industry. A CSR chief is nominated, given an air of respectability, and he has the role to establish a clear image to the company, despite the dishonest is anchored inside it, as it is clear in the case of Volkswagen.

Furthermore, this conduct damage costumers, principally morally. They are cheated about the way of doing business of their favorite brands that sell their products with the unique aim of maximize their profit, in any way, even illegally.

Volkswagen conduct proves how the company did not matter about environmental issues, since it was only concerned of maintaining its position as the world leading car manufacturer. They had polluted the planet through its defective vehicles, emitting forty times the legal limit of NOx, but they, and their CSR departments, did not care about this issue. After the scandal, the effects of Dieselgate on car owners could be compared to the tobacco industry. As millions of smokers acknowledge that the smoke which they inhale is dangerous for their health but they continue to do this, so car owners know about the dangers of diesel vehicles but they continue to buy them, and their only interest is that their cars runs faster and better. The problem is obviously inside our society.

The main concern of the CSR is to self-regulate the company and consequently the environment around it. Furthermore, many people see CSR as a company function that does not contribute in making profit, something superfluous or a sort of unnecessary luxury. Thus, the real importance of the CSR concept is often misunderstood by management or underestimate, and this could turn against the company itself.

The Volkswagen scandal give us proof that the concept and role of CSR, especially in big companies, should be reconsidered. The people who are at the top of this department should be made responsible for their actions with extreme consequences, as going to jail. In order to incentivize these peoples to act properly, as to investigate behaviors against ethical principles in their companies, they should be rewarded with an increase in their salary or gain of budgets.

In conclusion, Volkswagen CSR was unsuccessful. Volkswagen case should be considered as a negative example for other companies and a sort of incentive to change and rethink about the role and the functions of CSR department in their own environment and business. Companies should consider that what happened with Volkswagen could occur even to them. CSR's chiefs need to think if their companies are willing to lie and cheat their customers in exchange of a kind of profits as Volkswagen made, considering if their board of directors is as irresponsible as Volkswagen's.

Volkswagen has to rebuild its image and credibility toward international audience. The company has to admit, first, its responsibility in Dieselgate, but, totally, all over the chain of management and not only fixing at a single individual. Moreover, it has to apply immediately a reliable plan that really reduce vehicle's emissions and respect international standards. Volkswagen can realize that plan only investing more in long-term R&D, positioning itself as a leader, rather than a laggard, in technology development producing better eco-friendly vehicle models.

In conclusion, the company needs to reformulate its CSR practices, reinforcing the power of that department to immediate operate in case of any unethical action: these are the bases to prevent any future fraud[25].

[25] Dans, E., "Volkswagen And The Failure Of Corporate Social Responsibility", Forbes, 2015, 27 September

3.2 Bosch's role

Robert Bosch Gmbh was founded by Robert Bosch in Stuttgart in 1886. It is a multinational engineering and electronics company headquartered in Gerlingen, near Stuttgart, Germany. Nowadays, the company is considered, worldwide, as the largest provider of automotive components, measured by 2011 revenues.

Bosch's core products are industrial goods (including drives and controls, consumer goods and packaging technology), automotive components (including generators, brakes, controls, steering systems, starter motors, electronics, electrical drives and fuel systems) and building products (including power tools, household applications, security systems and termo-technology).

Volkswagen is not the only company that could be considered responsible for illegal behavior in the scandal. Bosch is responsible, in fact, for many of the components directly involved in the Volkswagen scandal, including the emission control software (the effective component that made the scandal born). Bosch has been under investigation in Europe but no Bosch employee has yet been indicted with wrongdoing. Furthermore, Bosch has recognized that it informed Volkswagen, in a letter in 2007, that the car manufacturer's proposed use of the software provided by Bosch could be illegal.

After the scandal, lawyers searching compensation for owners of vehicles affected by Volkswagen emissions-cheating inquiry are rising the pressure on auto-components supplier Bosch. In 2016, attorneys representing thousands of Volkswagen car owners in the US filed a 741 page brief in San Francisco federal court that relied deeply on documents provided by Volkswagen to support claims that Bosch worked "side by side" with the German carmaker giant.

Bosch supplied the engine control unit, which Volkswagen planned to "switch on" automatically when its diesel cars were undertaking emissions tests. The supplier company has revealed that it is not responsible for how its components are incorporated into vehicles by clients.

However, the lawsuit claimed that Bosch did not allow manufacturers to make changes without its approval, saying it was inconceivable, then, that Bosch did not know that the software it was responsible for defining, developing, testing, maintaining and delivering contained an illegal defeat device.

Furthermore, another factor is against Bosch: the plaintiffs' attorney debated that the Clean Air Act not only inhibits the use of defeat devices but also forbids the sale of parts used as defeat devices, if the supplier is aware that the part will be used as such.

The plaintiffs' lawyers pushed Bosch to provide more information about the case, but, as they said, the evidence has already showed that Bosch played a critical role in the system to escape US emission requirements. The only missed circumstance was that they should validate that Bosch was a knowing and active participant in the organization to defraud US consumers.

On February 1, 2017, Bosch emitted a press release where the company agreed to pay 327,5 million dollars to consumers in US as compensation for its role in conceiving the illegal software. The press release reported: *"Bosch has entered into a settlement agreement with civil claimants in the U.S. in order to settle the most substantial part of the civil law proceedings pending in connection with Volkswagen, Audi and Porsche diesel vehicles that were sold in the U.S. The corresponding documents have been filed overnight with the competent U.S. court, the United States District Court for the Northern District of California.*

The settlement agreement was concluded with the Plaintiffs' Steering Committee ("PSC") on behalf of proposed settlement classes.

The agreement would settle the claims of consumers and dealers of used vehicles against Robert Bosch GmbH, its affiliates, employees, and directors concerning Volkswagen and Audi diesel vehicles with 2.0L engines for model years 2009 through 2015 and Volkswagen, Audi, and Porsche diesel vehicles with 3.0L engines for model years 2009 through 2016"[26].

However, in the press release Bosch affirmed that it did not acknowledge the realities as assumed by the plaintiffs, nor admitted any kind of responsibility. It seems that the company had decided to settle the issue in order to clean their role into the scandal and maintain its image toward its clients.

[26] Bosch press release, 2017, 1 February

3.3 Customers reaction

The scandal has impacted the conduct that Volkswagen and Bosch should have toward their customers.

In Volkswagen case, the first outcome is the loss in brand value due to a consequent lack in trust that spread after the scandal. The other result was a huge economic loss caused by the payments that the company had to sustain. The company has already settled billions of dollars but it has not finished yet.

In March 2017, in fact, another lawsuit against Volkswagen emerged. For the first time, even in Germany, customers began to acknowledge that Volkswagen with its action has damaged them. The result is a lawsuit where thousands of car-owners were represented in order to receive compensations for damages from Volkswagen's behavior. It is an additional concern for the company since it could be the beginning of a huge amount of compensations.

Volkswagen already paid an amount of 535,000 thousand dollars to US consumers and about 20 billion dollars for car dealers' compensation, but refused to make any similar offer to its nine million clients in Europe affected by the emissions scandal.

If the lawsuit succeeded, it would create additional claims and Volkswagen's costs to solve the diesel scandal would increase considerably. The company has faced lawsuits from authorities and customers in many countries, but only a limited number of plaintiffs have brought individual lawsuits in Germany, differently from US. Volkswagen has excluded European car buyers' demands for compensation and denied they suffered damages, because there is a different regulatory framework between US and Europe. The company offered, in fact, only technical remedies for cars with cheating software.

On 25th May 2015, another class action was lodged in Italy, in Venice's court. An association in defense of Volkswagen customers (Altroconsumo), owners of the faulty vehicles, accused Volkswagen to build their brand through marketing and communication campaigns focused on ecological values, praising the vehicle performance in term of emission, thus, hiding the truth. That conduct demonstrated an unfair commercial practice of Volkswagen, which was characterized by the diffusion of falsified information that damaged the freedom of consumers in the purchase decision. The sentence has confirmed that owners of faulty vehicles have to be compensated for the damaged suffered. The unfair conduct is clearly demonstrated by Volkswagen communication campaigns and messages. These reasons have been approved by the Venice court, which opened the adhesion to the class action. The sentence was an important step, since it could lead to a "domino effect", which would increase the economic damage of Volkswagen also from European customers[27].

The way of doing of Volkswagen in Europe may is explained by the large loyal clientele throughout Europe and the lower number of people that has adhered to the lawsuit carried on against the company. Moreover, EU regulations do not assure those kinds of compensations. In US, the behavior is dissimilar, not only for the different regulations but especially for the kind of clientele. Owners are more attached to American car manufacturers and it is easier to change their preferences if Volkswagen treat them in unsatisfactory way.

Bosch case is quite different. Even if it has some obligations in product liability, Volkswagen creates the fault into the system. The eventuality could be, however, not enough. Bosch's clients could require higher types of warranties that maybe increase costs of made contracts. Nevertheless, it is very unlikely that they will

[27] Bassi M., Venice court sentence, 2017, 25 May

change their supplier, at least, in the short run, because Bosch guarantees a sign of high quality for them.

3.4 Impact on brand image

In all businesses, leaders have to take into consideration not only shareholders but also the people and the environment. Volkswagen concentrates all its efforts in order to gain short-term profits and goals; the company does not care about other issues as the sustainability of the company's brand, its customers and the environment.

Sustainable businesses can support shocks from any kind of events that could be financial crises or natural calamities, moreover, financial sustainability can create flexibility for the business. This outcome is generated from durable relationships that the company undertakes with communities, the environment and its employees. Volkswagen's behavior was totally against the sustainability concept. Volkswagen executives should have imagined that these activities could generate profits but even benefits to their organization in the long-term. At the opposite, the impact of Dieselgate was an immediate economic loss, as the depreciation of Volkswagen shares in global financial markets, and a huge amount to pay for the recall campaign and the following penalties from governments.

Volkswagen planned to sell its defective vehicles labelling them as "clean diesel" automobiles. The company tried to alleviate environmental concern of customers, rather than introduce electric-hybrid vehicles that really solve the ecological issue. The scandal was neither an accident nor an error; it was systematically and technically programmed deception and fraud. After Dieselgate the loss of reputation has been a serious concern for the company, also more important than the huge payments.

It is difficult to evaluate the losses of an immaterial good as reputation because it is difficult to measure them as a regular economic loss. Reputation is a factor that create and destroy value as well as other economic forces, but, more than

them, incompetence, although grave, is recoverable, while the lack in sincerity is not. Last reports exhibit that Volkswagen become the world's largest manufacturer, at expenses of Toyota, but the real results have not been shown yet and, as analysts say, this trend is expected to change[28].

In the emission scandal, Bosch has to refund Volkswagen's client too with a sum equal to about 330 million dollars. Beyond the pure economic loss, analyzing the Bosch's role into the events, there is also for them a loss of reputation. As previously introduced, Bosch is the most important provider of automotive parts and accessories in the world, equipping the most important car manufacturers. Bosh's responsibility in the scandal is clear, even if less remarkable than Volkswagen, and this can damage their image within its clients.

The extent to which Bosch brand has been damaged is less than Volkswagen. In another perspective, Bosch did not damage directly the final clients because, as known, the cheating system, even if provided by Bosh, was probably explicitly requested by Volkswagen

[28] Bibhu Prasan Patra, "The Deliberate Deception: Case Study on Volkswagen Emission Scandal", Journal of Management, 2016, March

3.5 Similar cases

Dieselgate is only one of a long series of scandals in automotive industry.

Ford Pinto's scandal exploded in the 1970s. The controversy born when the magazine Mother Jones reported Ford that it was responsible to mortal fires in rear-end accidents. Successively, it was discovered that Ford's internal documents exhibited that the company knew about this defective component but they preferred to not solve it, the carmaker calculated that it could be cheaper to pay potential compensations from accidents. Cause to the death of three teenagers in Indiana, the company was accused for negligent homicide, even if it was innocent. After this event, in 1978, Ford ordered a recall campaign to install new components in order to fix the rear-end accidents issue.

Another event raised in 2009 with Toyota. After the death of a California Highway Patrol Officer and his family, cause to lose of control of its Lexus, several accuses started against Toyota. National exposure forced Toyota to begin a recall campaign; the company explained it as a problem caused by a floor map entrapment. However, successively, the company admitted that there was a problem with "sticky pedals". Technically, the accelerators get fixed at partially depressed levels and it seems that something hinder the pedals, as the floor map.

In 2014 Toyota was obliged to pay a huge amount, about 1,2 billion dollars, to avoid criminal examinations and it was the largest penalty ever paid by an automotive company, before Dieselgate. Toyota disclosed that it deceived US customers by hiding and reporting misleading statements.

Another scandal was born in the supplier sector and could be compared to Bosch's investigation.

Takata is a Japanese manufacturer of airbags, the company was accused to provide a defective component in the installation of its airbags. During accidents, the airbags exploded with too much force and this mechanism caused metal scraps flying into the passenger cabin. The faultiness has been considered responsible of eight deaths and 100 injuries in US. The defective component lead Takata to a recall campaign, it regarded about 19 million vehicles in US equipped with them. As New York Times reported, Honda, that was one of the provided companies of those defective airbags, and Takata recognized the danger behind the airbags for years, keeping the silence, before starting recalls and disclose it to the national agencies. In September 2016, the US National Highway Traffic Safety Administration started new examinations that embraced a wide variety of airbags made by Takata.

Furthermore, in 2016, regulator explained that auto companies were liable for Takata's faulty airbag recalls. About this affair there are other concerns affecting the National Highway Traffic Safety Administration, Mark Rosekind, the head of the agency, admitted it is likely that there are in circulation more than 300.000 old Honda branded vehicles, that have installed Takata airbags with a 50% chance to be defective during a crash.

These scandals were handled as Volkswagen is currently doing, through huge payments, but there is an important difference. For instance, Toyota overcomes its losses with a long-standing plan aimed to innovate and at the meantime increase its market share, while Volkswagen has solved its problems merely changing the CEO. Without a clear and longsighted business plan, and keeping the same obsolete corporate culture, the company could meet some difficulties in order to come back as the first carmaker in the world.

Takata's scandal is important to compare with Bosch's role in Dieselgate. Both suppliers are involved in the product liability but they are not responsible in the

faulty of the products and carmakers are considered the unique counterpart that have to compensate its damaged clients[29].

[29] Reuters, "Regulator Says Automakers Are Responsible for Takata's Faulty Airbag Recalls", Fortune, 2016, 3 November

3.6 The Volkswagen scandal impact on its major competitors

A scandal as Dieselgate has surely an important impact on the entire automotive industry. It affects car manufacturers all over the world for two reasons. First of all, this scandal lead to new measures to adopt in terms of new regulations about emission standards, globally, and this influence car manufacturer policies not only in the long term but, above all, immediately. The other reason is that, Dieselgate reconsider the position of Volkswagen into the market. The possible consequences of the scandal on the company move a series of eventualities for its competitors, especially in terms of market shares.

The Volkswagen scandal, as reported by many reviewers, could be seen as the first step that leads to the collapse of the diesel car market. Max Warburton, an automobile research analyst at Bernstein Research, stated in an interview on that topic that: the move against Volkswagen is going to act as a catalyst to speed up the fall in diesel market share in Europe and halt it in the US.

Dieselgate, in fact, could increase the issues related with that particular market. These vehicles are already known, especially by environmentally concerned customers, as particularly pollutant and expensive, in terms of insurance coverage, than petrol cars, and they are going toward a gradual fall. These considerations are disastrous for European automobile market. As known, EU has invested a lot, over the last decades, on these kind of vehicles, with incentives and subsidies to boost companies to build a more eco-friendly diesel engine. Dieselgate has shown how this activity created a huge economic loss caused by a large waste of money among Europe. These considerations are significant: in fact, also Germany, which is the largest export site of automobiles in Europe, has raised its concerns over the lack of regulation inside the automobile industry and the need to implement a new regulatory framework in the short period.

The new hint boost companies in automotive industry, from car manufacturers to suppliers, to fast move to new type of engines more sustainable for the environment.

Another important consequence is the manner in which consumers face after the scandal, not only in environmental terms but also regarding the trust towards automobile companies.

Dieselgate implications are having consequences in market share not only on Volkswagen: other car manufacturers, as well as Peugeot, Renault, Nissan and BMW have seen their market share decreased by 2 to 4 percent since the scandal first started. Furthermore, more attention and new regulations concerning the European automobile industry are likely to become more stringent, and the immediate consequence could be a loss of profits associated with a loss of confidence of customers.

The scandal hit, obviously, especially Volkswagen with consequently large losses and reduction in market share; this result has surely a positive effect for its competitors, above all Toyota that overtook Volkswagen as larger car manufacturer. American hybrid and electric car brands, in particular, could and should take advantages of the situation that this scandal brought, such as the need for eco-friendly vehicles.

CHAPTER 4. The new perspectives

4.1 After the scandal, the new investigations

Dieselgate creates an alert system in environmental agencies all over the world, new investigations started and all the automotive industry is under examination.

In 2016, FCA was under investigation for fraud by FBI. The investigation started after that, in December 2015, FCA substantiated the best month of sales in the US, and it was a record in the automaker's history, with 217.527 vehicles sold. According to latest reports, those results were considered untrustworthy and inaccurate. A Chicago-based dealership group (which sources does not disclose the name of) marched a lawsuit against FCA earlier in 2016. FCA was indicted of paying off dealers to fake new vehicle sales. When the press charges emerged, the FCA group claimed that any such accusations had no basis and therefore no merit.

According to "Automotive News", after the initial lawsuit, FCA started adding extended refusals of responsibility at the end of all monthly sales reports. In August, FCA agents made the following statement after the US Justice Department began probing saying that they will "cooperate fully" with the Securities and Exchange Commission investigation regarding the "reporting of vehicle unit sales to end customers." The car-manufacturer also included with their public statement that they will also cooperate with "inquiries into similar issues … recently made by the U.S. Department of Justice".

The examining from the FBI and the SEC initiated in July 11 when they visited FCA field staff in their homes and offices. Later, the federal staff attorneys visited the headquarters of FCA US in Auburn Hills, Mich. Eventually there were visits

also directed in Orlando, Dallas and California involving both current and former FCA employees.

Furthermore, at the beginning of 2017 EPA accused FCA of using software that allowed 100 thousand vehicles, SUV sold from 2014 in US, to exceed emission standards. However, FCA rejected the accusations calling itself "in good standing and ready to collaborate"[30].

In 2016, another investigation started against General Motors about emissions from the Chevy Cruze diesels in the US. GM launched the Chevy Cruze diesel model to challenge Volkswagen's supposed dominance into the diesel market. GM then moved the 2.0 liter diesel engine from Europe to the US market and appealed that the US model was even cleaner here than it was there. Mike Siergist, GM's chief engineer behind the US model of the diesel engine, confirmed this statement; he said to the press that this new engine has better NOx control.

As Volkswagen case, also GM was accused that they launched an engine emitting - but hiding - excessive NOx emissions.

According to the Seattle based law firm of Hagens Berman Sobol Shapiro, GM's diesel factory used emissions-cheating software just as Volkswagen did, delivering more than allowed NOx to escape the tailpipe. This lawsuit asked GM to pay all Cruze Diesel owners back the $2,000 premium they paid for their cars as well as more for punitive damages.

GM denied these indictments, with a representative saying, *"These claims are baseless and we will vigorously defend ourselves. GM believes the Chevrolet*

[30] Patel, J., "FCA under investigation for fraud by FBI, SEC, and DOJ", Autoblog, 2016, 18 July

Cruze turbo diesel complies with all US EPA and CARB emissions regulations"[31].

Other examination started against Nissan. In Nissan's case, things were a little bit different. While they also were accused of lying about the emissions from the diesel-powered Qashqai, they were suing South Korea for alleging as such.

The South Korean environment ministry charged Nissan 340 million Won ($290,000) last month and proceeded to order a recall of more than 800 Qashqai vehicles sold, before punctually blaming the Japanese automaker of using a similar so-called defeat device to Volkswagen in the Qashqai model.

A Nissan representative gave the following statement to "Automotive News" that: *"We have filed the lawsuit to dispute the ministry's accusations"*.

At the same time, the ministry has also filed a complaint with prosecutors against Nissan Korea and President Takehiko Kikuchi, with the charge of violating an environment law.

As reported by a ministry official: *"We believe that we have taken appropriate legal action"*[32].

Linked to Nissan investigation is the Renault's case. The French Press wrote that antifraud French investigators sequestered computers in some Renault offices, in January 2016. The implicated sectors were engines approval and control; this investigation is strictly linked to Volkswagen scandal inquiry.

[31] Blanco, S., "Lawsuit alleges Chevy Cruze Diesels use VW TDI-like cheat", Autoblog, 2016, 24 June

[32] https://www.endurancewarranty.com/learning-center/shoptalk/news/every-automaker-diesel-scandal/

Renault confirmed the inspections and explained that tests did not prove illegal mechanisms about emissions, an argument confirmed by French authorities. The investigation aimed to engine control unit. The suspect concerned the turbo-diesel engine Energy 1.6 Dci offered in two power levels (130 and 160 CV), that equipped several models of Renault-Nissan group (Renault Espace, Nissan Qashqai) but Daimler vehicles too, as Mercedes Class C thanks to the industrial alliance between these two groups. It is important to highlight that the 1.6 Dci equipped Bosh Edc17 central units, the same used by Volkswagen engines got involved in Dieselgate[33].

[33] Moussanet, M., "Renault sotto inchiesta a Parigi, titolo giù in Borsa", Il Sole 24 Ore, 2017, 13 January

4.2 The fault of the regulatory framework

The Dieselgate scandal itself is the extreme representation of the situation in Europe, where automakers exploit the lack in the regulatory framework to adopt illegal practices, which are becoming "best practices" among automotive companies. The immediate consequence is that the EU ability to enforce emission standards law is going to fail.

To explain this causal chain of events is important to analyse two policy variables and their role in EU's failure to implement real world automotive emissions target:

1) EU Regulatory Design of command and control (CAC) policies arranged in the EU automotive industry, classified as general regulatory instruments; precisely the performance standard regulation of Nitrogen Oxides (NOx) and Carbon Dioxide (CO2) tailpipe emissions. NOx in the EU is regulated as a toxic emission under the Euro 1–6 legal frameworks, first introduced in 1993, and CO2 is regulated under EU regulation (EC) No 443/2009, which was phased in between 2012–2015[34]. These EU guidelines imply automakers to meet a certain level of emissions based on a fleet average, indeed several industry sources have discovered that there is an important gap between emissions exhibited by automobile companies and actual real-world performance figures[35].

[34] Bergek, A., & Berggren, C., "The impact of environmental policy instruments on innovation: a review of energy and automotive industry studies", Ecol. Econ. 106, 112–123, 2014

[35] ICCT, "Impact of real world driving on emissions from UK cars and vans", Committee on Climate Change, 2015; Transport & Environment, "Closing the chasm between test and real-world car CO2 emissions", Transport & Environment, 2015

2) Policy interaction between EU CAC policies and EU member state market based instruments (MBIs), incentivizing, especially, low diesel emissions. Policy interaction is an important argument to analyze since policies are usually made in isolation and there are sometimes accidental consequences when different policies take effect on a market.

During this section will be discussed: a brief overview of CAC regulation and policy interaction, a background regarding EU preferential treatment of diesel and the real-world emissions gap and how automakers were able to skirt the EU's strict performance standards for reducing emissions in road cars (the fault in the system).

Since the 1960s, OECD and emerging countries have established the objective to set the development of technologies in order to decrease air pollution. The two most important policy instruments that allow them to reach this goal are CAC environmental regulations and MBIs. CAC policies are guidelines that compel producers to modify their behavior, although MBIs give financial incentives to private companies and consumers in exchange for changes in their behavior, for example tax reductions, exemptions and bonus payments[36].

In the automotive industry, researches report that technology-forcing policies are the drivers to boost emission technologies development and the introduction of emission control systems. Furthermore, research shows that the lack of regulation (or presence of lax regulations) obstructs innovation significantly. The result is

[36] Santos, G., Behrendt, H., Maconi, L., Shirvani, T., Teytelboym, A., "Externalities and economic policies in road transport", 2010

that technology-forcing policies approach substantially encourage the development of eco-friendly vehicles[37].

At the beginning, in 1995, the European Commission (EC) worked together with automakers to implement an autonomous set of regulatory standards to reduce CO2 emissions. Nevertheless, even if this settlement lead to some decrease, especially in France, there was, in average, an increase by 20% of pollution level between 1990 and 2006, globally. Consequently, EC decision was to apply mandatory standards to improve the negative trend shown in the previous sixteen years. In 2007, the EC set a proposal to substitute the actual voluntary arrangement with a mandatory guideline of 130 g CO2/km. The entire automotive industry replied that the regulatory goals were not feasible, and after negotiations, all parties decided to spread over time the mandatory guidelines as follows: 65% of an automaker's fleet would have reach the target by 2012, 75% by 2013, 85% by 2014 and 100% by 2015. Moreover, the EC also established a new target of 95 g/km by 2021[38].

Indeed, the EU regulatory framework is less rigorous, in terms of respectability, than in the US and Japan regarding NOx emissions and it is the main reason why Europe is the lead market for diesel automobiles and diesel technology development. Moreover, the EU guidelines are more flexible in terms of

[37] Schot, J., Hogma, R., Elzen, B., "Strategies for shifting technological systems: the case of the automobile system", Futures 26, 1060-1076, 1994

[38] Plotkin, S.E., "Examining fuel economy and carbon standards for light vehicles", CO2 Emiss. Transp. 37, 3843-3853, 2009; Shiau, C.S.N., Michalek, J.J, Hendrickson, C.T., "A structural analysis of vehicle design responses to Corporate average fuel economy policy", Transp. Res. Part Policy Pract. 43, 814-828, 2009

companies' compliance regarding emission standards and the time horizon for compliance to be met. While EU emissions principles may have a reduced technology forced effect, they still encourage continuous innovation and reduce levels of pollution without raising a "dominant design"[39].

Before the scandal of 2015, there was already anxiety and debate among car industry and Western Europe governments, where politicians and other stakeholders became more interested in diesel technologies and in the negotiations for a better air quality reducing CO2 emissions. In 2014, Manuel Valls, the French Prime Minister, admitted that the favoritisms towards diesel engine from French government was a mistake and the priority is to change policies about this issue. The proclamation was noteworthy since French government owns about 20% of Renault, the most important car manufacturer in France. At the beginning of 2015, in UK, Barry Gardiner, Shadow Environment Minister of the Labor Party, reported that the previous Labor government's decision to fix the country's car tax on CO2 output was a mistake, since it had the involuntary effect to distort the market favoring diesel vehicles. Diesel vehicles emit four times more NOx and 22 times more chemical substance than petrol automobiles. These results are important because, as reported by the Greater London Authority and Transport of London, diesel emissions are considered the main factor of dangerous level of air pollution in London that caused the death of about 9500 people each year[40]. Another estimation from the

[39] Oltra, V., Saint Jean, M., "Sectoral systems of environmental innovation: an application of the French automotive industry", 2009

[40] Walton. H., Dajnak, D., Beervers, S., Williams, M., Watkiss, P., Hunt, A., King's College London report on morality burden of NO2 and PM2,5 in London, 2015

London Assembly underlie that diesel vehicles account for 40% of the city's air pollution.

Since early 2015, the discussion regarding diesel emission was mainly between carmakers and lawmakers, but after accusatory reports by "Transport and Environment", a sustainable transport NGO, the trend was going to change. These reports (joined with data from International Council on Clean Transportation) exhibited the large gap in the claimed NOx and CO2 emissions and proposed the World Harmonized Light-duty Vehicle Procedure (WLTP) and the Real Driving Emission (RDE) testing procedures to solve the issue. The reports showed how the gap between test results and real world performance in CO2 emissions increased from 8% in 2001 to 40% in 2014 and was expected to rise to 50% by 2020 if it should be remained uncontrolled. (Transport and Environment, 2015b) It should be also considered that independent publications and car magazines have consistently flagged discrepancies in advertised fuel economy estimates by automakers[41].

After Dieselgate the French government started debates on the reduction or the complete elimination of diesel subsidies which made it approximately US 90 cents per gallon cheaper than gasoline. Segolene Royal, the French Environment Minister, reported about this argument, that there is an inconsistency between the advantages guaranteed by diesel and its downsides in terms of pollution. The intervention of the government would increase taxes on diesel while decreasing them on gasoline in order to offset the gap. The under taxation of diesel engine made it the most common technology in automotive market across Western Europe. The consequence of the policy that could be adopted by French

[41] Consumer Reports, "The miles per gallon gap", Consumer Report Magazine, 2013

government, according to the French automaker association (CCFA), would be catastrophic, since approximately 68% of all vehicles in France are diesels[42].

In the UK, about this argument, Lord Drayson, former Labor science minister in the Brown government from 2008 to 2010, said: "We did get it wrong. We now have a much better understanding than we did just a few years ago of what are the health effects of the products of diesel cars and they are literally killing people so it's clear that in retrospect that was the wrong policy"[43].

Generally, the new wind among European governments is a huge problem for the European bigger car manufacturers, as the two state-backed companies (Renault and Peugeot) and the German "big three" (BMW, Daimler AG and Volkswagen). In fact, as referred by an industry report, the diesel mix, diesel cars in proportion of total sales in Europe, in several EU countries ranges between 70-80% among these automakers, rising to 90% for Volvo[44].

The regulatory framework shows some faults that create the inefficient system that Dieselgate expressed to the entire world. As discussed previously in this section, lax regulations and lack of policy interaction lead to this situation. There are different consequences of a lax regulation, obviously in terms of human and environmental health but, especially, at regulatory level, in terms of exploitation, due to a kind of behavior adopted by agents inside the market, compromising the

[42] Rosemain, M., "France moves to end diesel's tax break amid emissions scandal", Bloomberg.com, 2015

[43] Kollewe, J., "UK government wrong to subsidize diesel, says former minister". The Guardian, 2015

[44] Sharman, A., "Carmakers braced for European crackdown on diesel vehicles", Financial Times, 2015,

entire framework. About this argument, it is reported the message of an EU regulator in the Dieselgate context:

"To go back to the mantra about deregulation and light-touch regulation and so on. What you see with the Volkswagen case is how damaging it is not to have effective regulation. I mean, the cost of this single incident to Volkswagen is going to exceed I would imagine any estimate of what proper regulation would have cost the industry"[45].

Dieselgate shows clearly how automakers have actively exploit the fault in the testing procedures, or the flexibilities, to their sole benefit.

The second argument to analyze is policy interaction. It arose since stakeholders argued that diesel was something "denigrated". Generally, many claimants from automotive industry specified that the boost to sell and produce diesel vehicles was encouraged by the policies put in place by governments, and now diesel market is suffering a remarkable repercussion.

The main source of policy interaction argument is the correlation between EU emissions regulations and technology-specific economic instruments, executed by EU member states that specifically favor the low carbon benefits of diesel technology. The problem is described by an EU regulator, he said: "*The reason many people buy diesel cars is because they are cheaper to run, one of the reasons they are cheaper to run is because diesel is undertaxed, that is a decision by member states, the EU has tried to reform fuel taxation and the member states have rejected that, despite the commission's proposals saying 'this is not right'*"[46].

[45] Jean-Paul Skeete, Examining the role of policy design and policy interaction in EU automotive emissions performance gaps

[46] Jean-Paul Skeete, Examining the role of policy design and policy interaction in EU automotive emissions performance gaps

Political interests are the main drivers of the lack in policy interaction among EU and actually the most important reason of national economic incentives. There are several opinions about the benefits and drawbacks of diesel engine. EU regulators believe that diesel should be more expensive than petrol since it has a higher energy density. Nevertheless, critics replied that in some member states, diesel is taxed at a lower rate than petrol and there is no evident justification for that action. They argued that, in the past, diesel was under-taxed, since diesel was mainly used in heavy goods vehicles; that choice was correct because taxes should not be applied to an intermediate product that is economically inefficient. However, they claimed that, nowadays diesel is more used in cars as commercial vehicles, so the previous argument has lost its validity.

The preferential conduct towards diesel vehicles, thanks to incentives, such as under taxation, produced a market pull effect and increased their popularity throughout Western Europe. The outcome was that, at EU legal perspective, car-manufacturers produced vehicles expanding real-world emissions gaps. At the national level, there was a huge increase in demand for these kind of vehicles, which created a lock-in effect to a suboptimal technology[47].

In conclusion, the most important source of real world emissions gaps was an organizational failure in the policy to implement stringent adherence by OEMs (Original Equipment Manufacturer). Several factors paid the way to this legislative collapse, particularly the exploitation of flexibilities in the regulatory framework by car manufacturers. Another factor was the negative effect on air quality caused by weak policy interaction about diesel under-taxation, which produced a national market pull effect and a lack in regulatory boost for lower

[47] Dolfsma, W., -Leydesdorff, L., "Lock-in and break-out from technological trajectories: modelling and policy implications", Techolog. Forecast Soc. Change 76, 932-941, 2009

CO2 emissions at the EU level. The consequence was a lock-in effect with the diffusion of over-polluting diesel vehicles in European market[48].

Diesel engines, which in the past appeared promising, is now leaving the place to more powerful technologies which were not been considered in the past.

[48] Witt, U., "Lock-in vs critical masses- industrial change under network externalities", Int. J. Ind. Organ. 15, 753-773, 1997

4.3 The future eventualities of the regulation

After Dieselgate resulted that Germany, Italy, Austria, Spain and many Eastern member states refused to support strict limitations on diesel vehicles emissions. Consequently, an agreement was set between member states and EC: new diesel vehicles will be allowed to overcome the NOx pollution limit by no more than double, from 2019 that amount must be further decreased to no more than 50%. Meanwhile, US EPA supervisors, in cooperation with the EC and MEPs (members of European Parliament) ahead of the European Parliament's vote, are discussing about the meaningless to establish new standards about test cycles if they do not have the authority, the resources and the determination to enforce. For this reason, the EC suggested to follow the US model; in fact, as EPA in US, the EC proposed a provisional agreement that would provide them new powers to supervise national authorities in the approbation process of new vehicles. The new proposal establishes that transgressors will be penalized up to 30.000 euro per vehicle founded in the EU. Nevertheless, differently from EPA in US, this proposal derived within reports that the Commission felt limited in its ability to enforce, as member state government are primarily responsible for the implementation of the regulation[49].

However, the EPA's failure to uncover Volkswagen's illegal behavior should also be a warning account to the EC, which even enhanced organizational autonomy does not safeguard against chronic regulatory failure.

The Volkswagen scandal places the European regulatory framework under deep inspection. The future of the regulation could be based on several contributions

[49] Stupp, C., "US Dieselgate watchdog met Commission and MEPs head of key emissions vote", EurActiv.com, 2016

from critics and academics that after the scandal published a number of researches, which exhibited how the real world performance gaps were born from the manipulation of flexibilities into the legislation by companies. The result is a damage in air quality that surely had contributed to the worsening of public health among European Union[50].

Nowadays, European regulatory framework is at the beginning and it is predicted a long debate between European Council and Parliament where there is the adverse position of powerful national parties. The main concern is that these countries are unfavorable to the new discipline that could increase costs for automakers, which operate directly in their territories. These costs could been reflected on the labor and consequently on the economy of these countries.

However, these changes in the regulatory framework will be adopted anyway: the measures, that will be implemented since now to the 2021 and will make test results closer to emission revealed on the road, will force to an increase in production costs.

Emission standards were fixed in 2007, but so far they are been respected only in unrealistic homologation tests. Nowadays, tests will be more onerous for the companies; it is estimated that new devices for the NOx catalysts could lead to the powertrain (describes the main components that generate power and deliver it to the road surface, water, or air. This includes the engine, transmission, drive shafts, differentials) cost equal to the 40% of the entire vehicle.

European Parliament has approved the recommendations voted in the first Emis (Emission Measurements in the Automotive Sector) commission, which has examined from autumn (but with insufficient influence) the Dieselgate.

Recommendations mainly require:

[50] Walton. H., Dajnak, D., Beervers, S., Williams, M., Watkiss, P., Hunt, A., King's College London report on morality burden of NO2 and PM2,5 in London, 2015

1) A quick adoption of the regulations about Real driving emissions (Rde), with the implementation of unpredictable challenges in homologation tests in order to detect illegal devices.
2) That Commission proposes a EU collective complaint system and compensations for car owners

The European Parliament approved the new homologation proposals anti-Dieselgate, they expect:

1) Intensification of on road supervision and that the national authorities will be obliged to verify the previous year almost the 20% of inserted vehicles into the market.
2) Commission would have more power to introduce greater supervision when national authorities do not respect homologation commitments and, in some cases, it can implement itself tests and inspections to the vehicles.
3) Car manufacturers that cheat on test results would be subjected to sanctions until 30000 euro each vehicle and the consequent earnings will be used for the market monitoring, consumers damaged or for the environment safeguard[51].

The growing repercussion towards diesel vehicles throughout Europe could be seen as the intervention of policymakers to overturn the enduring privileged treatment that diesel cars has received from member states.

The first solution to adopt in order to change the inefficiencies of the EU legal framework should be immediately solving all flexibilities during future test cycles. To apply this legal procedure, the only obstacle is the member states hesitancy; in fact, as known, some of them have special interests, as shareholdings in their domestic auto companies, which could create difficulties

[51] Caprino, M., "Effetto dieselgate, prezzi in aumento dal 2020. Braccio di ferro in Europa", Il Sole 24 Ore, 2017, 5 April

in approving such revisions in the regulation. It is important to take into consideration that, potentially, if a member state retroactively decide to remove preferences of a particular technology like diesel, the action is likely to create a damage to all those consumers that bought, thanks to government's economic incentives, diesel vehicles. The member states supremacy could be solved granting an extra decision power to the European Commission. The authority to intervene at the national level would facilitate these problems in approving new guidelines, but this is another decision that need the EU member states approval. From an industry perspective, future EU emissions goals will be modulated down to a point where achieving targets with an internal combustion engine will become virtually impossible, which is the whole point of the regulation. Nevertheless, innovation is not free and thus the "costs" of these regulations are of perpetual concern to OEMs. As the EC continues to conduct detailed cost studies, research has shown that between 1995 and 2010, regulations have not increased the per unit cost of new cars and that on average, their quality-adjusted price has remained unchanged[52].

About present-day technology, EU regulators' cost curves foresee that another 50-60% efficiency can be potentially extracted from the internal combustion engine, compared to 2013 technology (European Commission, 2008).

In US the situation is quite different compared to EU.

EPA and the National Highway Traffic Safety Administration (NHTSA) developed together, in the immediate future: fuel economy standards for light-duty vehicles (in particular trucks and passenger cars) and the national program for greenhouse gas emissions (GHG).

[52] Wells, P., Varma. A., Newman, D., Kay, D., Gibson, G., Beevor, J., Skinner, I., "Governmental regulation impact on producers and consumers: a longitudinal analysis of the European automotive market", Transp. Res. Part Policy Pract. 47, 28-41, 2013

The standards were established in two phases:

- Phase 1: model years 2012-2016
- Phase 2: model years 2017-2025.

Both final standards are developed to:

- Cut 6 billion metric tons of GHG over the lifetimes of the vehicles sold in model years 2012-2025
- Result in an average industry fleet wide level of 163 grams/mile of CO2 in model year 2025, which is equivalent to 54.5 miles per gallon (if achieved exclusively through fuel economy improvements)
- Reduce US' dependence on oil by more than 2 million barrels per day in 2025
- Save families more than 1.7 trillion dollars in fuel costs [53]

EPA determined that these standards could be discussed in a Midterm Evaluation and it concerns the longer-term standards for model years 2022-2025. The evaluation has to be exposed to the cooperation of the California Air Resources Board and NHTSA.

On January 12, 2017, EPA's administrator, Gina McCarthy, signed her determination to conserve the present GHG emissions standards for model year 2022-2025 vehicles. Her final determination established that automobile

[53] https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-greenhouse-gas-emissions-passenger-cars-and

companies are at a good point to meet the guidelines at lower costs than previously estimated.

In fact, the results of Administrator McCarthy's January 2017 Final Determination are:

- The standards will save consumers money, significantly decrease GHG emissions and fuel consumption providing benefits to the health and welfare of Americans
- Car-manufacturers outperformed the standards for the first model years (2012-2016) and they are implementing fuel efficient technologies at exceptional rates, meanwhile vehicle sales increased for seven consecutive years
- Car-manufacturers have a wide scope of development of efficient technologies to meet model years 2017-2025 standards, at slightly lower per-vehicle costs than previously predicted. The standards are feasible with very low diffusion of powerful electric, hybrid vehicles.

McCarthy's Final Determination was based on an extensive eight years job where several stakeholder meetings, researches and published reports gave input to build the current guidelines. The Final Determination follows the November 2016 release of EPA's Proposed Determination and the July 2016 release of a Draft Technical Assessment Report (TAR), distributed together with EPA, CARB and NHTSA. EPA provided opportunities for public observation to both the TAR and the Proposed Determination.

On March 15, 2017, it was considered to review the Final Determination, issued on January 12, 2017, to introduce new proposals to the GHG and regarding the fuel economy standards for light-duty vehicles for model years 2022-2025, which were not expected in the previous determination. EPA has just announced, with

Administrator Scott Pruitt (nominated after Trump escalation) and Department of Transportation Secretary Elaine Chao, it will reconsider that determination in coordination with NHTSA.

The intermediate process was already planned as part of the 2012 phase for model years 2017-2025, demanding EPA to establish by April 1, 2018, the compliance of the standards for model years 2022-2025. According to that program, it is expected that EPA will determine, even more, a new Final Determination regarding the compliance of the standards within April 1, 2018[54].

If the current situation in Europe is not clear and surely is not in an advanced projection, in US it is precarious. In fact, a wide share of EPA's programs could be under the knife to meet President Donald Trump's budget proposals requirements, as several sources report, and as the designation of Scott Pruitt could implicate. Trump's campaign in favour of petrol industries and military enforcement will cause, probably, for EPA a budget cut of 25% costing about 3000 jobs loss. This program could hidden EPA's most important and best-known plans, as initiative to improve water and air quality, as well as many regulations aimed to reduce nation's greenhouse emissions (Clean Air Act). The Clean Power Plan, which could return into cuts program, was a proposal by former President Barack Obama aimed to diminish carbon emissions from each state. Furthermore, Trump's plan entails other fourteen different EPA's partnership programs to reduce greenhouse gas emissions.

The new warning-sign arise in US could hinder the important changes that automotive industry needs for improving next generations well-being. US is very influential into European dynamics and this new ideology, that is spreading in

[54] https://www.epa.gov/regulations-emissions-vehicles-and-engines/midterm-evaluation-light-duty-vehicle-greenhouse-gas-ghg

US, could slow down or even stop the possible changes into the regulatory framework even in Europe.

4.4 Future prospects and advices for Volkswagen

European governments granted economic incentives to diesel engine over gasoline since they allow a higher fuel performance for a lower carbon emission. However, Dieselgate is the beginning of a new trend in European automotive industry. The scandal has lead governments to move towards ecological vehicles; for example, in Italy, government gave the concession of free parking for electric and hybrid vehicles, and even car-sharing companies are thinking about introducing the launch of eco-friendly automobiles in their fleet.

As seen previously, an increase in production costs due to new regulations will cause a reduction in the supply of diesel vehicles (especially at the bottom of the market). Considering the car sharing and public service progress (in more organized cities), the automobile market should settle to low levels compared to the present.

The new wind is demonstrated by declarations of political figures throughout Europe. In Paris, for instance, the mayor affirmed that within five years diesel vehicles will be banned to reach the programmed green plan of the city. Moreover, in other European countries it has been formalizing the cancellation of incentives for diesel vehicles. These programs lead automobile companies to rethink about the launch of new diesel vehicles, since without public subsidies the production of these kind of engines become more costly compared to others. The pronouncements emerged from the European Parliament Committee exhibited the agreement to reformulate and improve guidelines on automobile's pollution limit and fines[55]. The statement is important especially concerning the behavior of consumers, they maybe are motivated to buy eco-friendly vehicles

[55] George, L., & Bousso, R., "RPT-Volkswagen emissions scandal dims outlook for diesel", Reuters, 2015, September 23

and this is an important aspect to consider in future projection for automobile companies. German government is very interested in this topic, and this is the reason why it planned to force automotive industry to boost sales and development of electric cars up to a million by 2020. Furthermore, subsidies have to be relocated to more eco-friendly electric models. Volkswagen decided, during its plan to recover its brand image, to concentrate its production efforts toward the development of new technologies. The company opted to renovate its over-used diesel control system for newest models, and in the meantime, focusing on the production of electric and hybrid vehicles. As reported by the New York Times, Volkswagen should adopt its new technology for 2019 and 2020 models of the Paethon limousine[56]. It is important to observe how the new renovation plan of Volkswagen it's mainly concentrated on revamping its diesel control system, rather than totally focus on hybrid as its major competitor, Toyota, is doing.

Dieselgate was an alert for all automobile companies all over the world. They learned the importance of clean energy technology and the relevance to focus on long term R&D strategies. Decisions of the bigger auto companies to plan the launch of new eco-friendly vehicles, for instance Toyota programed to produce several models of hybrid and ecological vehicles by 2050, lead to an increase in consumers choice regarding more alternative energy vehicles to buy. Some analysts expected that automakers would consolidate, through agreements or partnerships, to share costs and responsibilities to develop alternative-energy vehicles. Difficulties could emerge if circumstances as low oil prices, expensive

[56] Kieler, A., "VW moving forward with new emissions system, electric power for future models", October 2014, Consumeristic, 2015

costs to purchase, and inconvenience to fuel, would overshadow the long-term benefits of purchasing alternative-energy cars at a greater cost[57].

Furthermore, the development of gasoline engines that become fuel efficient and more powerful, with lower carbon emissions, could create a further obstacle to the spread and the growth of alternative-energy automobiles[58].

Volkswagen scandal lead the company to face the need to develop a strength model to launch into the market, even to use it as a symbolic image of its new cycle, recovering the brand image. Nowadays, maybe there is a slow process of recovering since the company is affected by economic losses all over the world, caused by recalls, fines, and a further concern due to decreased sales in the short-term and a diminished brand image in the long-term. In fact, while in the short term the company had to pay huge penalties, especially in US, and large amount for the recall campaign, in the long term the company may need many years to recover its corporate image and loss of costumer's trust. Even if USA and China accounted for small shares of diesel vehicle unit sales, they are the largest auto markets worldwide and it is into the interest of the company to recover its sustainability even in these markets, particularly for the future prospects of the automaker[59].

Volkswagen scandal and the consequent loss of trust of company's customers could threaten the long-term profitability of the automaker. Currently, it is

[57] Phelan, M., "Diesel scandal opens door for other technologies", Detroit Free Press, 2015, October 24

[58] George, L., & Bousso, R., "RPT-Volkswagen emissions scandal dims outlook for diesel", Reuters, 2015, September 23

[59] Ewing, J., "Volkswagen says 11 million cars worldwide are affected in diesel deception", New York Times, 2015, September 22

difficult to estimate the potential total costs of the scandal but it would be important to watch out what the company should do in the next couple of years. Dieselgate creates a need to change for Volkswagen and in order to recover its credibility there are some advices for the company, such as: develop Leadership with Emotional Intelligence Flexibility, inject Outside Perspectives and monitors and be Aware of a Competency Trap.

1) **Develop Leadership with Emotional Intelligence Flexibility.**

   Strong emotional intelligence allows leaders to spread trust and effective communication within the company. Leaders can build a network with other employees using honesty, empathy, tolerance and cooperation. Both Piëch and Winterkorn leadership style was based on the fear. Their engineering backgrounds lead them to concentrate mainly on details and micromanagement and this is a reason why they were not adroit to be tolerant and flexible. That leadership style could be more efficient in the mass-manufacturing era, where the main concern was the cost efficiency through standardization and top-down distribution of the power. The automotive companies are a kind of environment that needs different approach and no single company can identify and manage all the information. Into this business, the key to success is cooperation and interaction among employees who accept other expert's opinions. To reach effective management, leaders do not have to stop at an individual perspective, but they have to develop a corporate culture where everyone can share its ideas without fear.

2) **Inject Outside Perspectives and Monitors.**

   Corporate governance can be positively influenced by an external personality. Two owner families, the Porsche and Piëch families, dominate Volkswagen management. Moreover, the government of Lower Saxony and unions compose the supervisory board of the company, sharing similar ideals and

objectives, as full employment and production. The result is an obsolete governance based on the same ideals since 60 years. It is important, particularly after the scandal, to inject fresh ideas from the outside to start the process of renovation that the company needs. For instance, CSR positively affects, on average, a company's financial performance. (Barnett & Salomon; Margolis & Walsh, 2003) It would be the best choice to nominate an external element as company's CSR chief, since he could operate without internal pressures, being less dependent on internal managers. Adopting that solution would be beneficial for Volkswagen image, in fact, an influential external CSR chief could monitor and influence future manager's decisions and actions and it would surely improve company image.

3) **Monitor and be aware of a Competency Trap.**

It is human nature that past-experience is very influent for consequent decision-making. Principally, if the past decision was successful in the past, it is likely that the leader adopt the same approach even in the present. In Volkswagen case, the successful decision, especially in terms of vehicles sold, is the diesel engine technology. Executives need to be, after the scandal, very cautious about their decision, thinking about all possible consequences and risks that the decision imply. In a fast-changing world, where nothing is safe, decision-making is even more difficult and sometimes leader rely on past-experience. Volkswagen managers should be aware of their decisions and monitor them, exploring new technologies and exploiting current strengths, which make Volkswagen the most important carmaker in the world.

4.5 The new opportunities in the Auto industry

The need to change into the regulatory framework boost the entire automotive industry to immediately realize or change their strategy.

The most important car manufacturers in the world have to rethink their idea of business; in fact, while we can observe in all the famous motor-shows all over the world, every year, the presentation of new prototypes designed for a new world in pursuit of clean air, no-one have concretely showed a model ready to be sold. They present these models only to increase the appeal around their customers. The only one car manufacturer, with a big market share, that have invested a lot in order to change immediately its strategies, toward a "clean" tech driven model, is Toyota.

The big automakers have other risks to face-off. New competitor as Tesla Motors and future players as Apple could reduce their market shares in the future.

New regulations, but especially changing customer needs and expectations, are driving the growth of electric vehicles into the market, but much of this excitement can be tracked back to Tesla Motors. Tesla founder and CEO Elon Musk sprang the company with the mission: to accelerate the advent of sustainable transport by bringing compelling mass market electric cars to market as soon as possible. Tesla did not invent the electric car, but, thanks to its business model, has broght persuasive electric vehicles to the market, differently from other manufacturers that stopped their prototypes to motor shows.

In April, Tesla registered a symbolic overtaking in terms of market capitalization over Ford. This is an epochal turning point, the future is of electric vehicles, iper-connect, hi tech and self-driving, not of the gasoline engine. This new perspective would not surprise if Tesla could early overtake another giant as General Motors, far one billion of dollars only in market capitalization. Furthermore, if sales in

auto market stopped in March, Tesla exhibited an increase equal to 69% in the first trimester of the year with 25000 vehicles sold.

The hypothesis is that in the following years will not be the traditional giants to register growth exploits and larger income. Tesla thanks to its innovative ability can reach these results. Chevrolet Bolt (GM vehicle) was the reply to Musk electric car but it sold about 3 thousand vehicles recently, it was unable to compete and it is an example of how these big rivals be late in this new market prospect[60].

Those needs to shift toward electric vehicles is also driven by the importance to meet the Paris Agreement's long-term goal of keeping the increase in global average temperature below 2°C. As seen in previous sections, the shift towards implementing them appears to be slow going; maybe, only with subsidies to buy electric cars this change could be real.

[60] Valsania, M., "Il mercato scommette su Tesla: è la nuova Ford, in Borsa e in strada", Il Sole 24 Ore, 2017, 4 April

CONCLUSIONS

Dieselgate drastically changed the destiny of diesel engine, however, there are also other factors that are changing the automotive industry: engineers are designing better and innovative solutions and consequently engines are going to evolve.

The scandal exhibited all the vile behind the automotive industry and the faults in the regulatory framework. Different solutions have been presented for building a new environment, where both companies and institutions would cooperate to restore the image of an industry which has damaged our world.

Diesel vehicles are expected to become more expensive because of the new and stringent regulations. The risk is that, in order to comply with the new guidelines, automotive companies are compelled to add components to the engines, increasing costs, complexity and technical difficulties. The best solution is to implement a completely different engine that interact with electric, guaranteeing the benefits of diesel combined with electric advantages, as well as to the accessibility to costumers.

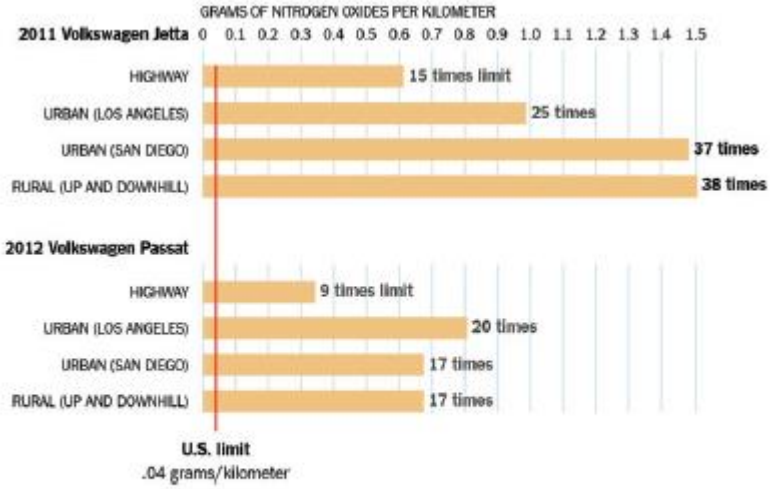
The future of automotive market is hybrid. Nowadays, all majors car manufacturers are implementing hybrid models, and governments have an important role in the spread of these vehicles. The bigger obstacle is the lack of charging stations available, and this is an important issue, since installing enough columns around entire cities represents a huge financial investment. The solution is to create a sort of incentive or subsidies, which governments will provide to auto companies as they did with diesel engines.

Last news exhibited how this important shift toward "green" energy is threatened by US President Donald Trump demonstration during ultimate G7 in Taormina, Italy, where he declared that USA would reject the Paris Agreement on

greenhouse emissions. The pronouncement could affect also the automotive industry since USA is the largest market, and it demonstrates as sometimes financial interests make people blind, and negative past-experiences, as Dieselgate, are forgotten, laying the foundation for a future, new scandal.

Appendix

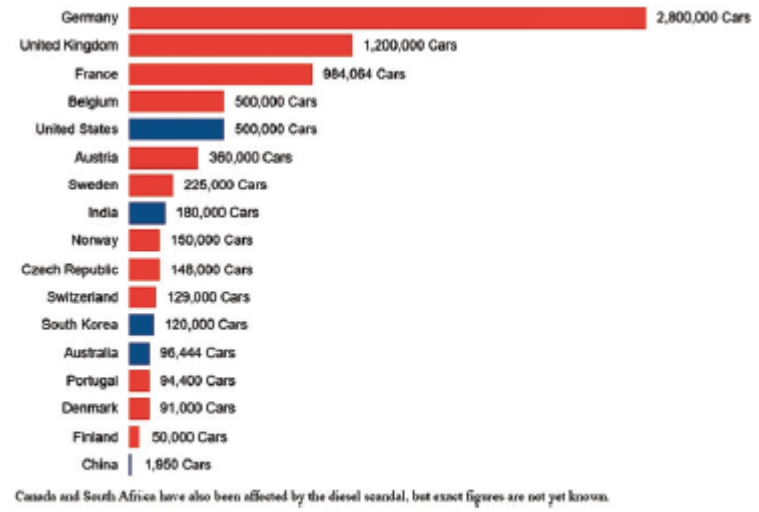
Appendix 1. Volkswagen ' s Nitrogen Oxides Emissions during On-Road Testing



Source: Gates et al., 2015.

Gates, C., Keller, J., Russell, K., & Watkins, D., "How Volkswagen got away with diesel deception", New York Times, 2015, October 2

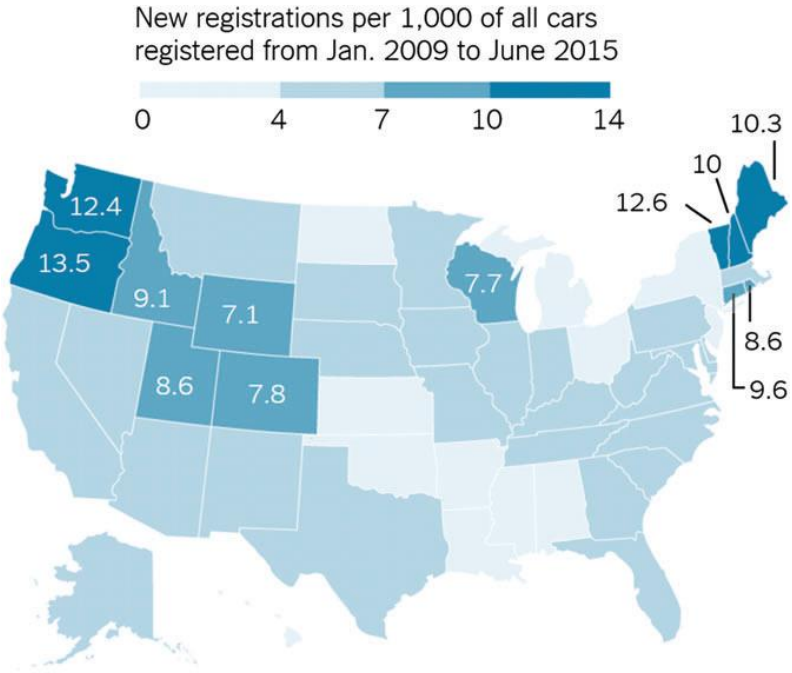
Appendix 2. Number of Volkswagen Diesel Models Affected by the Defeat System by Country



Source: McHugh, 2015.

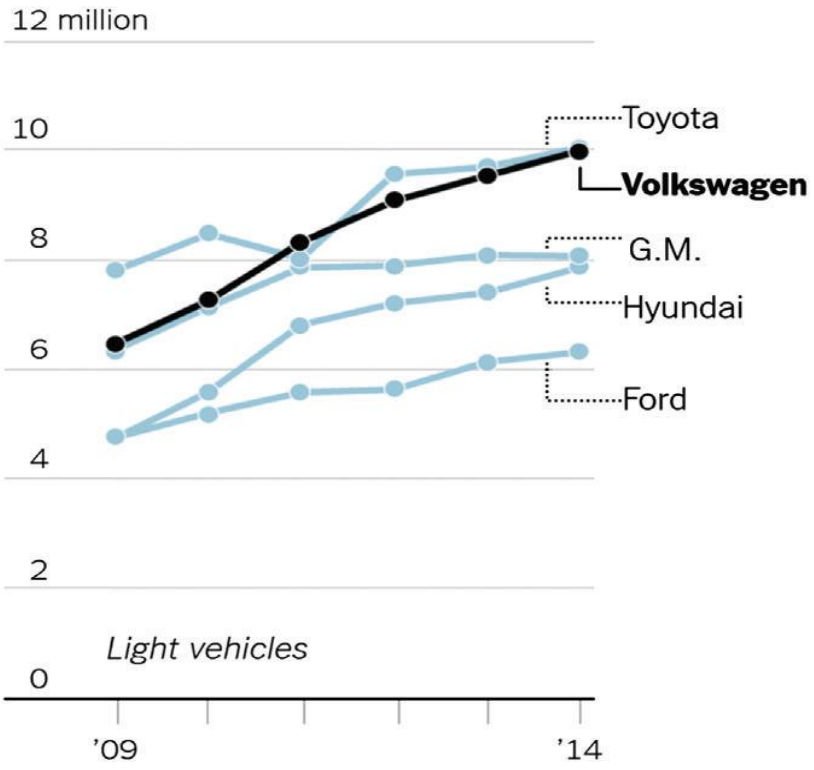
McHugh, J., "Volkswagen diesel scandal update 2015: Affected countries are largely in North America, Europe, but Asia not immune", International Business Times, 2015, October 12

Appendix 3 Diesel Volkswagens Registered in the United States (January 2009 to June 2015)



Gates, C., Keller, J., Russell, K., & Watkins, D., "How Volkswagen got away with diesel deception", New York Times, 2015, October 2

Appendix 4 Worldwide Annual Car Sales before the VW Scandal



Gates, C., Keller, J., Russell, K., & Watkins, D., "How Volkswagen got away with diesel deception", New York Times, 2015, October 2

Appendix 5 Regulation Map (as of September 30, 2015)

Bloomberg

REFERENCES

Associated Press, “EPA to change diesel tests to thwart VW-like cheating”, New York Times, 2015, September 25

Barnett, M.L., & Salomon R.M., “Does it pay to be really good? Addressing the shape of the relationship between social and financial performance”, Strategic Management Journal, 33, 1304-1320, 2012

Bergek, A., & Berggren, C., “The impact of environmental policy instruments on innovation: a review of energy and automotive industry studies”, Ecol. Econ. 106, 112–123, 2014

Bibhu Prasan Patra, “The Deliberate Deception: Case Study on Volkswagen Emission Scandal”, Journal of Management, 2016, March

Blanco, S., “Lawsuit alleges Chevy Cruze Diesels use VW TDI-like cheat”, Autoblog, 2016, 24 June

Boston, W., & Sahin, M., “Volkswagen is expected to post quarterly loss”, Wall Street Journal, 2015, October 27

Bowley, C., & Eddy, M., “VW’s emissions scandal has its German hometown facing an uneasy future”, Wall Street Journal, 2015, October 27

Boyle, C., “VW’s diesel debacle may already have hit sales”, CNBC, 2015, October 1

Caprino, M., “Effetto dieselgate, prezzi in aumento dal 2020. Braccio di ferro in Europa”, Il Sole 24 Ore, 2017, 5 April

Clothier, M., “Diesel scandal undercuts one of VW’s few strengths in showroom”, Bloomberg Business, 2015, September 29

Consumer Reports, “The miles per gallon gap”, Consumer Report Magazine, 2013

Dans, E., “Volkswagen And The Failure Of Corporate Social Responsibility”, Forbes, 2015, 27 September

De La Cuesta, S., “Does Every Automaker Have a Diesel Scandal?”, Endurance, 2016, 8 September

Dolfsma, W., -Leydesdorff, L., “Lock-in and break-out from technological trajectories: modelling and policy implications”, Techolog. Forecast Soc. Change 76, 932-941, 2009

Eddy, M., “Volkswagen to recall 8.5 million vehicles in Europe”, New York Times, 2015, October 15

European Commission, “Energy sources, Production costs and Performance of Technologies for Power Generation, Heating and Transport”, 2008

Ewing, J., “Volkswagen says 11 million cars worldwide are affected in diesel deception”, New York Times, 2015, September 22

Ewing, J., Hakim, D., & Kessler, A.M., “As Volkswagen pushed to be No. 1 ambitions fuelled a scandal”, New York Times, 2015, September 26

Gates, C., Keller, J., Russell, K., & Watkins, D., “How Volkswagen got away with diesel deception”, New York Times, 2015, October 2

George, L., & Bousso, R., “RPT-Volkswagen emissions scandal dims outlook for diesel”, Reuters, 2015, September 23

ICCT, “Impact of real world driving on emissions from UK cars and vans”, Committee on Climate Change, 2015

Kieler, A., “VW moving forward with new emissions system, electric power for future models”, October 2014, Consumeristic, 2015

Kollewe, J., “UK government wrong to subsidize diesel, says former minister”. The Guardian, 2015

Margolis, J.D., & Walsh, J.P., “Misery loves companies: Rethinking social initiatives by business”, Administrative Science Quarterly, 48 (2), 268-305, 2003

McHugh, J., “Volkswagen diesel scandal update 2015: Affected countries are largely in North America, Europe, but Asia not immune”, International Business Times, 2015, October 12

Meiners, J., “Piech vs Winterkorn: an epic battle unfolds for control of VW group”, Car and Driver, 2015, April 13

Moussanet, M., “Renault sotto inchiesta a Parigi, titolo giù in Borsa”, Il Sole 24 Ore, 2017, 13 January

Oltra, V., Saint Jean, M., “Sectoral systems of environmental innovation: an application of the French automotive industry”, 2009

Patel, J., “FCA under investigation for fraud by FBI, SEC, and DOJ”, Autoblog, 2016, 18 July

Phelan, M., “Diesel scandal opens door for other technologies”, Detroit Free Press, 2015, October 24

Plotkin, S.E., “Examining fuel economy and carbon standards for light vehicles”, CO2 Emiss. Transp. 37, 3843-3853, 2009

Reuters, “Regulator Says Automakers Are Responsible for Takata’s Faulty Airbag Recalls”, Fortune, 2016, 3 November

Rosemain, M., “France moves to end diesel’s tax break amid emissions scandal”, Bloomberg.com, 2015

Ruddick, G., “Volkswagen: a history of board-room clashes and controversy”, The Guardian, 2015, September 23

Santos, G., Behrendt, H., Maconi, L., Shirvani, T., Teytelboym, A., “Externalities and economic policies in road transport”, 2010

Schot, J., Hogma, R., Elzen, B., “Strategies for shifting technological systems: the case of the automobile system”, Futures 26, 1060-1076, 1994

Selin, N.F., “One of the biggest consequences of the Volkswagen diesel scandal”, Fortune, 2015, September 30

Sharman, A., “Carmakers braced for European crackdown on diesel vehicles”, Financial Times, 2015

Shiau, C.S.N., Michalek, J.J, Hendrickson, C.T., “A structural analysis of vehicle design responses to Corporate average fuel economy policy”, Transp. Res. Part Policy Pract. 43, 814-828, 2009

Stapleton, S. “Diesel engines and how VW’s defeat device worked”, Fortune, 2015, September 21

Statista, n.d, “Statistics and facts about Volkswagen”

Stewart, J., “Problems at Volkswagen start in the boardroom”, New York Times, 2015, September 24

Stupp, C., “US Dieselgate watchdog met Commission and MEPs head of key emissions vote”, EurActiv.com, 2016

Transport & Environment, “Closing the chasm between test and real-world car CO2 emissions”, Transport & Environment, 2015

Valsania, M., “Il mercato scommette su Tesla: è la nuova Ford, in Borsa e in strada”, Il Sole 24 Ore, 2017, 4 April

Walton. H., Dajnak, D., Beervers, S., Williams, M., Watkiss, P., Hunt, A., King’s College London report on morality burden of NO2 and PM2,5 in London, 2015

Wells, P., Varma. A., Newman, D., Kay, D., Gibson, G., Beevor, J., Skinner, I., “Governmental regulation impact on producers and consumers: a longitudinal analysis of the European automotive market”, Transp. Res. Part Policy Pract. 47, 28-41, 2013

Witt, U., “Lock-in vs critical masses- industrial change under network externalities”, Int. J. Ind. Organ. 15, 753-773, 1997

WEBSITE REFERENCES

https://www.endurancewarranty.com/learning-center/shoptalk/news/every-automaker-diesel-scandal/

https://www.epa.gov/aboutepa/our-mission-and-what-we-do

https://www.epa.gov/laws-regulations/summary-clean-air-act

https://www.epa.gov/regulations-emissions-vehicles-and-engines/midterm-evaluation-light-duty-vehicle-greenhouse-gas-ghg

https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-greenhouse-gas-emissions-passenger-cars-and

ABSTRACT

Dieselgate scandal is a critical topic to analyze as it gave the way to a series of considerations about the automotive industry.

The scandal began in May 2014, when investigations started thanks to the job of the California Air Resources Board (CARB). Volkswagen diesel models were exposed to an on road test and researchers at West Virginia University measured an excessive level of NOx emissions, about forty times higher than the established US threshold. The results of the investigation in US was that Volkswagen diesel models were forbidden to be sold by a directive of the Environmental Protection Agency (EPA) assisted by the CARB. Volkswagen diesel models were equipped with a deceptive software, which allowed to reduce, during emissions test, the level of NOx released; this passed in a "clear mode" when it identified the car was being tested for emissions. The investigation lead Volkswagen to acknowledge that 5 million branded model were equipped with the illegal software while the remaining 6 million cars were subsidiary branded.

The 11 million vehicles incriminated refer to a number of faulty cars collected worldwide. In US, the EPA revealed that 500.000 Volkswagen diesel models were equipped with the illegal software, a small percentage compared to the rest of the world, and the scandal broke there, not in Europe (the biggest market for Volkswagen).

The following analysis proceeds focusing on the regulatory framework, both in US and Europe.

In US the EPA had an essential role in the scandal. The agency found that several Volkswagen models were equipped with a defective device that cheated on emissions level. In November 2015, the carmaker admitted that an illegal

software affected almost 800.000 of its vehicles worldwide, but EPA demonstrated that these numbers were lower than reality; in fact, only in US they found irregularities in 482.000 vehicles. These results overcame the standards established by the Clean Air Act. EPA's investigation fostered other countries to look at this scandal; all around the world several agencies, politicians and regulators were examining the validity of Volkswagen's emissions testing. The consequence for the company after the emissions scandal was that it had to recall 8.5 million cars in Europe, including 2.4 million in Germany, 1.2 million in the UK, and 500,000 in the US. Furthermore, the company faced a fall in its market share of a third after the scandal began.

EU limits on emission standards are the most inflexible of the world. This rigidity is completely in conflict with the uncertainty of the methods with which emissions are measured. The EU regulatory framework entails different directives listed from Euro 1, the oldest, to Euro 6 (the newest) and, recently, Euro 6 plus. Today, consumption and emission of new cars are homologated with Nedc (new European driving cycle), a test procedure on a kind of "tapis rulant" where there are three cycles: urban, extra-urban and mixed, the most relevant of the procedure. The examiners are private companies designated by EU that implement this practice to analyze the consumption and emissions. Indeed, the cycle allows consuming less fuel than in reality and the result is uncertainty in the real emissions data.

Volkswagen scandal is the consequence of a lax regulatory framework, but also of an anarchical governance embedded in austere leadership style, insular governance culture and nepotism. These three factors surely lead to the scandal born, since they develop fear among employees and consequently lack of communication across the organization hierarchy.

Dieselgate had an impact on multiple dimensions: it lead to economic, political and social consequences. The scandal produced a huge economic damage for Volkswagen; the consistency of economic consequences of this scandal is reported by the fact that after 15 years the car manufacturer announced a quarterly operating loss of about 3.9 billion dollars in the period from July to September 2015. Economic losses were tied with: penalties, costs of the recall campaign and the negative impact on brand image.

The scandal had an impact also on the political side. Volkswagen is a multinational company and it is a source of income for many countries, which have special interests. Dieselgate could lead to a different approach between the company and states because of the new conditions and regulations raised after the scandal.

Dieselgate lead to important social costs. After the scandal broke, it is scheduled a 30.000 employees reduction all over the world and the majority of these cuts are planned in Wolfsburg. Another social consequence, and maybe the most important, is the implicit cost of the health damages.

The following analysis also considers Volkswagen management responsibility in the scandal.

Dieselgate can be considered as a total failure in terms of Corporate Social Responsibility (CSR). Volkswagen applied an illegal strategy to gain an advantage over its competitors that guaranteed it to maintain its leadership into the market. The highest levels of the management chain were surely aware of that behavior and its real consequences - the company was effectively injuring the planet - were far away from the company's CSR mission: "to sell environmentally friendly vehicles". The company needs to reformulate its CSR

practices, reinforcing the power of that department to immediate operate in case of any unethical action: these are the bases to prevent any future fraud.

The responsibility issue concerns also Bosch, the supplier of the illegal software. Volkswagen is not the only company that could be considered responsible for illegal behavior in the scandal. Bosch is responsible, in fact, for many of the components directly involved in the Volkswagen scandal, including the emission control software (the effective component that made the scandal born). Bosch has been under investigation in Europe but no Bosch employee has yet been indicted with wrongdoing. Furthermore, Bosch has recognized that it informed Volkswagen, in a letter in 2007, that the car manufacturer's proposed use of the software provided by Bosch could be illegal and that the company was not responsible for how its components are incorporated into vehicles by clients. After the scandal, a lawsuit was undertook against Bosch, which on February 1, 2017, agreed to pay 327,5 million dollars to consumers in US as compensation for its role in conceiving the illegal software. However, Bosch affirmed that it did not acknowledge the realities as assumed by the plaintiffs, nor admitted any kind of responsibility. It seems that the company had decided to settle the issue in order to clean their role into the scandal and maintain its image toward its clients.

Dieselgate impact on Volkswagen's customers is very important. Several lawsuits were carried out against Volkswagen in US as in Europe and the economic losses are likely to increase for the company. However, the most important consequence is the impact on brand image. Volkswagen concentrates all its efforts in order to gain short-term profits and goals; the company does not care about other issues as the sustainability of the company's brand, its customers and the environment.

Volkswagen planned to sell its defective vehicles labelling them as "clean diesel" automobiles. The company tried to alleviate environmental concern of customers, rather than introduce electric-hybrid vehicles that really solve the ecological issue. The scandal was neither an accident nor an error; it was systematically and technically programmed deception and fraud. After Dieselgate the loss of reputation has been a serious concern for the company, also more important than the huge payments.

It is difficult to evaluate the losses of an immaterial good as reputation because it is difficult to measure them as a regular economic loss. Reputation is a factor that create and destroy value as well as other economic forces, but, more than them, incompetence, although grave, is recoverable, while the lack in sincerity is not. Last reports exhibit that Volkswagen become the world's largest manufacturer, at expenses of Toyota, but the real results have not been shown yet and, as analysts say, this trend is expected to change

Dieselgate is only one of a long series of scandals in automotive industry. Similar cases are: Ford Pinto's scandal (where it was responsible to mortal fires in rear-end accidents), Toyota case (where there was a problem tied with the "sticky pedals") and Honda-Takata airbags scandal. These scandals were handled as Volkswagen is currently doing, through huge payments, but there is an important difference. For instance, Toyota overcomes its losses with a long-standing plan aimed to innovate and at the meantime increase its market share, while Volkswagen has solved its problems merely changing the CEO. Without a clear and longsighted business plan, and keeping the same obsolete corporate culture, the company could meet some difficulties in order to come back as the first carmaker in the world.

Dieselgate had an impact also on Volkswagen's competitors. It affected car manufacturers all over the world for two reasons. First of all, this scandal lead to new measures to adopt in terms of new regulations about emission standards, globally, and this influenced car manufacturer policies not only in the long term but, above all, immediately. The other reason is that, Dieselgate reconsiders the position of Volkswagen into the market. The possible consequences of the scandal on the company move a series of eventualities for its competitors, especially in terms of market shares.

Dieselgate implications are having consequences in market share not only on Volkswagen: other car manufacturers, as well as Peugeot, Renault, Nissan and BMW have seen their market share decreased by 2 to 4 percent since the scandal first started. Furthermore, more attention and new regulations concerning the European automobile industry are likely to become more stringent, and the immediate consequence could be a loss of profits associated with a loss of confidence of customers.

American hybrid and electric car brands, in particular, could and should take advantages of the situation that this scandal brought, such as the need for eco-friendly vehicles.

The Volkswagen scandal lead to new perspectives in the automotive industry and the emission standards regulation. Furthermore, Dieselgate creates an alert system in environmental agencies all over the world, new investigations started and all the automotive industry is under examination.

In 2016, FCA was under investigation for fraud by FBI. The investigation started after that, in December 2015, FCA substantiated the best month of sales in the US and according to latest reports, and those results were considered untrustworthy and inaccurate. Furthermore, at the beginning of 2017 EPA

accused FCA of using software that allowed 100 thousand vehicles, SUV sold from 2014 in US, to exceed emission standards. However, FCA rejected the accusations calling itself "in good standing and ready to collaborate".

In 2016, another investigation started against General Motors about emissions from the Chevy Cruze diesels in the US. As Volkswagen case, also GM was accused that they launched an engine emitting - but hiding - excessive NOx emissions. According to the Seattle based law firm of Hagens Berman Sobol Shapiro, GM's diesel factory used emissions-cheating software just as Volkswagen did, delivering more than allowed NOx to escape the tailpipe. This lawsuit asked GM to pay all Cruze Diesel owners back the $2,000 premium they paid for their cars as well as more for punitive damages.

Another investigation started, in France, against Renault where the implicated sectors were engines approval and control; this investigation is very similar to Volkswagen scandal inquiry.

The Dieselgate scandal itself is the extreme representation of the situation in Europe, where automakers exploit the lack in the regulatory framework to adopt illegal practices, which are becoming "best practices" among automotive companies. The immediate consequence is that the EU ability to enforce emission standards law is going to fail.

To explain this causal chain of events is important to analyze two policy variables and their role in EU's failure to implement real world automotive emissions target:

1) EU Regulatory Design of command and control (CAC) policies arranged in the EU automotive industry, classified as general regulatory instruments.

2) Policy interaction between EU CAC policies and EU member state market based instruments (MBIs), incentivizing, especially, low diesel emissions.

CAC policies are guidelines that compel producers to modify their behavior, although MBIs give financial incentives to private companies and consumers in exchange for changes in their behavior, for example tax reductions, exemptions and bonus payments.

The EU regulatory framework is less rigorous, in terms of respectability, than in the US and Japan regarding NOx emissions and it is the main reason why Europe is the lead market for diesel automobiles and diesel technology development. Moreover, the EU guidelines are more flexible in terms of companies' compliance regarding emission standards and the time horizon for compliance to be met. The regulatory framework shows some faults that create the inefficient system that Dieselgate expressed to the entire world and lax regulation combined with lack of policy interaction have lead to this situation.

Dieselgate shows clearly how automakers have actively exploited the fault in the testing procedures, or the flexibilities, to their sole benefit. Political interests are the main drivers of the lack in policy interaction among EU, and actually the most important reason of national economic incentives.

The preferential conduct towards diesel vehicles, thanks to incentives, such as under taxation, produced a market pull effect and increased their popularity throughout Western Europe. The outcome was that, at EU legal perspective, car-manufacturers produced vehicles expanding real-world emissions gaps. At the national level, there was a huge increase in demand for these kind of vehicles, which created a lock-in effect to a suboptimal technology.

The fault in the regulatory framework pave the way to new eventualities of the regulation.

In Europe the European Parliament has approved the recommendations voted in the first Emis (Emission Measurements in the Automotive Sector) commission, which has examined from autumn (but with insufficient influence) the Dieselgate.

Recommendations mainly require:

3) A quick adoption of the regulations about Real driving emissions (Rde), with the implementation of unpredictable challenges in homologation tests in order to detect illegal devices.
4) That Commission proposes a EU collective complaint system and compensations for car owners

The European Parliament approved the new homologation proposals anti-Dieselgate, they expect:

4) Intensification of on road supervision and that the national authorities will be obliged to verify the previous year almost the 20% of inserted vehicles into the market.
5) Commission would have more power to introduce greater supervision when national authorities do not respect homologation commitments and, in some cases, it can implement itself tests and inspections to the vehicles.
6) Car manufacturers that cheat on test results would be subjected to sanctions until 30.000 euro each vehicle and the consequent earnings will be used for the market monitoring, consumers damaged or for the environment safeguard.

The first solution to adopt in order to change the inefficiencies of the EU legal framework should be immediately solving all flexibilities during future test cycles. To apply this legal procedure, the only obstacle is the member states hesitancy; in fact, as known, some of them have special interests, as shareholdings in their domestic auto companies (i.e. France owns 15,01% of

Renault shares), which could create difficulties in approving such revisions in the regulation.

In US the situation is quite different compared to EU.
EPA and the National Highway Traffic Safety Administration (NHTSA) developed together, in the immediate future: fuel economy standards for light-duty vehicles (in particular trucks and passenger cars) and the national program for greenhouse gas emissions (GHG).
However, if the current situation in Europe is not clear and surely is not in an advanced projection, in US it is precarious. In fact, a wide share of EPA's programs could be under the knife to meet President Donald Trump's budget proposals requirements, as several sources report, and as the designation of Scott Pruitt, as head of EPA, could implicate. Trump's campaign in favor of petrol industries and military enforcement will cause, probably, for EPA, a budget cut of 25%, costing about 3000 jobs loss. This program could hidden EPA's most important and best-known plans, as initiative to improve water and air quality, as well as many regulations aimed to reduce nation's greenhouse emissions (Clean Air Act).

The new warning-sign arisen in US could hinders the important changes that automotive industry needs for improving next generations well-being. US is very influential into European dynamics and this new political ideology, that is spreading in US, could slow down or even stop the possible changes into the regulatory framework even in Europe.

After these considerations regard the new perspectives in the regulatory framework, the analysis continues with the future prospects of Volkswagen and what the company has to think about to rebuild its image and maintain costumers' loyalty.

New regulations about diesel vehicles lead to an increase of production costs for car manufacturers that could affect their plan in the launch of new models.

The new wind is demonstrated by declarations of political figures throughout Europe. In Paris, for instance, the mayor affirmed that within five years diesel vehicles will be banned to reach the programmed green plan of the city. Moreover, in other European countries it has been formalizing the cancellation of incentives for diesel vehicles. The pronouncements emerged from the European Parliament Committee exhibited the agreement to reformulate and improve guidelines on automobile's pollution limit and fines. The statement is important especially concerning the behavior of consumers, they maybe are motivated to buy eco-friendly vehicles, and this is an important aspect to consider in future projection for automobile companies. Volkswagen decided, during its plan to recover its brand image, to concentrate its production efforts toward the development of new technologies. The company opted to renovate its over-used diesel control system for newest models, and in the meantime, focusing on the production of electric and hybrid vehicles.

Dieselgate creates a need to change for Volkswagen and, in order to recover its credibility, during the analysis are proposed some advices for the company, such as: develop Leadership with Emotional Intelligence Flexibility (creating a network with employees through honesty, empathy, tolerance and cooperation), inject Outside Perspectives and monitors (acceptance of external proposals and ideas) and be Aware of a Competency Trap.

Dieselgate creates new opportunities in the automotive industry and the most important car manufacturers in the world have to rethink their business plans. New regulations, but especially changing customer needs and expectations, are driving the growth of electric vehicles into the market, but much of this

excitement can be tracked back to Tesla Motors. Introduction of subsidies to buy electric cars could increase this trend and create a new path to follow.

Those needs to shift toward electric vehicles is also driven by the importance to meet the Paris Agreement's long term goal of keeping the increase in global average temperature below 2°C. The shift towards implementing them appears to be slow going. Last news from G7 reported that US President Donald Trump declared US exclusion from the Paris Agreement and consequently their dismissal from the low greenhouse emissions fulfillment. The statement is important in the argument against illegal behaviors, indeed, it demonstrates as sometimes financial interests make people blind, and negative past-experiences, as Dieselgate, are forgotten, laying the foundation for a future, new scandal.