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Crisis management: Compare study of company restructuralizations in the Tier 2 level of Automotive Industry in the Czech Republic

A Master's Thesis submitted for the degree of
“Master of Business Administration”

supervised by
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11929276

Vienna, 09.10.2022

Affidavit

I, **ING. MAREK SEDLACEK, PHD.**, hereby declare

1. that I am the sole author of the present Master's Thesis, "CRISIS MANAGEMENT: COMPARE STUDY OF COMPANY RESTRUCTURALIZATIONS IN THE TIER 2 LEVEL OF AUTOMOTIVE INDUSTRY IN THE CZECH REPUBLIC", 104 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted the topic of this Master's Thesis or parts of it in any form for assessment as an examination paper, either in Austria or abroad.

Vienna, 09.10.2022

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Signature

Acknowledgement

I am very grateful to my supervisor, Doc. Ing. Ján Lešinský, CSc., for his review, comments and encouraging on this study and thesis project. Than I would like to give many thanks to the companies and managers mentioned in this thesis. Of course, some thankful words I would like to say to my family, friends, my best teachers like Doc. Vladimír Vrecion, Csc., Mgr. Milena Vychodilová, Prof. Ján Košturiak, Prof. Drahomíra Pavelková, companions and inspirational leaders who I try to follow on the way of living.

"Stojím v dešti, v očích pláč,
mé neštěstí, jméno láska má.
Život klížím, nemám pevný bod,
pode mnou propast temná,
není přes ní most.

Kdo se blázen zdá, mou vinou,
tím vším je láska má.
Hvězdy blednou, vstává dům,
já tu smutně stojím za vzor básníkům.

Kdo se blázen zdá, mou vinou,
tím vším je láska má.
Marně bloumám, marně sním,
marně prosím ráno,
které k tobě smí.

Jsem prý blázen jen, jsem prý blázen jen,
jsem prý blázen jen, má-li být po tvém."

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Abstract

The submitted Master thesis solves the problems which appears during this time in Automotive Industry worldwide as consequences of many factors like macroeconomic situation, state debts, rising inflation, pandemic situation and so on. Also some megatrends in Automotive Industry needs to be taken into account as impacts on company performance, existence, survival and potential future development.

One of the main aim of this thesis is to reveal impacts of the global economic situation and megatrends in Automotive Industry especially in the time period from 2019 to 2021 when the new phenomenon like worldwide pandemic situation appeared. These negative influences on the company existence are mostly manageable but during this time period there has been a mix of them and also a lot of additional problems such a customer call offs decrease, raw material shortages, enormous electricity and gas price rising, lack of worker staff and so on. All these influences at the same time have been so negative impacts on the company performance and in some cases the company existence too.

The other aims of this study are focused on company performance and company or management approaches in the analyzed companies.

To find answers for this research the author uses chosen methods like Theoretic – logical methods, some statistical methods like Descriptive statistic methods, Time series analyses, Exploratory data analyses, Regression and correlation analyses etc. Also some controlled discussions is used.

In this study the author tries to create some compare study especially in the Tier 2 level in Automotive Industry to identify most negative factors and to find some factors or similarities in the analysed companies. These common factors and similarities can be helpful for a definition of a universal managerial way in this unpredictable world and unique situation. The result of the study is to find and determinate the general approach and recommendations for the managers which can be helpful to steer the company not only during similar time periods but also generally in all time periods to achieve the goal.

1. INTRODUCTION OF THE RESEARCH

During my professional career I have already met the situation which was partially similar to the situation in which we have been facing during the last years. The first opportunity was during the financial crisis from the time period 2007 – 2009 with a significant impact on Automotive Industry. Some companies, not only from the Tier 2 level, were in serious troubles and on the edge of bankruptcy. For the author that meant the first experience with this kind of external threats and also some kind of interest to find the way how can companies be ready or adjust for going through these unpredictable time periods. The most interesting question is if there are some universal adjustments or rules which can be followed. To be able to answer this question many things have to be done not only in companies but also in knowledge, behaviour and minds of managers and leaders. That was also for the author the motivation to attend the MBA Automotive Industry program while working in the company MONTIX, a.s. because the company was established in 2012 after the financial crisis. The company performance had a decreased trend in each measures from 2019 and author felt that the situation could have been worse if the external conditions had brought problems like market decrease, financial issues etc. During the time some issues came and one of that was completely new, pandemic situation. This brought a lot of consequences and impacts not only on companies but also on economy as a system.

From this point of view the motivation of the author is not the pure crisis management but to find the right way how to prepare, steer and manage companies. How to do crisis management without crises, being ready or proactive than reactive. On the other hand the owners of the company MONTIX, a.s. were not able to find the way and solve the problems and the company had to be sold. To avoid this kind of failure in the future the author would like to find the way and being motivated not to repeat the same mistakes again. If there are some universal rules of company adjustment to be followed, this Master thesis can help to bring them on the table. That's the highest authors´ personal motivation.

1.1. The main objectives of the research

Company adjustment and preparation for unpredictable situations especially external situations plays most important role for survival during the crisis period and potential future success. It has the highest impact on the company profit and has huge influence for the satisfaction of stakeholders and shareholders too. The main objectives of the master thesis are to analyse the most interesting impacts of the global economic situations on companies, to reveal megatrends in Automotive Industry (AI) which change the industry itself, than to make a compare study between some companies from the Tier 2 level and based on that to define or recommend some common managerial ways which can bring some success into companies life. All these things can be done also without the crisis or before the crisis comes and can be helpful to avoid some drastic or quick cost saving actions which could be understood in a negative way. Being able to find these useful risk elimination steps or actions and help companies being ready for the future.

The Mater Thesis, according the authorś opinion on this kind of situation, should help to analyse and identify some macroeconomic situations and also some impacts including the Covid 19 pandemic situation on companies in the Automotive Industry even if the industry itself.

The author pays his special attention to companies from the Tier 2 level (sub-suppliers) which some analysis are planned and then made. There should be found some crisis or potentially dangerous similarities for the future existence. Also there can be some recovery similarities which should be transferred into the general recommendations.

The main research questions (RQ) are:

1. Has been the Automotive Industry (AI) influenced with the global economic situation?

2. Are there any relationships between basic economic indicators and Automotive Industry indicators?

3. If there are some crisis similarities are there also some recovery similarities in companies in AI at the level Tier 2?

4. Are there universal recommendations for recovering the companies, managing them and being prepared for the future?

These Research questions were defined to help the author with finding the right way of the research and focus on the main topics and prepare the right direction for being able to confirm or refute the hypothesis.

1.2. Hypothesis

Author expects that the results getting from the research based on the TLM (Theoretic – logical method), statistic research (Descriptive statistics, Time frame analyses etc.) and also based on direct discussions and interview with the managers and experts bring enough knowledge to confirm or refute these hypothesis:

H1: It is expected that the AI has been significantly and negatively influenced during the defined time period.

H2: It is expected that in the course of the defined time period 2019 – 2021 there have been significant production volume, performance and profit decrease in AI and each of analysed companies.

H3: It is expected that there are some symptom similarities between unsuccessful companies which have the highest profit decrease during the defined time period.

1.3. Aims and structure of the thesis

As was already described the thesis has its own main objectives, research questions and hypothesis. Also there are the partial aims which could develop the main ones e.g.:

description of the market economy and its crisis potential, to compare companies starting point before the current situation or crisis, to make a comparison between management approaches and chosen methods for solving the situation internally in the companies etc.

The structure of the thesis should bring a clear view into the problem via literature study and information sources recherche, bringing current or up to date information. Than also the description of the research problem, main aims and hypothesis, working and research methods description, own research procedures, presentation of the results, suggestions and recommendations. After that conclusion and critical discussion in the last chapter.

1.4. Short summary of the Chapter 1

In this Chapter 1 the author introduced his own or personal motivation for the MBA study, for making this choice of the Master thesis topic and also for the research of this kind. Further the main objectives of the research were introduced and described by the author.

In the second part of this chapter 1 the author tried to define the main research questions which can support and let to the next steps of the research.

Hypothesis definition was done too and the author would like to confirm or refute in total three hypothesis.

One of the most important parts of the Master thesis is the aims and alsou structure of the Master thesis. That was discussed too and the author respects the standard Master thesis structure which was defined by TU.

Due to a relatively wide defined problem it is needed, from the author perspective, to go ahead with some defined successive steps from the general to the specific. Which means in practise from the macroeconomic point of view across the Automotive Industry sector to the company existence and performance to fulfill the research aims.

2. STATUS OF KNOWLEDGE AND COGNITION

In this part of the Master thesis the author tries to introduce thoughts and knowledge of the authors and researchers who inspired and influenced him and his view on the research topics even if on the current economic situation too. At the same time the author would like to make an information sorting, critical literature study or recherche. This is done step by step with the analytical successive approach from the whole to the individual parts. The successive steps mean that the author tries do describe the most general knowledge of existence, their continuity and projection into the microstructure of the market economy with its tends to crisis. Than also a short excursion into the Automotive Industry sector. For being able to evaluate and compare some companies and their performance the author describes some Key Result and Key Performance Indicators and also some hierarchical systems for company performance measurement. Modern knowledge and approaches from the Strategical management are described and introduced too.

These above mentioned areas make a theoretical backround for the next steps of the Master thesis and they are some support for the analytical and research part of the work and than for the critical discussion too.

2.1. Basic principles of the objective reality

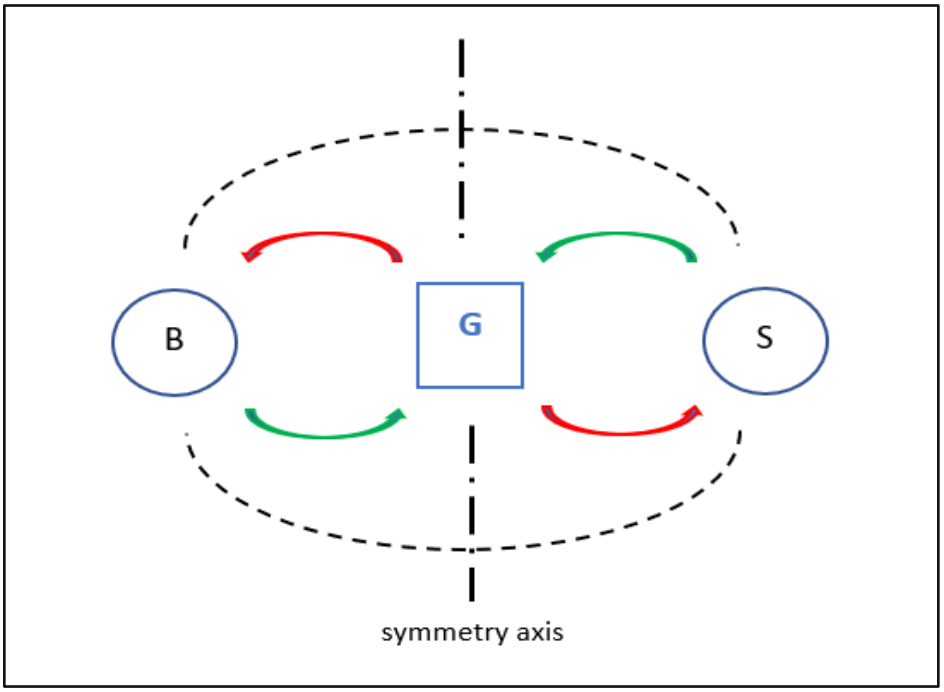
Todayś economic and social situation can be seen as a certain period of time which logically implies from the historical development of the objective reality, society and its existed social-economic relationships. The situation is not alone or existing by random but the situation and its own existence can be predictable if our level of knowledge is able to calculate any causes and consequences. To be able to see and understand what has happened in the society and economy there is only one way how to get it. The way is small successive steps of knowledge improvement with of course some limitations. As Vrecion defines “economy and its own functioning is in a close relationship with the total level of

society, with its political system, organization, state functioning and with the power of law" (Vrecion 2008: 4).

2.2. Dynamic balance of the market economy

Market economy (ME) has a visual model which characterizes and formalizes its status of dynamic balance which means a polar symmetry based on the rule of free exchange on the free market. This polar symmetry relationship between a buyer and a purchaser can be named as the microstructure of market economy, its first fundamental relationship.

FIGURE 1: MARKET ECONOMY MICROSTRUCTURE



Zdroj: (Vrecion, 2008)

Based on this polar symmetry relationship between a buyer (B) and a seller (S) all the circumstancies can be visible: the buyer (B) and the seller (S) are forced with the interest of the goods (G) especially about its sales or purchase and at the same time there is an opposite force concerning the price of the goods (G). The buyer (B) would like to buy the

goods (G) from the seller (S) in as much as possible quantity with the interest to pay as lowest as possible price for the goods (G). The seller (S) on the other side would like to sell the goods (G) to the buyer (B) in the smallest quantity with the highest price as possible. The balance can be achieved only as a general agreement on the price. Than can be said that the symmetry exchange is concretized. This is an automatic balance achievement without any needed outside forces or supports. This rule and procedure we can call as "Invisible hand of market" based on cooperation of free. That means in the end profit for both sides of the transaction and profit for society as usual. The is the basic rule how the wealth of nation exists and grows.

"Free market and free exchange is the only one where both sides of the transaction realize additional value, benefit or profit. Another kind of transaction or exchange is not free" (Zelený 2011: 225). If these basic conditions are not fulfilled that means the free market is destroyed via external forces focused mostly on one side of the relationship like government support, EU support etc., the symmetry or dynamic balance can´t be achieved. The implications of the disbalanced status imply other disparities and problems. The same opinion is written also by other authors e.g. "The deformation of the free market decision makes successive steps to the collapse of the whole market economy system" (Friedman 1992: 87) and "The basis of the free market relationships depends on the rule of value" (Smith 2001: 331).

To see todays consequencies in the economy worldwide we can say that the financial system which is a derivation of economic system is on the edge of collapse. Doing a few steps backward and analyze the situation on the market via these market economy microstructure we can find some basic facts which can indicate potential future problems. These problems have been raised also by the unexpected pandemic situation with Covid 19, government restrictions all around the world, lack of raw materials, components, destroyed supply chains etc. In total that means that the period 2019 – 2022 is much more worse than the last global financial crisis period 2007 – 2009 was. The current time period is a huge mix of causes, according the author thinking, on main three parts of the economy: a) finance (cheap money, low or negative interest rates, huge state debts), b) goods and materials (lack of the components, semi-conductors, raw material etc.) and at the end c)

human beings (pandemic situation, pollution, population growth, migration, living standard etc.).

2.3. The role of the state in the market economy

"State is the specific political form of organization which disposes a public authorities on a defined area and it is able even if with the usage of violence to enforce establishing, forming and operating some specific social society rules" (Vrecion 2006: 11). "State or government is the form of voluntarily kind of cooperation of citizen society which exists for securing of general interests of individuals" (Friedman 2002: 69). According (Vrecion, 2008a) the basic state topic are:

1. Protection individuals and groups from an unauthorized compulsion
2. Protection against monopolization and value destruction
3. Basic finance regulation especially cash and its equivalence and interest rate.

The role of the state in the market economy is only supporting in necessary things. The state can´t be the main player in economic activity between the individuals due to its internal immanent problems.

I´m afraid that this basic rules have been permanently crossed not only from the state point of view but from the transnational organization like EU too. The role of Invisible hand of market cańt be effectively fulfilled. Some limits, bans, regulations etc. are focused only on one side of the economy microstructure. There are two entities which we need to distinguish according (Zelený, 2011):

a) market regulations

b) market interventions.

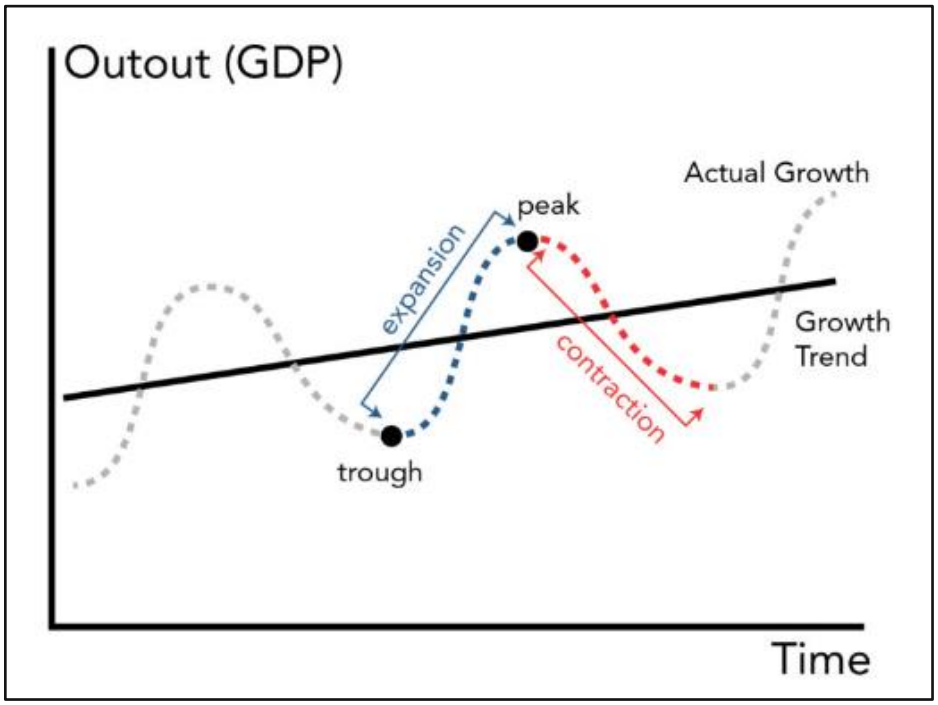
Where market interventions are the most critical interruptions into the free market balance and privilege one before the others.

2.4. Economic crisis as a standard economical phenomenon

"The business cycle, also known as the economic cycle or trade cycle, is the downward and upward movement of gross domestic product (GDP) around its long-term growth trend. The length of a business cycle is the period of time containing a single boom and contraction in sequence. These fluctuations typically involve shifts over time between periods of relatively rapid economic growth (expansions or booms) and periods of relative stagnation or decline, contractions or recessions" (HKT Research 2020).

"Business cycles are usually measured by considering the growth rate of real gross domestic product. Despite the often-applied term cycles, these fluctuations in economic activity do not exhibit uniform or predictable periodicity. The common or popular usage boom-and-bust cycle refers to fluctuations in which the expansion is rapid and the contraction severe" (HKT Research 2020).

FIGURE 2: STANDARD ECONOMIC CYCLE



Source: (www.lumenlearning.com, 2020)

According (Zelený, 2011) the crisis can be perceived in a positive way too because it has its own "cleaning" effect for the whole economy, relieves noneffectivities from the economy and, of course, brings a space for some new ideas, companies, systems and people. (Kislingerová, 2010) says, that the real sources of the crises can be mostly found in the state actions, exchange rate supports, fiscal indiscipline and others. During the last decades there has been a permanent financial crisis from the US bank crisis (1980 – 1995), Chile financial crisis (1981 – 1985), Latina debt crisis (1982 – 1089), Japanesse finance crisis (1989 – 2004), EU convergency crisis (1992 – 1993), etc. till the Global finance crisis (2007 – 2010) as was mentioned by (Sedláček, 2013).

Based on mentioned facts only a few, almost nobody, can predict the crisis which came in the 2019 and is connected later with the pandemic situation, restrictions and impacts. Automotive Industry has been negatively influenced as a sector. Many car producers have lost their sales, volume etc. After the strongest pandemic years 2020, 2021 the next crises came: finance, connected with the inflation and maybe with the stagflation too and from 2022 the Russian special operation on Ukraine started.

2.5. Systems for competitiveness measurement of national states

For the localization of companies exist, except internal factors or strategic reasons, also external factors. These factors have a huge impact on the future performance. That means each company is certainly influenced by the external facts. That can be market as "competitiveness of the economy". For this Master thesis author would like only shortly to introduce some of these systems for better understanding the differences between some countries and economies. The best known systems are:

1. World Competiveness Yearbook (WCY) done by International Institute for Management Development (IMD),
2. Global Competitiveness Report (GCR) done by World Economic Forum (WEF),

3. Business Cycles and Growth Rate Cycle Chronologies done by The Economic Cycle Research Institute (ECRI),

4. Freedom in the World done by The Freedom House Foundation,

5. Economic Freedom of the World done by The Fraser Institute,

and some others. E.g. The Fraser Institute defines five areas of research and comparison: 1. Size of Government, 2. Legal System and Property Rights, 3. Sound Money, 4. Freedom to Trade Internationally, 5. Regulation. The final index is done with 24 main components. In total there are 42 indicators in the intervals between 1 to 10. Milton Friedman was a ambassador of this index during his time era. The index is created based on the Friedrich August von Hayekś and Douglas Northś studies.

Thee author just mentioned these indexes and reports for better understanding of this field. In the Master thesis further the author would like to use separate indicators like Gross Domestic Products, Inflation, Household Consumption etc. for revealing the status of the macroecnomic surrounding. The macroeconomic situation is one of the most influencing factor not only for the Automotive Industry but also for a company existence.

2.6. Automotive Industry – sector production situation in Europe

For the Master thesis and especially for better understanding of the situation in analyzed companies is needed to have a short view inside the Automotive Industry (AI) during the time period 2019 – 2022. Not even in the worldwide perspective but also focused on the chosen and most influenced territory, the Czech Republic.

In the Master thesis the author uses some independent information sources. The primary information sources are the data from the analyzed companies. The secondary data is the data from some reports like The Automobile Industry Pocket Guide done by ACEA, EU Economic Report, Report done by The Automotive Industry Association – Auto SAP CZ, Helgi Library Reports and statistics, OICA Statistics and so on.

The Master thesis and its chosen companies from the Tier 2 level are located in the Czech Republic. That means, their production orientation (especially plastic parts and sub-groups for lighting) is influenced mostly by the the Tier 1 supplier from the Czech Republic (Hella Autotechnik Nova, Varroc Lighting System, Automotive Lighting, Koito Czech, ZKW). Others Tier 1 like Mahle, Siemens, Magna, etc. create just a small part in their customer portfolio. From this point of view the most analyses are devoted to the European AI and chosen production locations at main countries and European car producers located on these countries.

From the historical perspective there has been a continual decrease of car production in Europe in pcs.

TABLE 1: VEHICLE PRODUCTION BY REGION 2019 - 2021

UNITS	YTD 2019	YTD 2020	YTD 2021	VARIATION 2021/2019	VARIATION 2021/2020
ALL VEHICLES	Q1-Q4	Q1-Q4	Q1-Q4		
EUROPE	21 575 118	16 942 248	16 330 509	-24%	-4%
EUROPEAN UNION 27 countries + UK	18 002 188	13 797 533	13 092 506	-27%	-5%
EUROPEAN UNION 15 countries + UK	13 622 777	10 210 084	9 630 799	-29%	-6%

Source: (OICA, 2021)

Concerning chosen countries, where the car manufacturers are located, the situation is very similar.

TABLE 2: VEHICLE PRODUCTION BY CHOSEN REGIONS 2019 - 2021

UNITS	YTD 2019	YTD 2020	YTD 2021	VARIATION 2021/2019	VARIATION 2021/2020
ALL VEHICLES	Q1-Q4	Q1-Q4	Q1-Q4		
FRANCE, cars and LCV only	2 175 350	1 316 371	1 351 308	-38%	3%
GERMANY, cars and LCV only	4 947 316	3 742 570	3 308 692	-33%	-12%
ITALY	915 291	777 057	795 856	-13%	2%
SPAIN	2 822 632	2 268 185	2 098 133	-26%	-8%
UNITED KINGDOM	1 381 405	987 044	932 488	-33%	-6%
CZECH REPUBLIC	1 433 961	1 159 151	1 111 432	-23%	-4%
POLAND	649 864	451 382	439 421	-32%	-3%
SLOVAKIA	1 107 902	990 598	1 000 000	-10%	1%

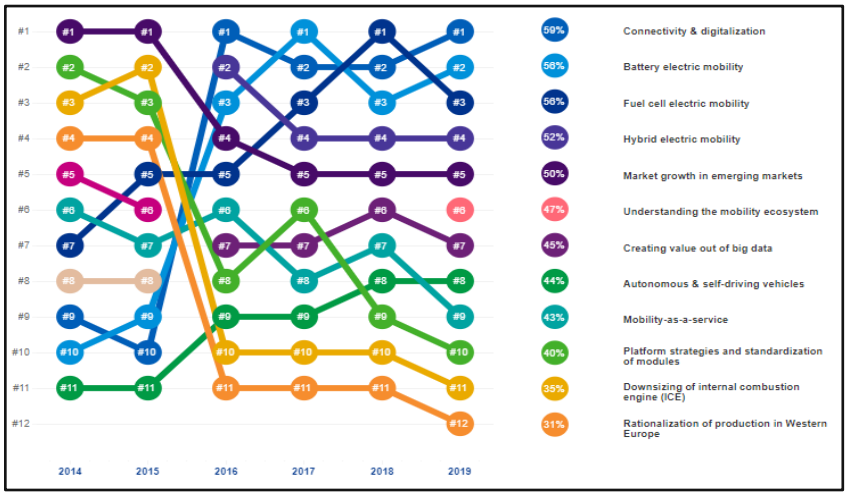
Source: (OICA, 2021)

Further in the Master thesis additional analyses are done. The first mentioned overviews above into the situation in AI production can bring the first insight into this sector. According the authorś opinion this inside view is needed because of the analyzed companies production programs, main customers and orientation into Automotive Industry. The AI sector status has the biggest impact on the company performance, sales, profit and internal actions. In total the author would like to mention that the AI sector is not separated and cańt exist without external impacts or conditions from macroeconomy point of view. If the macroeconomy reflects the status of society itself than e.g. the pandemic situation and restrictions for standard social relationships in society means in the end also some consequences and limits in the AI sector, companies and individuals.

2.7. Key and megatrends in Automotive Industry

“We surveyed executives not on key trends for 2025, but for 2030. The results show that the trends connectivity and digitalization, battery electric vehicles and fuel cell electric vehicles are the overarching key trends across all regional clusters and stakeholders in 2030.” (www.automotive-institute.kpmg.de, 2019).

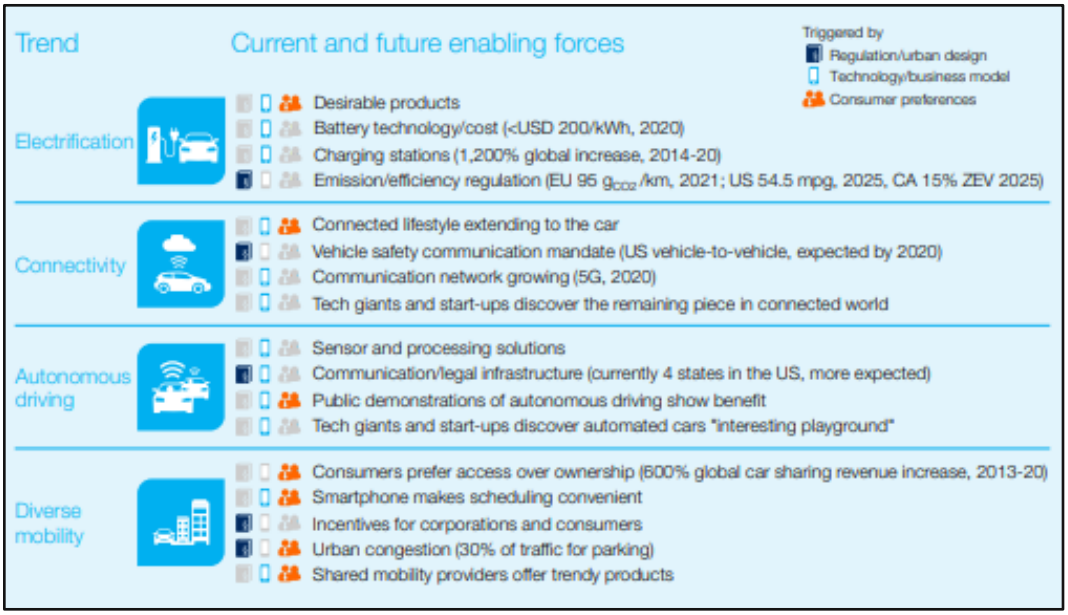
FIGURE 3: KEY TRENDS IN AI - KPMG SURVEY



Source: (www.automotive-institute.kpmg.de, 2019)

Today's economies are dramatically changing, triggered by development in emerging markets, the accelerated rise of new technologies, sustainability policies, and changing consumer preferences around ownership. Digitization, increasing automation, and new business models have revolutionized other industries, and automotive will be no exception. These forces are giving rise to four disruptive technology-driven trends in the automotive sector: **diverse mobility, autonomous driving, electrification, and connectivity"** (Kaas, Mohr, Wee & Gao**,** 2020).

FIGURE 4: KEY TRENDS AND FUTURE ENABLING FORCES

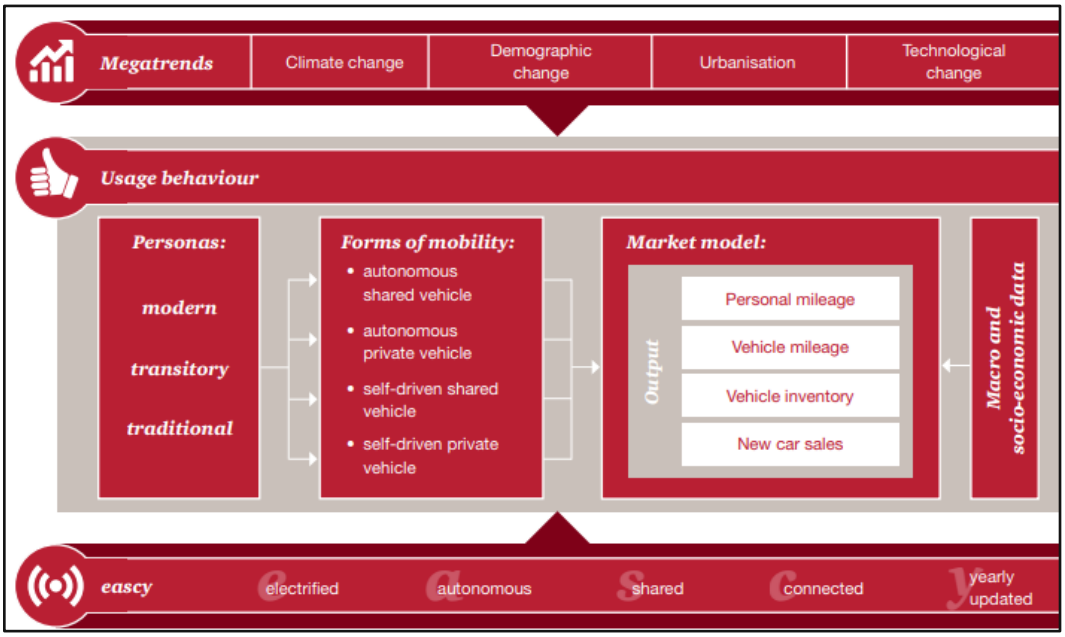


Source: (McKinsey&Company, 2020)

"The car of the future is **electrified**, **autonomous**, **shared**, **connected** and **yearly updated** – or "eascy" for short: It will emit less exhaust fumes and noise into its environment because it is electric. That means:

- It will take up less personal time and space because it moves autonomously.
- It will be more accessible because users will not need a driving licence to use it.
- It will be more affordable because it will no longer have to be bought outright but can instead be paid for in small amounts per use" (www.pwc.com, 2021)

FIGURE 5: MODEL OF THE TRANSFORMATION OF THE AI



Source: (www.pwc.com, 2019)

To above mentioned Key and megatrends from the the authorities like PWC or McKinsey&Company should be also added some expected megatrends defined by Prof. W. Sihn and Frauhofer Austria: **Globalization/Glocalization**, **Digitization**, **Connected Car**, **Big Data**, **Demographical Change**, **Industry 4.0**, **New Work**, **3D-Printing**.

For the companies, especially in Tier 2 level in Automotive Industry, its so important to follow the Key and megatrends to stay in business and to be successful in business. To find the common main trend sis very simple. On the other hand all above and previous mentioned facts e.g. in macroeconomics, in the automotive sector and also the key or mega trends influence the company status, performance, future and existence a lot. The problém during the last years has been that everything has come in a mix, at the same time and the completely new pandemic situation from 2020/21 has made all the changes more quicker and deeper.This kind of mix of the external situations, sector changes, customer preferences has brought for the companies very unstable conditions. Without an appropriate internal adjustment and change acceptance thinking won´t be easy for them to exist further in a long term perspective.

2.8. Strategic management and company performance

The years of 2019 – 2022 in the world history will be primarily connected with the entrance and marks of some crisis (pandemic, financial, material), secondarily with its expansion in the form of worldwide economic recession and with declining activity of most economic subjects (states, companies, consumers, etc.) in the real economies. Various recession marks with different intensity have influenced the present and also the company future. This kind of knowledge would bring a new view on firm strategic thinking, planning and decision making.

"Standard concept of company or concern strategies is possible to be defined as the ability of the company to reach its aims, its readiness to the future and company ability to face future world conditions" (Porter 2008: 6).

"Strategic management in a business refers to the planning, management, utilization of resources to define and achieve objectives efficiently. It also includes a review of internal processes and external factors impacting the business. Formulating and implementing strategies allow a company to proceed with its action plan" (www.wallstreetmojo.com, 2021).

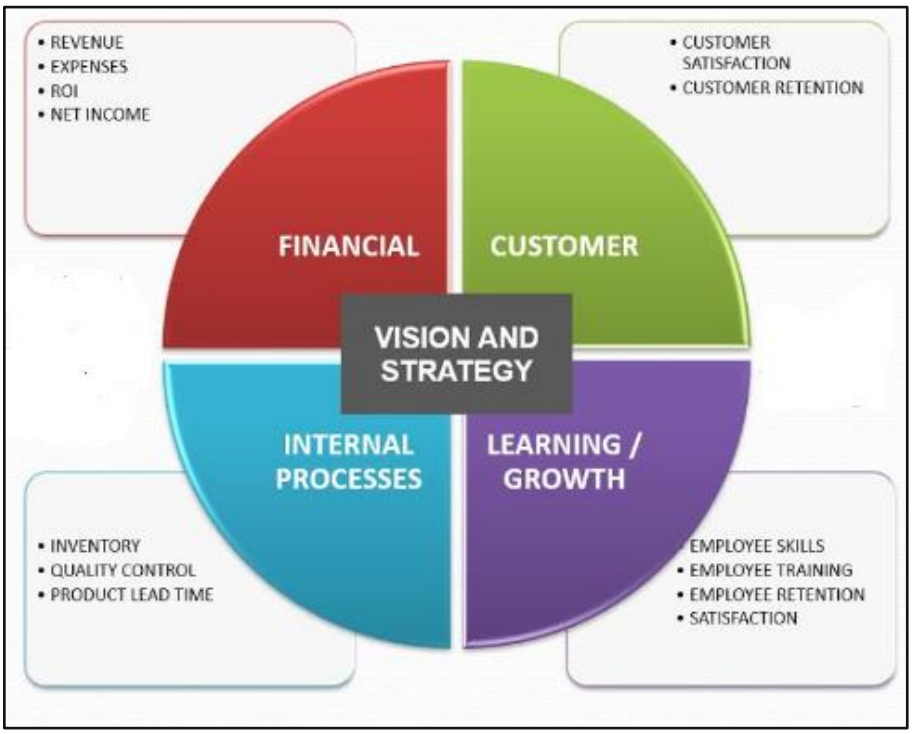
There are a lot of similar definition of Strategic management. It is not efficient to try to get all of them, for the basic and simple understanding in this Master thesis the previously mentioned are completely useful. The Strategic management theory recognizes a lot of various approaches to strategy definition and implementation.

In this Master thesis the author would like to mention the basic three methods: a) Standard strategy definition (vision/mission/strategy), b) BSC – Balanced Scorecard by Kaplan, Norton, c) ZIPF model by Zelený, Košturiak.

"Determination and accomplishment of strategies in most companies are observed by means of so called RI or KPI – Result Indicators or Key Performance Indicators and so called Strategic Gap Analysis (SGA)" (Vernimmen 2009: 58). Company RI/KPI are usually set internally. Among used and in this Master thesis analysed company RI/KPI

belong for example Earnings Before Interest and Taxes (EBIT), Sales (S), Gross Inventory (GI), Gross Margin (GM) and others. The areas of strategy, controlling and planning is also changing. That is why it is not possible to understand the strategy only internally on the level of the company. It is required to observe the fulfilment and update in the relationship to external i.e. economic, social, sector and company surrounding. Also customer preferences need to be counted.

FIGURE 6: BALANCED SCORECARD MODEL



Source: (Kaplan & Norton, 2002)

2.9. Crisis management

"Crisis management is the process by which an organization deals with a disruptive and unexpected event that threatens to harm the organization or its stakeholders" (Bundy, Pfarrer, Short & Coombs 2017: 161). Three elements are common to a crisis: (a) a threat

to the organization, (b) the element of surprise, and (c) a short decision time. That means all three elements can characterize the time period 2019 – 2022, because the events which have came fulfilled all these elements not only one but repeatedly.

According (www.wikipedia.org, 2020) for business recovery, when a crisis hits, organizations or companies must be able to carry on with their business in the midst of the crisis while simultaneously planning for how they will recover from the damage the crisis caused. Crisis handlers not only engage in continuity planning (determining the people, financial, and technology resources needed to keep the organization running), but will also actively pursue organizational resilience.

For the Research questions 3. (If there are some crisis similarities are there also some recovery similarities?) and 4. (Are there universal recommendations for recovering the companies, managing them and being prepared for the future?) the basic ideas of the Crisis management can bring some inspiration or answers.

2.10. Short summary of the Chapter 2

In the Chapter 2 the current status of knowledge and cognition was described by the author from general to detailed. The author tried to describe and bring a short excurse into the basic principles of the objective reality from which all the followings arise. Can be seem like unusual way of starting point, but needed for the whole or complet understanding. Than the role of the state in the market economy was described, its dynamic balance and some crisis internal (immanent) potential. Also the author could understand the crisis as a chance for the economy, not only a way how to destroy existing. A short excurse was done into the Automotive Industry sector focused on Eurepe and biggest production countries and only total numbers. From that its visible all the falls during the time period 2019 – 2021. The falls could have been also effected with the mentioned key trends and megatrends. The basic view was done into the strategic management and crisis management too because the situation, production decrease, macroeconomic situation and especially gas and electricity is worth to mentioning.

3. THE METHODICAL APPROACH AND METHODS

To understand the science theory of research is needed to start with ontology as the universal doctrine and than to continue with the gnoseology and its more usable procedures for the science research. Methodology is the science of research methods and the most universal method is logic systematic method, mathematics and cybernetics. In the Master thesis are used the methods which can help to understand the market economy behavior, to reveal the causes of crisis and to enable insights into the Automotive Industry and also into company daily operation.

3.1. Methods and scientific approaches

The method is a defined procedure to the objective achievement. The scientific method than a group of intellectual and theoretic logical steps how to solve some kind of problem. Most of the authors and scientific authorities recognize:

a) qualitative research analysis
b) quantitative research analysis

Most of the authors and scientists prefer both methodological ways due to the fact that each of the method has its own advantages and disadvantages. Combination is the solution.

Qualitative analysis means e.g. literature, recherche, scientific contributions study, etc. Information gathered with this method is very detailed, very comprehensive and allows external observers to look to organizational culture. Types of qualitative methods, except the above mentioned, e.g. observation, deep discussion, facilitated discussion, interview etc. A disadvantage of this method is, that is time spending and it is not comparable between different companies. In the Master thesis practical part managers of the analysed companies were asked to read some steps of crisis plan being ready for discussion if it is useful or not for their companies. That was only partially successful.

Quantitative analysis means e.g. some statistics, annual reports, databases etc. This type of research is based on quantitative occurrence of several characters which are collected before the own research itself. Disadvantage of this analysis is that the data are picked not good, the answers or findings will not describe and answer the research question enough. On the other hand advantage of this method is the time saving data collection and easier evaluation possibilities. The other way of this analysis can be e.g. questionnaire.

In the Master thesis the author uses these basic methods and approaches too:

1. Deduction – the procedure when from the well known facts are new facts deduced in a logical way only,
2. Induction – from the empiric facts are new general facts deduced via probability deduction procedures,
3. Analysis – a kind of practical distribution the observed object from the whole to the separated parts,
4. Synthesis – from the separated parts to the whole procedure,
5. Static approach – used for research in a concrete moment in time,
6. Dynamic approach – contrary on static, comparison sequence and development during the time.

From the statistics point of view author in this Master thesis uses basic statistical calculations and methods. Between the basic can be involved: Growth Rate, Simple Moving Average, Correlation and Regression Analysis and others.

As was already mentioned the author also uses the general methodical approach which is named **Theoretical – logical method (TLM)**, especially for finding the most basic social relationship which historically existed as first in the phenomenon.

All above mentioned methods and methodical approaches could bring, according the author opinion, the requested results of this Master thesis. In the same time they respect the options or possibilities for this kind of research.

3.2. Procedure of the Master thesis proceesing

The complex activities leading to the Master thesis processing the author devided into a few logical successive steps which create the basic structure of the thesis:

1. Introduction.
2. Critical literature recherche and information source analysis.
3. Definition of primary and secondary aims of the thesis.
4. Analyses and result presentation.
5. Hypothesis verification.
6. Benefit evaluation for theory and practise.
7. Conclusion and critical discussion.
8. Executive summary.

3.3. Short summary of the Chapter 3

In the Chapter 3 the author mentioned the Methodical approach and chosen methods which were used in the Master thesis with a short description and explanation. Also the approaches and qualitative and quantitative kind of research analysis were described. In the end of this chapter the author pointed out the basic statistic methods like Growth Rate, Time series analysis, Simple Moving Average, Correlation and Regression Analysis and others. The last part is devoted to the procedure of creation of the Master thesis that introduced the Master thesis proceesing in some successive steps that made them as a logical procedure that leads to the results and the Master thesis main and secondary aims or targets fulfillment.

4. OWN RESEARCH AND ANALYSES FOR THE THESIS

In this part of the Master thesis the author serves results of the analyses. The results of the research are requested to devide into a few parts. In the first part the results, just mentioned, from the analysis of the political and economic freedom, then some basic macroanalyses for better understanding of the surroundings of Automotive Industry sector and its basics.

In the second parts there some analysis of the Automotive Industry itself where the author tries to reply the research questions and clarify the hypothesis. Then, if found or existed, common recommendations based on the findigs and results will be defined.

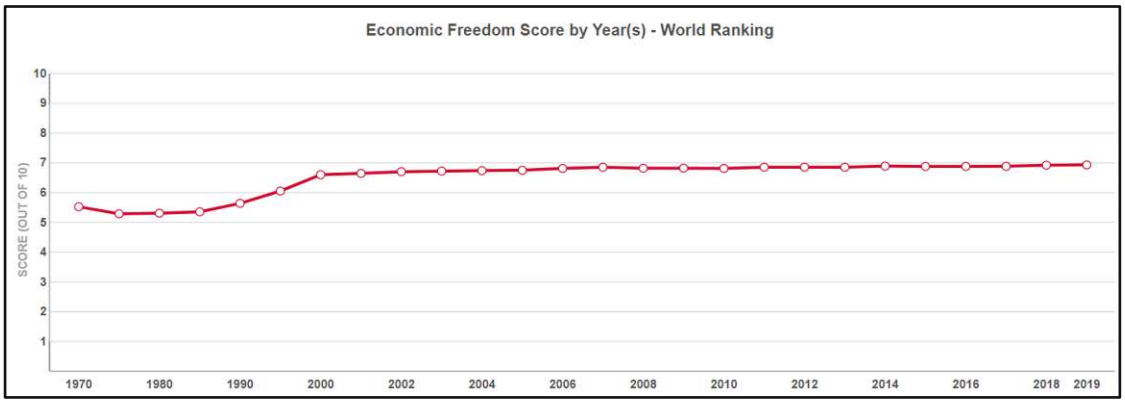
4.1. Economic freedom of the chosen countries (EU, markets, productions)

The cornerstones of economic freedom are (1) personal choice, (2) voluntary exchange coordinated by markets, (3) freedom to enter and compete in markets, and (4) protection of persons and their property from aggression by others. Individuals have economic freedom when property they acquire without the use of force, fraud, or theft is protected from physical invasions by others and they are free to use, exchange, or give their property as long as their actions do not violate the identical rights of others. Individuals are free to choose, trade, and cooperate with others, and compete as they see fit.

In an economically free society, the primary role of government is to protect individuals and their property from aggression by others. The EFW index from Fraser Institute, which was chosen by the author, is designed to measure the extent to which the institutions and policies of a nation are consistent with this protective function and the freedom of individuals to make their own economic decisions. Put another way, the EFW measure is an effort to identify how closely the institutions and policies of a country correspond with a limited government ideal, where the government protects property rights. According the author, that shows where the main markets and production economies are.

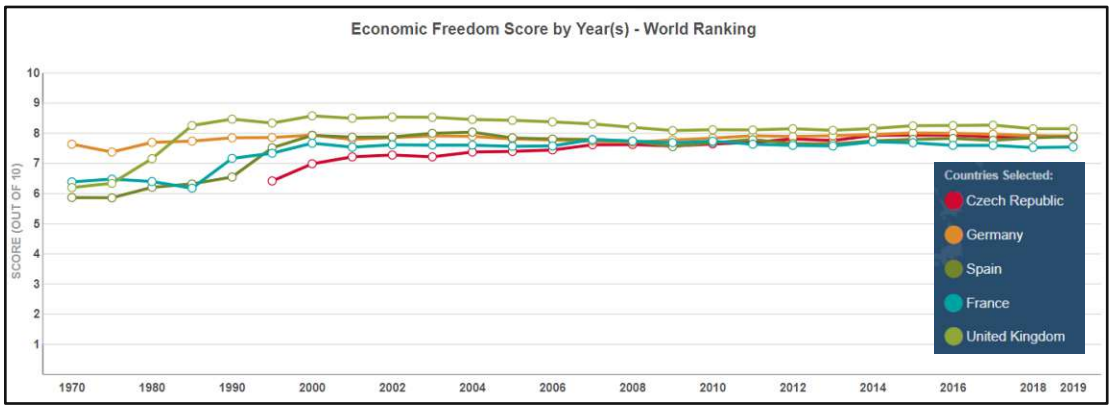
The data are available till 2019, before the pandemic situation and a significant drop of the economic activity in 2020 with the highest production and sell decrease on the Automotive Industy sector, markets, producers, Tier 1 and Tier 2 too.

FIGURE 7: ECONOMIC FREEDOM SCORE (EFS) – WORLD RANKING



Source: (www.fraserinstitute.org, 2022)

FIGURE 8: EFS OF THE CHOSEN ECONOMIES IN EU



Source: (www.fraserinstitute.org, 2022)

To understand where the chosen economies or markets are (esp. Germany, France, Spain, UK, Czech republic, Italy, Slovakia, Poland) and especially which condition for the located automotive producers have the author used the Fraser Institute score. The score is calculated based on statistical data and respondent opinions. The value of the score is in an interval <0; 10>. The higher, the better level of economic freedom.

TABLE 3: THE ECONOMIC FREEDOM SCORE 2014 - 2020

The Economic freedom score - Fraser Institute 2014 - 2020													
Country	2014	2015	2016	2017	2018	2019	2020	Status 14 - 20	ø	MAX	MIN	R	Trend
Czech Republic	7,93	7,94	7,94	7,88	7,91	7,87	7,86	-0,07	7,90	7,94	7,86	0,08	↓
Germany	7,96	8,01	8	7,97	7,92	7,91	7,9	-0,06	7,95	8,01	7,9	0,11	↓
France	7,72	7,69	7,6	7,6	7,53	7,55	7,5	-0,22	7,60	7,72	7,5	0,22	↓
Italy	7,67	7,7	7,64	7,61	7,61	7,61	7,61	-0,06	7,64	7,7	7,61	0,09	↓
Poland	7,54	7,52	7,38	7,49	7,09	7,2	7,2	-0,34	7,35	7,54	7,09	0,45	↓
Slovakia	7,7	7,54	7,62	7,61	7,61	7,61	7,61	-0,09	7,61	7,7	7,54	0,16	↓
Spain	7,75	7,8	7,83	7,77	7,85	6,42	6,43	-1,32	7,41	7,85	6,42	1,43	↓
Unitred Kingdom	8,16	8,25	8,26	8,21	8,15	8,15	8,16	0	8,19	8,26	8,15	0,11	→

Source: (own preparation)

The author focused on the markets and economies which are most relevant to the car producers and especially to the firms from the Tier 2 level which are analyzed further. The most interesting finding which can be released is that the score, except United Kingdom (stable trend) has decerased trend. Most decrease in Economic freedom could be seen in Spain (- 1,32), Poland (- 0,34) and France (- 0,22). Max decrease realized Spain. The other economies have decreased continually but not so much significant.

From the Automotive Industry point of view the author expects that the markets are stable but due to decrease trends can´t be for the AI emerging markets in the next years. Also these stable situation the author expects that in the next years there will be some problems in the economies concerning the debts ration, increase of the salaries, working staff costs and also some troubles concerning knowledge and technical skills. If there are some critical situations e.g. pandemic restrictions that means these countries or economies will be influenced more because the central governments are limited due to the some effective (short term) countermeasures.

The highest score of the economic freedom based on the Fraser institute have: Hong Kong (8,91), Singapore (8,81), New Zealand (8,56) and Schwitzerland (8,48). The lowest score: Venezuela (2,83), Libya (4,19), Algeria (4,90) and Zimbabwe (4,94).

In comparison with e.g. Index of economic freedom done by The Heritage Foundation org. the results are very similar. From the point of view of economic surrounding stability the main territories and markets for Tier 2 companies can be secured and stable.

4.2. Business cycle analysis of the EU chosen economies and USA

Economic fluctuation is based on three characteristics: the change must be significant, the whole economy influence and the change must be long term. Business cycles consist of alternating periods of expansion and contraction in the level of economic activity experienced by market-oriented economies. "Business cycles are a type of fluctuation in aggregate economic activity in market-oriented economies. They consist of simultaneous expansions in many economic activities, followed by similarly general recessions. This sequence of changes is recurrent but not periodic – a business cycle can last from a year to more than a decade. A business cycle cannot be divided into shorter cycles of similar character and magnitude" (www.businesscycle.com, 2022).

TABLE 4: BUSINESS CYCLE IN THE EU ECONOMIES AND USA 1999 - 2021

1999/21	DE	France	UK	IT	Spain	PL	CZ	SK	USA*
Total	**8**	**8**	**7**	**8**	**6**	**6**	**6**	**6**	**9**
x_{max}	29	**36**	34	35	31	31	30	30	38
x_{min}	8	7	7	**6**	10	**6**	7	7	7

Source: (own preparation)

According the Business Cycles Peak and Trough analysis the author can say that during the period 1999 – 2021 the most periodic economies in the EU were Germany (DE; 8 periods), France (8), Italy (8). United Kingdom and Poland, Czech Republic, Slovakia look pretty stable. The USA is only mentioned for the comparison (9 cycles during the period). The maximal length of one business cycle (from peak to trough) was 36 months in France, the shortest 6 months in Italy and Poland. From the analysis point of view the Italy economy can be understood as the most variable economy. Also France and Germany economy fluctuate so often. From the analysis above and Economic freedom score some differences can be noticed e.g. the most economic freedom score loss Spain economy is

relatively stable concerning business cycle analysis and one the most variable economy in business cycle analysis (Germany) is relatively at the same level of economic freedom score. From the point of view of the Automotive Industry and economic stability as a basic condition for it can be said that there are mostly periodical situations between peaks and troughs on the main market and economies. The Tier 2 companies in AI have to take into account that the risks are there. Especially from the long term period, investment, loans and credits needs to be counted with these risks. The Tier 2 companies in the Automotive Industry invest into the technologies, machines etc. very often. The biggest reason is missing capacity at the Tier 1 level. Missing capacity means often only a lot of work, huge volume, but with a low level of additional value. That can be observed or proved further.

4.3. Macroeconomic analysis as a backround for the sector AI

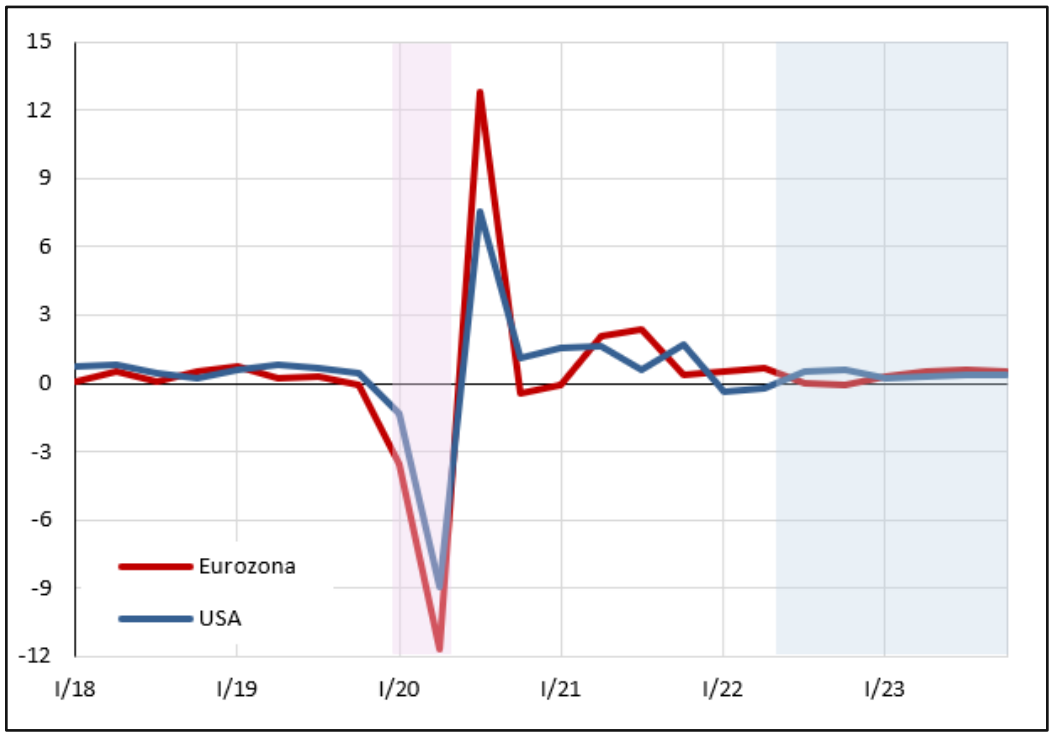
Macroeconomic analyses are one of the most important due to the ability to aggregate and describe the national economies. National accounts provide information to analyse the structure of economies and their development over time. They contain a wide range of statistics describing an economy in various ways. For the Autromotive Industry, as the most leading sector in the analysed economies, is the macro surroundigs and situations the most important. The author would like to shortly analysed the chosen economies and main markets for the companies from the Tier 2 level. The macro situation, also e.g. pandemic situation, were most influencing factors for the Tier 2 companies. The author tries to analyse the main or basic macro indicators: GDP, inflation and government/state debts. The main GDP aggregates provide an overview about key economic developments.

TABLE 5: REAL GDP USA AND EUROZONE QTY IN % 2018 - 2023

Real GDP USA and Eurozone - quaterly in % 2018 - 2023 prediction																								
	I/18	II	III	IV	I/19	II	III	IV	I/20	II	III	IV	I/21	II	III	IV	I/22	II	III	IV	I/23	II	III	IV
USA	0,8	0,8	0,5	**0,2**	0,6	0,8	0,7	**0,5**	-1,3	-8,9	7,6	**1,1**	1,5	1,6	0,6	**1,7**	-0,4	-0,2	0,5	**0,6**	0,2	0,3	0,4	**0,4**
EU zone	0,1	0,5	0,1	**0,5**	0,8	0,2	0,3	**-0,1**	-3,5	-11,7	12,8	**-0,4**	-0,1	2,1	2,4	**0,4**	0,5	0,7	0,0	**-0,1**	0,3	0,5	0,6	**0,5**

Source: (OECD, Eurostat, own preparation, 2022)

FIGURE 9: REAL GDP USA AND EUROZONE QLY IN % 2018 - 2023



Source: (OECD, Eurostat, own preparation, 2022)

To compare the situation and see the most terrible time period between 1st quarter 2020 and 3rd quarter 2020 with the highest impact of the pandemic situation with Covid 19 not only on industrial production. The prediction for 3rd quarter 2022 till the end of 2023 seems not so positive but with a smooth increase of the real GDP in the USA (0,4% quarterly on average) and in the Eurozone (0,3% quarterly on average). According the prediction the GDP growth should be positive but other factors, especially the gas and electricity, raw material prices and inflation, increase significantly. That can bring more potential problems into the Automotive Industry, for car producers e.g. lost sales, lost volumes etc. That can make the call offs down and due to that cause economic troubles to the Tier 2 level. The first macroeconomic analysis is done for the USA and EU zone. The next ones are more focused on the countries and markets where the chosen companies from the Tier 2 levels produce and sell their products to Tier 1 and through Tier 1 to the

car producers. As was mentioned these are Germany, France, Spain, Poland, Italy, Czech Republic, Slovakia and United Kingdom.

4.4. Macroeconomic analysis of the chosen economies and markets

For the analysis of the impacts of the pandemic situation from the first and second quarter of 2020 the author has chosen GDP (Gross Domestic Products) of the chosen economies as main markets for the following analyses in the Automotive Industry and the Tier 2 level. The number of the countries was the author coerced to reduce due to a limited extension of the Master thesis.

In the Table 6 below you can see not only the real GDP in real market prices in EUR but also the growth rate between the years. The red ones are the negative growth in the Czech Republic 2014/2013 -1,03%, also Poland an United Kingdom in 2016/2015 -0,78 and -7,96%. United Kingdom also had a negative growth 2017/2016 -3,05%.

TABLE 6 : GDP IN EU 27 AND CHOSEN ECONOMIES 2010 - 2021

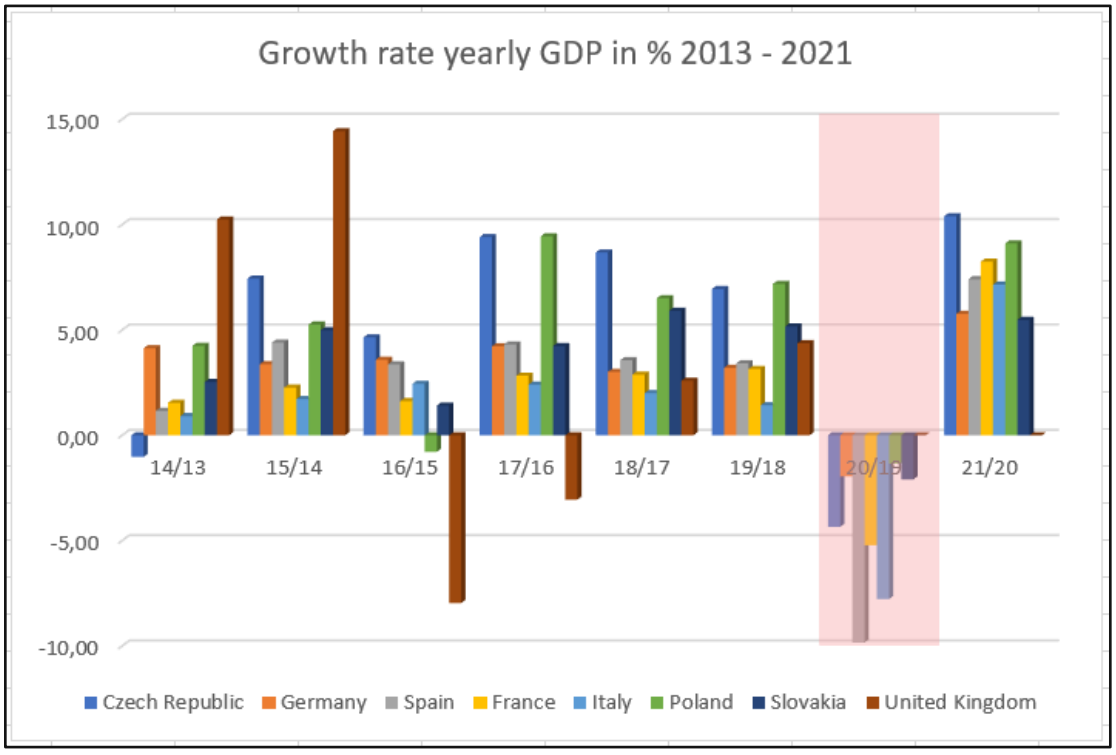
TIME	2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021
European Union - 27	10 980 334,1	3,13	11 323 935,4	0,60	11 391 946,4	1,13	11 520 205,5	2,29	11 784 025,8	3,66	12 214 799,8	2,77	12 552 647,2	4,18	13 076 870,1	3,49	13 532 162,2	3,58	14 016 453,5	-4,31	13 411 849,1	7,93	14 475 095,3
Czech Republic	157 920,8	4,61	165 202,2	-1,59	162 587,5	-1,92	159 461,5	-1,03	157 821,3	7,44	169 558,2	4,65	177 438,5	9,41	194 132,9	8,67	210 970,5	6,94	225 613,5	-4,35	215 805,4	10,39	238 238,2
Germany	2 564 400,0	5,04	2 693 560,0	1,82	2 745 310,0	2,41	2 811 350,0	4,13	2 927 430,0	3,37	3 026 180,0	3,59	3 134 740,0	4,22	3 267 160,0	3,01	3 365 450,0	3,20	3 473 260,0	-1,95	3 405 430,0	5,76	3 601 750,0
Spain	1 072 709,0	-0,83	1 063 763,0	-3,07	1 031 099,0	-1,04	1 020 348,0	1,16	1 032 158,0	4,40	1 077 590,0	3,36	1 113 840,0	4,31	1 161 867,0	3,56	1 203 259,0	3,42	1 244 375,0	-9,84	1 121 948,0	7,41	1 205 063,0
France	1 995 289,0	3,16	2 058 369,0	1,48	2 088 804,0	1,36	2 117 189,0	1,54	2 149 765,0	2,26	2 198 432,0	1,62	2 234 129,0	2,62	2 297 242,0	2,88	2 363 306,0	3,15	2 437 635,0	-5,22	2 310 469,0	8,24	2 500 870,0
Italy	1 611 279,4	2,33	1 648 755,8	-1,49	1 624 358,7	-0,71	1 612 751,3	0,91	1 627 405,6	1,72	1 655 355,0	2,44	1 695 786,8	2,41	1 736 592,8	2,00	1 771 391,2	1,43	1 796 633,8	-7,77	1 656 960,7	7,15	1 775 436,4
Poland	362 190,9	4,88	379 860,0	2,13	387 947,0	1,12	392 310,7	4,25	408 967,8	5,26	430 465,8	-0,78	427 091,8	9,44	467 426,6	6,51	497 842,3	7,16	533 599,9	-1,34	526 445,2	9,11	574 385,4
Slovakia	68 492,1	4,36	71 477,1	2,64	73 360,8	1,17	74 217,3	2,53	76 092,7	4,99	79 888,1	1,41	81 014,3	4,23	84 442,9	5,91	89 430,0	5,16	94 048,0	-2,09	92 079,3	5,48	97 122,5
United Kingdom	1 872 175,5	2,17	1 912 869,3	10,36	2 111 028,9	-0,70	2 096 338,0	10,24	2 311 080,2	14,44	2 644 716,5	-7,96	2 434 119,2	-3,05	2 359 789,9	2,59	2 420 897,2	4,37	2 526 615,2	x	x	x	x

Source: (OECD, Eurostat, own preparation, 2022)

From the growth perspective on average e.g. 2014/13: 2,97%; 2015/14: 5,48%; 2016/15: 1,04% only due to the Greece crisis and EUR as currency was so unstable then 2017/16: 4,22; 2018/17: 4,39%; 2019/18: 4,36%; 2020/19: -4,65% that was the highest decrease due to the Covid pandemic situation. A lot of shut downs not only in Automotive Industry but also in other sectors. From March 2020 till on average the end of May 2020 that was the most critical time period for the Automotive Industry (lost registrations, lost

production) around the world which is be analysed later. The next growth 2021/20 was 7,65% on average. During the whole time period 2013 – 2021 the average GDP growth was 3,18% for the chosen economies and 2,58% for EU 27. The author thought also about some prediction model for GDP or GDP growth based on the Time series analysis with the linear trend and usage of estimated parameters $T_t = \beta_0 + \beta_1 t$ where β_0 a β_1 are uknown parameters and $t = 1, 2, \ldots n$ is time variables. But the uncertainty is higher than can be described via the linear trend. From this reason the author did not make this kind of predictions.

FIGURE 10: GDP GROWTH RATE 2013 – 2021



Source: (OECD, Eurostat, own preparation, 2022)

Also on the Figure, as was mentioned, the significant decrease of GDP growth rate in comparison 2020/2019. A negative growth for all chosen economies. The highest decrease in Spain -9,84%, Italy -7,77% and France-5,22%. In a next analyses the author introduces one potential reason for that – the central government debts. Also form the Economic

freedom score point of view (see Table 3) the significant decrease of the score was analysed in Spain and France. The lowest, but also negative, GDP growth rate was analysed Poland -1,34%, Germany -1,95% and Slovakia -2,09. Also these economies are quite good with the decrease of Economic freedom score done by the Fraser institute.

TABLE 7: MAIN GDP AGGREGATES PER CAPITA GROWT RATE IN % (MP)

TIME	2013		2014		2015		2016		2017		2018		2019		2020		2021
GEO (Labels)																	
Czech Republic	15 170	-1,12	15 000	7,20	16 080	4,42	16 790	9,17	18 330	8,29	19 850	6,55	21 150	-4,63	20 170	10,41	22 270
Germany	34 860	3,70	36 150	2,49	37 050	2,75	38 070	3,84	39 530	2,68	40 590	2,98	41 800	-2,03	40 950	5,71	43 290
Spain	21 900	1,46	22 220	4,50	23 220	3,27	23 980	4,13	24 970	3,12	25 750	2,60	26 420	-10,33	23 690	7,47	25 460
France	32 080	1,06	32 420	1,85	33 020	1,24	33 430	2,39	34 230	2,37	35 040	2,65	35 970	-5,53	33 980	7,89	36 660
Italy	26 740	0,90	26 980	1,85	27 480	2,66	28 210	2,59	28 940	2,21	29 580	1,69	30 080	-7,31	27 880	7,75	30 040
Poland	10 190	4,32	10 630	5,27	11 190	-0,71	11 110	9,54	12 170	6,49	12 960	7,25	13 900	-1,22	13 730	9,61	15 050
Slovakia	13 710	2,41	14 040	4,91	14 730	1,29	14 920	4,09	15 530	5,73	16 420	5,05	17 250	-2,26	16 860	5,69	17 820
United Kingdom	32 700	9,42	35 780	13,53	40 620	-8,71	37 080	-3,64	35 730	1,99	36 440	3,81	37 830	x	x	x	x

Source: (OECD, Eurostat, own preparation, 2022)

Also the main GDP aggregates per Capita with the annual time frequency in current prices (EUR per capita) confirm the above mentioned closing facts. The figures in % reflect the GDP situation in the Table 6 completely.

TABLE 8: GENERAL GOVERNMENT GROSS DEBT 2013 - 2021

TIME	2013	2014	2015	2016	2017	2018	2019	2020	2021
GEO (Labels)									
Czech Republic	67 096,2	65 581,0	67 943,9	64 939,8	68 520,7	67 431,3	68 492,7	81 901,8	103 249,9
Germany	2 201 919,3	2 203 744,1	2 177 230,8	2 161 539,9	2 111 360,1	2 062 628,9	2 045 744,	2 314 090,4	2 475 775,7
Spain	1 025 655,	1 084 846,	1 113 661,	1 145 050,	1 183 412,0	1 208 860,0	1 223 354,	1 345 783,	1 427 235,
France	1 977 734,	2 039 884,	2 101 255,	2 188 481,	2 254 331,0	2 310 877,0	2 374 942,	2 648 147,	2 813 087,
Italy	2 136 199,6	2 202 969,3	2 239 381,	2 285 667,3	2 329 857,3	2 381 509,4	2 410 004,	2 572 727,3	2 677 910,4
Poland	224 119,6	204 509,3	216 566,3	229 014,4	241 130,0	240 786,0	245 692,8	293 124,1	306 835,9
Slovakia	40 742,0	40 844,0	41 413,4	42 481,3	43 572,4	44 383,8	45 277,1	55 012,2	61 259,4
United Kingdom	x	x	x	x	x	x	x	x	x

Source: (OECD, Eurostat, own preparation, 2022)

The second chosen indicator is according The Treaty on the Functioning of the European Union defines this indicator as the ratio of government debt outstanding at the end of the year to gross domestic product at current market prices. For this calculation, government

debt is defined as the total consolidated gross debt at nominal value in the following categories of government liabilities (as defined in ESA 2010): currency and deposits (AF.2), debt securities (AF.3) and loans (AF.4). The general government sector comprises the subsectors of central government, state government, local government and social security funds. Total government gross debt in million EUR is shown as well. In the Table 8 can be seen that the total value increased during the time period 2013 – 2021 rapidly e.g. Germany as the main economy for the later analysis from 2.201.919 EUR in 2013 to 2.475.775 mil EUR which is increase 273.856 mil EUR. The Czech Republic government, as a homeland economy for the chosen companies Tier 2 level, than generated from 67.096 mil EUR the debt to 103.249 mil EUR. That means increase by 36.153 mil EUR which is increase about 53,9% during the 8 years. Pretty very similar situation is in other analysed countries.

The better way to see the real increase is to use the percentage increase year-by-year which is mentioned in the Table 9. The green fields means that during this year-by-year comparison there was no increase but yearly decrease (minimum fields). During the years 2020/2019 a 2021/2020 you can see the enormous increase, according the official statements and data, the main reason was the pandemic situation with Covid 19.

TABLE 9: GENERAL GOVERNMENT GROSS DEBT GROWTH 2013 - 2021

TIME	2014/13	2015/14	2016/15	2017/16	2018/17	2019/18	2020/19	2021/20
GEO (Labels)								
Czech Republic	-2,26	3,6	-4,42	5,51	-1,59	1,57	**19,58**	26,07
Germany	0,08	-1,2	-0,72	-2,32	-2,31	-0,82	**13,12**	6,99
Spain	5,77	2,66	2,82	3,35	2,15	1,2	**10,01**	6,05
France	3,14	3,01	4,15	3,01	2,51	2,77	**11,5**	6,23
Italy	3,13	1,65	2,07	1,93	2,22	1,2	**6,75**	4,09
Poland	-8,75	5,9	5,75	5,29	-0,14	2,04	**19,31**	4,68
Slovakia	0,25	1,39	2,58	2,57	1,86	2,01	**21,5**	11,36
United Kingdom	x	x	x	x	x	x	x	x

Source: (OECD, Eurostat, own preparation, 2022)

For the Automotive Industry and also for the later analysed companies from in Tier 2 that can means some threats in the future, can be shown e.g. based on GGGD/GDP analyses.

TABLE 10: RATIO OF GGGD TO GDP 2013 - 2021

TIME / GEO (Labels)	2013	2014	2015	2016	2017	2018	2019	2020	2021
Czech Republic	44,4	41,9	39,7	36,6	34,2	32,1	30,1	37,7	41,9
Germany	78,3	75,3	71,9	69,0	64,6	61,2	58,9	68,7	69,3
Spain	100,5	105,1	103,3	102,8	101,9	100,5	98,3	120,0	118,4
France	93,4	94,9	95,6	98,0	98,1	97,8	97,4	114,6	112,9
Italy	132,5	135,4	135,3	134,8	134,2	134,4	134,1	155,3	150,8
Poland	56,5	51,1	51,3	54,2	50,6	48,8	45,6	57,1	53,8
Slovakia	54,9	53,7	51,8	52,4	51,6	49,6	48,1	59,7	63,1
United Kingdom	x	x	x	x	x	x	x	x	x

Source: (OECD, Eurostat, own preparation, 2022)

This indicator as the ratio of government debt outstanding at the end of the year to gross domestic product at current market prices. For this calculation, government debt is defined as the total consolidated gross debt at nominal value in the following categories of government liabilities (as defined in ESA 2010): currency and deposits (AF.2), debt securities (AF.3) and loans (AF.4). The general government sector comprises the subsectors of central government, state government, local government and social security funds. From this point of view also the drastic increase can be seen during the years 2020 and 2021. The countries Spain, Italy and France are above 100% GGGD/GDP. Italy with its 150,8% of GGGD/GPD is the most critical economy for the next years. That can bring in the future the problematic situation also with the currency EUR due to that debts. For the companies from Tier 2 (esp. located in the CZ without EUR currency) means this situation the threat of increase inflation and especially also the threat of currency exchange rate between EUR / CZ. If the EUR (mostly used for the payment into the company) goes down than the companies get less CZ crowns which they mostly used for the payments of the costs. The production costs than can go up, but the power of the money goes down.

The last macroeconomic indicator is from the monetary field, it is called Harmonised Indices of Consumer Prices (HICPs) and to be designed for international comparisons of consumer price inflation. HICP is used for example by the European Central Bank for monitoring of inflation in the Economic and Monetary Union and for the assessment of inflation convergence as required under Article 121 of the Treaty of Amsterdam.

TABLE 11 : HARMONISED INDICES OF CONSUMER PRICES 2013 - 2021

TIME / GEO (Labels)	2013	2014	2015	2016	2017	2018	2019	2020	2021
Czech Republic	1,4	0,4	0,3	0,6	2,4	2,0	2,6	3,3	3,3
Germany	1,6	0,8	0,7	0,4	1,7	1,9	1,4	0,4	3,2
Spain	1,5	-0,2	-0,6	-0,3	2,0	1,7	0,8	-0,3	3,0
France	1,	0,6	0,1	0,3	1,2	2,1	1,3	0,5	2,1
Italy	1,2	0,2	0,1	-0,1	1,3	1,2	0,6	-0,1	1,9
Poland	0,8	0,1	-0,7	-0,2	1,6	1,2	2,1	3,7	5,2
Slovakia	1,5	-0,1	-0,3	-0,5	1,4	2,5	2,8	2,	2,8
United Kingdom	2,6	1,5	0,	0,7	2,7	2,5	1,8	x	x

Source: (OECD, Eurostat, own preparation, 2022)

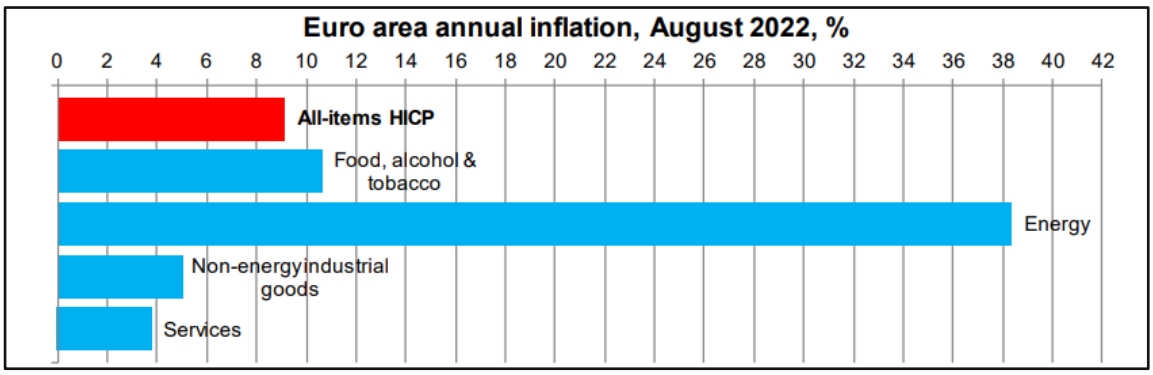
Based on the Table 11 the rate of increase the HICPs in the analysed countries speed up the increase especially after 2017. The year 2021 in the period-to-period comparison menas e.g. in the Czech Republic that in 2013 HICPs was 1,4% but in 2021 3,3% increase. Very similar situation is in other countries e.g. Germany from 1,6% to 3,2%. Significant increase is from 2021 to 2022 due to the stupid quantitative monetary policy represents especially by the EU and national governments. The increase in the case of Czech Republic is the inflation rate 16,7% year-to-year comparison. In case of Germany 13,3% and so on. That means for the Automotive Industry and esp. the companies from Tier 2 level a lot of troubles in investment, with bank loans, with the daily financial situation, increase interests etc.

Mix of these macroeconomic situation aspects mean for the Automotive Industry sector, car producers and also for companies in Automotive Industry Tier 2 some unpredictable situations and uncertain future. Especially during the pandemic situation, except the financial situation, the main problem was also with the staff availability, with the components and raw material availability etc. Mix of these aspects than accelerate serious troubles with call off reduction, production quantity reduction and additional costs for operations which the final price of products (mostly calculated some years ago) can not reflect. Also the future can not be forecasted due to the different and changeable conditions during the time. The bad macroeconomic situation on the leading economies like Germany, France and Italy is the most affecting aspect not only for the Tier 2 level in

Automotive Industry. Also the risk of a new pandemic situation during the next winter season in 2022 – 2023 can be difficult to manage and to an economic survival for the later analysed companies. The current bad situation especially due to the inflation increase means for the companies in AI Tier 2 level a "death mix" for further existence.

Euro area annual inflation is expected to be 9.1% in August 2022, up from 8.9% in July according to a flash estimate from Eurostat. Looking at the main components of euro area inflation, energy is expected to have the highest annual rate in August (38.3%, compared with 39.6% in July), followed by food, alcohol & tobacco (10.6%, compared with 9.8% in July), non-energy industrial goods (5.0%, compared with 4.5% in July) and services (3.8%, compared with 3.7% in July).

FIGURE 11: HICP ANNUAL INFLATION (IN TOTAL EU)



Source: (OECD, Eurostat, own preparation, 2022)

The Figure 11 shows that the rise of inflation during the last seven months is divided into some section which are described above. The most difficult situation, not only for the Automotive, but for all industrial sectors is the situation with energy (gas, electricity). This kind of situation has a lot of causes in the course of the last few years.

In the Czech Republic where the companies from Tier 2 are located the level of the inflation rate within 2022 has been between 15,1 – 17,2%. This kind of ratio means increase of interests up to 7% on average and it is one of the biggest problem concerning cash flow and so on. But all these causes and consequences will be analysed later.

TABLE 12: EURO AREA ANNUAL INFLATION AUGUST 2022

	Annual rate						
	Aug 21	Mar 22	Apr 22	May 22	Jun 22	Jul 22	Aug 22
Belgium	4.7	9.3	9.3	9.9	10.5	10.4	**10.5e**
Germany	3.4	7.6	7.8	8.7	8.2	8.5	**8.8e**
Estonia	5.0	14.8	19.1	20.1	22.0	23.2	**25.2e**
Ireland	3.0	6.9	7.3	8.3	9.6	9.6	**8.9e**
Greece	1.2	8.0	9.1	10.5	11.6	11.3	**11.1e**
Spain	3.3	9.8	8.3	8.5	10.0	10.7	**10.3e**
France	2.4	5.1	5.4	5.8	6.5	6.8	**6.5e**
Italy	2.5	6.8	6.3	7.3	8.5	8.4	**9.0e**
Cyprus	3.3	6.2	8.6	8.8	9.0	10.6	**9.6e**
Latvia	3.6	11.5	13.1	16.8	19.2	21.3	**20.8e**
Lithuania	5.0	15.6	16.6	18.5	20.5	20.9	**21.1e**
Luxembourg	3.5	7.9	9.0	9.1	10.3	9.3	**8.6e**
Malta	0.4	4.5	5.4	5.8	6.1	6.8	**7.1e**
Netherlands	2.7	11.7	11.2	10.2	9.9	11.6	**13.6e**
Austria	3.2	6.6	7.1	7.7	8.7	9.4	**9.2e**
Portugal	1.3	5.5	7.4	8.1	9.0	9.4	**9.4e**
Slovenia	2.1	6.0	7.4	8.7	10.8	11.7	**11.5e**
Slovakia	3.3	9.6	10.9	11.8	12.6	12.8	**13.3e**
Finland	1.8	5.8	5.8	7.1	8.1	8.0	**7.6e**

Source: (OECD, Eurostat, own preparation, 2022)

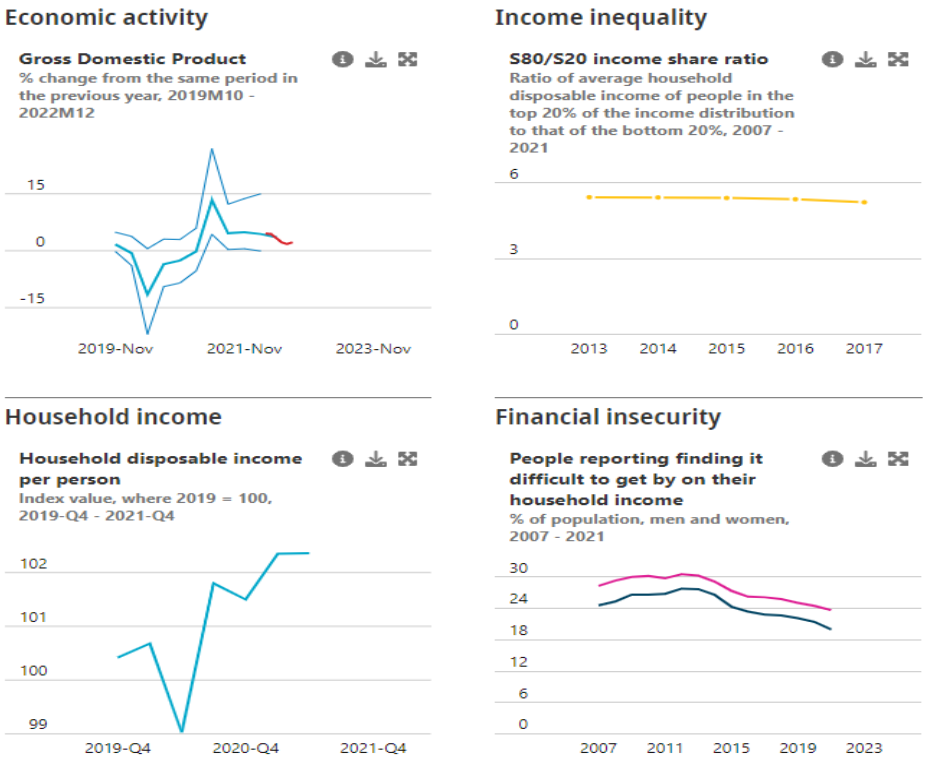
On the Table 12 is mentioned the annual rate of inflation measured with HICP indicator in the countries which use euro as their national currency. The interval in analysed countries from macroeconomic point of view is from 8,8% in Germany to 13,3% in Slovakia (year-to-year comparison). All this data regarding inflation is understood by the author as some consequences of the Covid 19 pandemic situation and the state behaviour (quantitative monetary policy, state debts total increase etc.).

The pandemic situation has been a new element in the economy, so it seems to have a special short paragraph in this Master thesis. For the short paragraph the data from OECD is used also with some description of its backround, necessity to measure and comparisons the situations between various countries. Covid 19 and pandemic situation has the biggest impact for all kind of industry and the automotive industry was influenced very strongly.

4.5. Covid 19 and the pandemic situation worldwide

"The COVID-19 pandemic is transforming how we think about our economies and our societies. The COVID-19 Recovery Dashboard was built at the request of OECD Ministers to keep track of national efforts to build back better. Its development was led by an advisory group of representatives of national statistical offices from OECD countries alongside policy experts and representatives of several OECD committees." (www.oecd.org, 2022). The Recovery Dashboard features twenty indicators to monitor the quality of the recovery. The pandemic situation and especially the consequences and next year time period (forecasts) can be seen. This Master thesis has its own target or aim not to analysed the Covid 19 and the pandemic situation itself but only from the main perspective of macroeconomic situation and in various industries all around the world.

FIGURE 12: OECD COVID 19 RECOVERY DASHBOARD



Source: (www.oecd.org, 2022)

"The OECD COVID-19 Recovery Dashboard features twenty indicators to monitor the quality of the recovery – whether it is strong, inclusive, green and resilient, with gender inequalities highlighted throughout. It features up-to-date and trusted OECD statistics complemented by novel data approaches. The timeliness, granularity and accuracy of its statistics are constantly improving as new sources become available." (www.oecd.org, 2022). On the Figure 12 the data only from 4 indicators are seen. In total there are 20 indicators from various segments including Debts, Business dynamics (Bankruptcies of enterprises), Trust in Government, Excess deaths, Investment and others.

Concerning worldwide health situation the Covid 19 means a significant increase in mortality with all the impacts behind and also mentioned above. From the Master thesis point of view the author would like to close this topic which has to be mentioned due to impacts on economies, industries, companies and also individuals.

FIGURE 13: MORTALITY RATE TO THE AVERAGE 2015 - 2019

Source: (www.oecd.org, own preparation, 2022)

The Figure 13 shows the mortality rate compared to the average in the period 2015 to 2019. The most catastrophic situation was in November 2020 (the 2nd wave) with increase 34,57% for men and 28,61% for women in comparison with 2015 to 2019 as average.

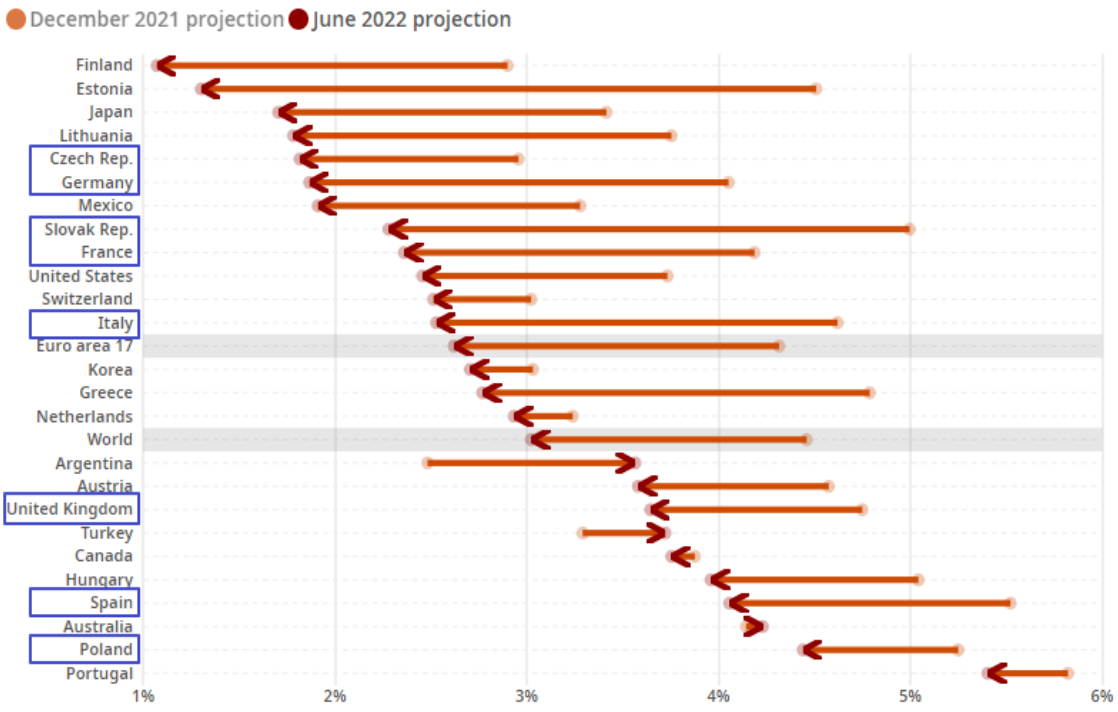
4.6. The price for war

The world is paying a heavy price for Russia's war in Ukraine. That has to be mentioned too. It is a humanitarian disaster, killing thousands and forcing millions from their homes.

The war has also triggered a cost-of-living crisis, affecting people worldwide, affecting countries, economies, industry sectors and of course the Automotive Industry and all companies. Global GDP growth is now projected to slow sharply this year, to around 3%, and remain at a similar pace in 2023. This is well below the pace of recovery projected last December according OECD.

"Growth is set to be markedly weaker than expected in almost all economies. Many of the hardest-hit countries are in Europe, which is highly exposed to the war through energy imports and refugee flows. Countries worldwide are being hit by higher commodity prices, which add to inflationary pressures and curb real incomes and spending, further dampening the recovery. This growth slowdown is a price of war which will be paid through lower incomes and fewer job opportunities." (www.oecd.org, 2022).

FIGURE 14: ANNUAL GDP GROWTH PROJECTION FOR 2022



Source: (www.oecd.org, own preparation, 2022)

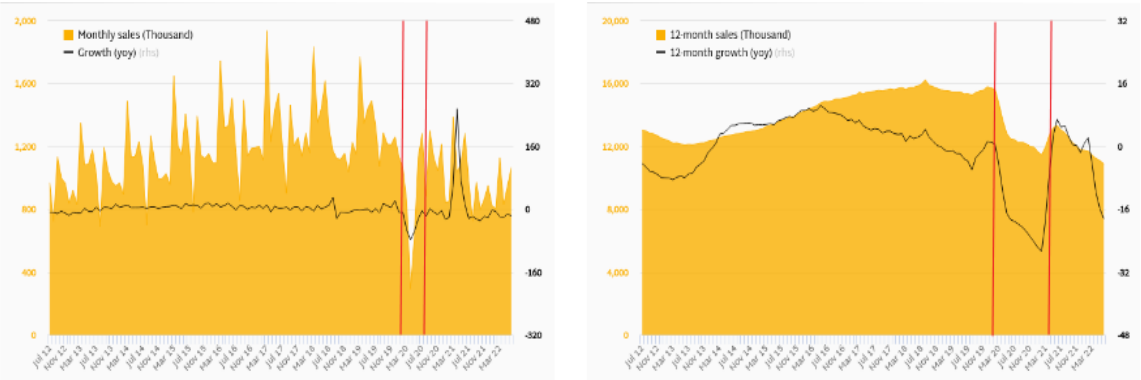
The decrease in % of GDP in the most cases, especially concerning analysed countries, can be see above on the Figure 14 with significant impacts on industry esp. on Automotive.

4.7. Automotive Industry – current situation and historical data

The current situation in Automotive Industry worldwide is a consequence of a lot of previous issues with positive effects on production and sales (quantitative monetary policy, low interest rates, availability of the financial instruments like loans, leasing, etc.) and also negative effects (Covid, raw material availability, components availability, etc.). For a better imagination the author would like to introduce some important total figures from his point of view. This kind of data collection is focused on Europa market due to the localization of the companies from Tier 2 level. As first the current situation (2022) in comparison with the previous year (2021) at the same time (sales figures by brands).

Sales of new passenger cars reached 1,066 thousand in June 2022 in the enlarged Europe (EU plus Iceland, Norway and Switzerland), according to ACEA. This is 16.9%, or 216 thousand less than in the previous year. In the first six months of 2022, some 5,598 thousand cars were sold in Europe, down 13.7% yoy. In June 2022, passenger car registrations continued their downward trend as supply chain issues continue to limit vehicle output. With 886,510 units registered in the EU, this is the lowest month of June on record since 1996. Historically, between 1990 and 2022, sales of passenger cars in Europe reached a high of 1,937 thousand in March 2017 and a low of 292 thousand in April 2020 according The Helgi Library.

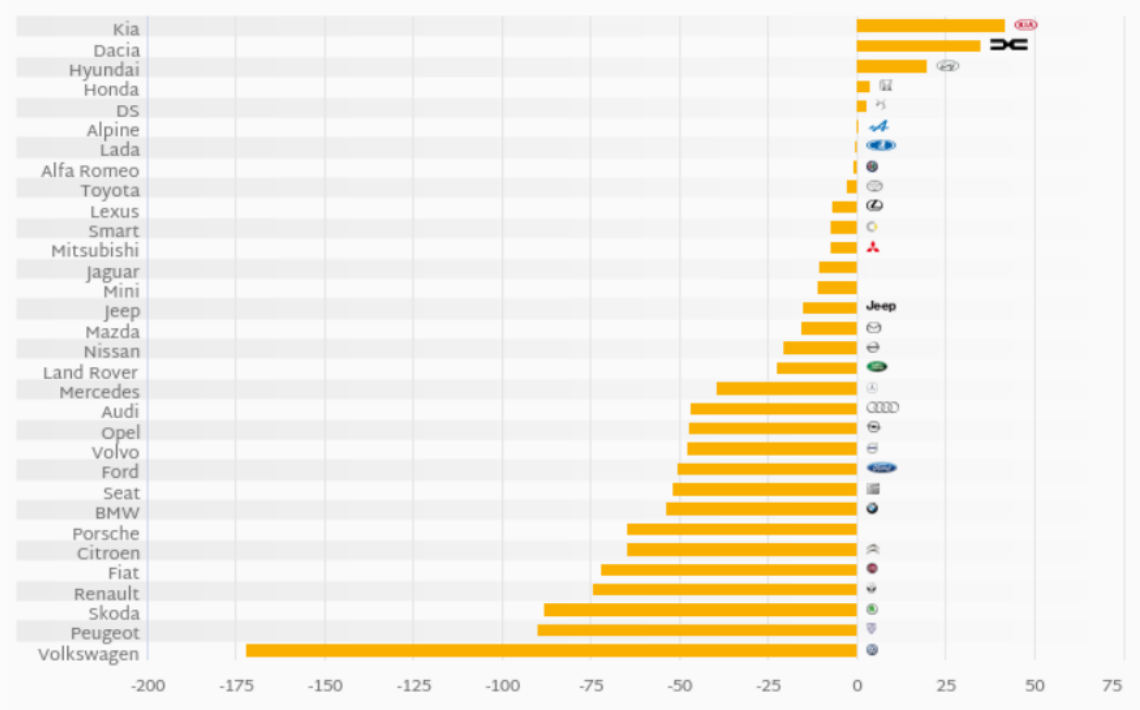
FIGURE 15: MONTHLY SALES AND 12 MONTH SALES JUL 2012 - MAR 2022



Source: (ACEA, OICA, Helgi Library, own, 2022)

The Figure 16 below shows the change in sales by brand in Europe. The most significant negative change have VW (app. -170.000 cars), Peugeot (-92.000), Škoda (-85.000). On the other side the most positive change have KIA (+42.000 cars), Dacia (+35.000), Hyundai (+19.000). The independent, the same as previous year, is Alpine and Lada.

FIGURE 16: CHANGE IN SALES BY BRAND (JAN/JUN 2021 VS JAN/JUN 2022)

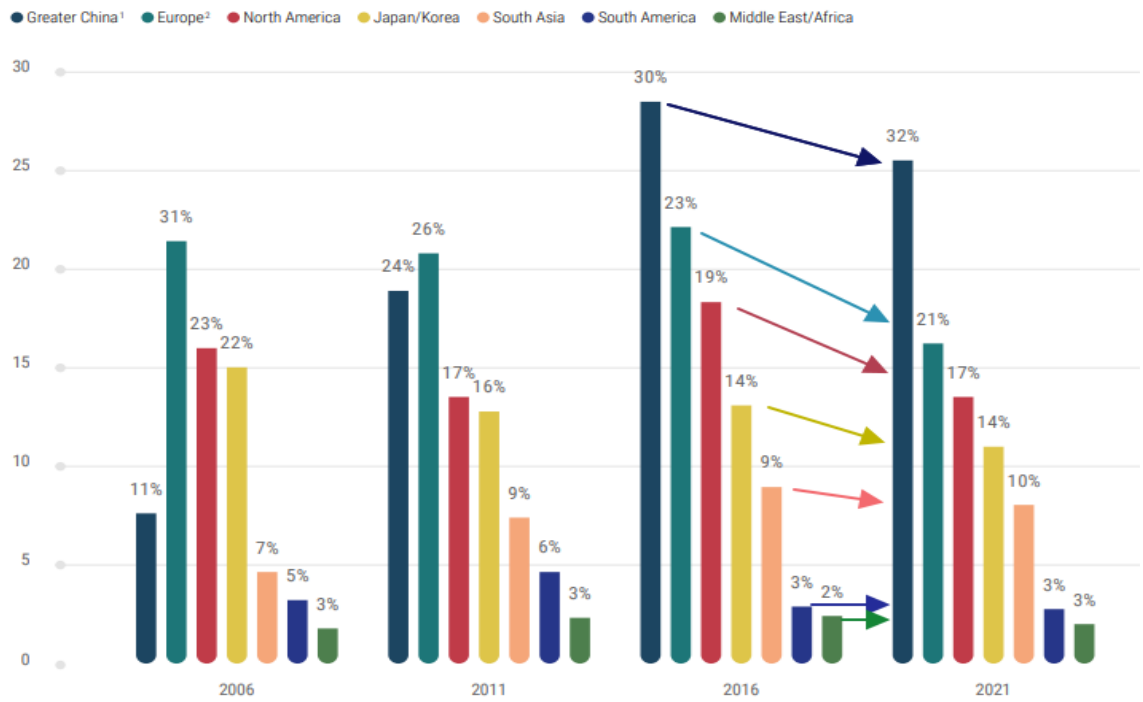


Source: (Helgi Library, ACEA, 2022)

Sales in total, as up-to-date information, in Europe of new passenger cars reached 1,066 thousand in June 2022 in the enlarged Europe, according to ACEA. This is -16.9%, or 216 thousand less than in the previous year. In the first six months of 2022, some 5,598 thousand cars were sold in Europe, down 13.7% yoy. In June, most vehicles (225 thousand) were sold in Germany, followed by France (171 thousand), the United Kingdom with 141 thousand cars, 127 thousand new vehicles were registered in Italy and 89.3 thousand in Spain. Volkswagen Group sold the most cars in June 2022 in Europe, some 256 thousand vehicles representing 24.0% of the European market. Sales of PSA Group amounted to 158 thousand vehicles (or 14.8% of the market) while Renault Group and

Hyundai Group held 12.0% and 9.50% of the European market in June. In terms of particular brands, Volkswagen stands out as the most favourite brand accounting for 564 thousand sold vehicles, or 10.1% of all new passenger cars sold on the European market in June 2022. In terms of momentum, Kia gained the most in terms of market share in the first month of the year 2022 (up 1.37 bp) followed by Hyundai and Toyota. Volkswagen and Skoda were on the other end of the market spectrum losing -1.27 bp and -0.718 bp respectively according the ACEA and Helgi Library. The current situation (2022/2021) in AI and especially at car producers can be characterized as very negatively influenced with the current economic situation, Covid 19 pandemic situation and then mostly with the raw material and components availability. Next graphs and figures are devoted to a longer historical period. The author used the statistics from OICA, ACEA and his own research.

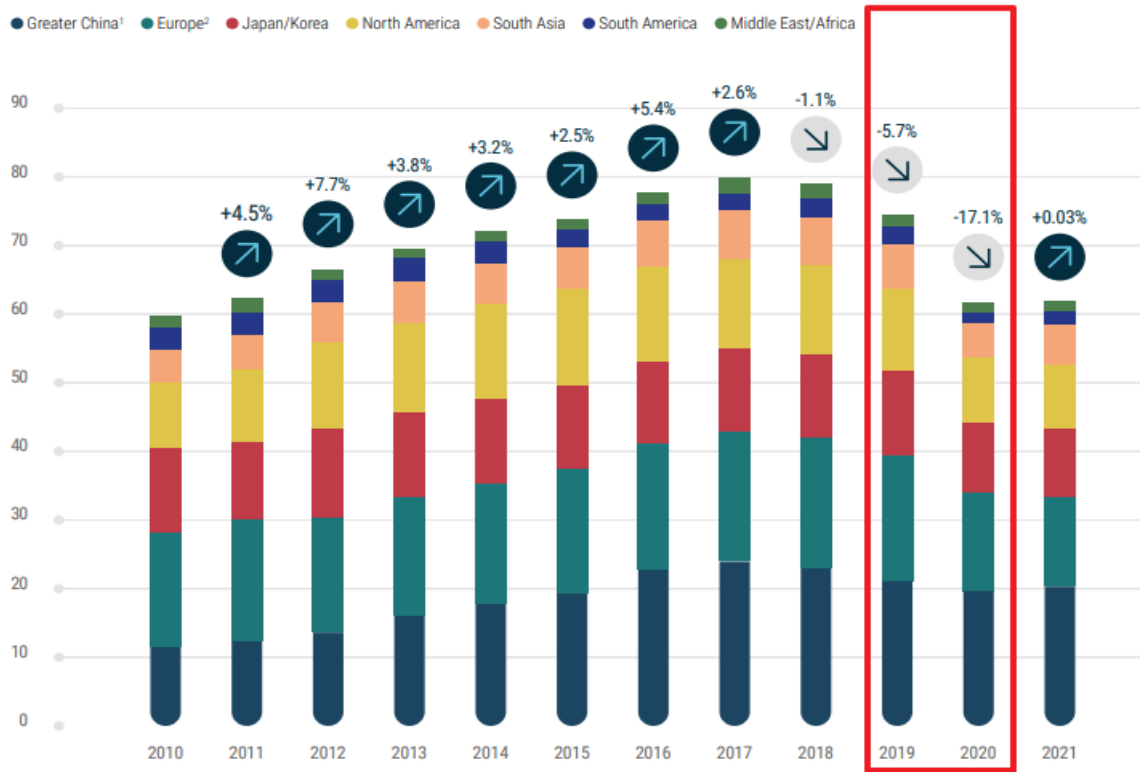
FIGURE 17: WORLD VEHICLE PRODUCTION 2006 - 2021



Source: (ACEA, 2022)

According the Figure 17 there were produced approximately 80 million vehicles globally. In 2021 as counted % share/2006 – 2021. Hong Kong, Taiwan, Turkey and CIS included.

FIGURE 18: WORLD CAR PRODUCTION IN % CHANGE 2010 - 2021



Source: (ACEA, 2022)

From the Figure 19 can be seen that global car production remained stable in 2021 (as in 2020 after the significant decrease from 2020/2019), after three years of decline.

4.8. Own survey and data analyses in the Automotive Industry

The next analysis done by the author. To represent yearly increase of the Total production volume in AI some chosen methods were used from so called elementary characteristics of time lines as calculations 1st difference (year-on-year/yoy) and 2nd difference. The calculations of growth rate or so called growth coefficients or line indexes and average growth rate which is defined as geometric diameter from individual (yearly) growth rate:

$$\bar{k} = \left(k_2 k_3 \ldots k_n\right)^{\frac{1}{n-1}} = \sqrt[n-1]{k_2 k_3 \ldots k_n} \ .$$

Further additional basic statistic methods are used as simple arithmetic mean (1), median (2), R - variation range (3) and SMDT standard deviation (4) according:

$$x = \frac{x_1 + x_2 + \cdots x_n}{n} = \frac{\sum_{i'1}^{n} xi}{n}; \tag{1}$$

$$x_p = \frac{z_p - n_1}{n_2} h_p + a_p; \tag{2}$$

$$R = x_{max} - x_{min}; \tag{3}$$

$$s_x = \sqrt{s_x^2} = \sqrt{\frac{\sum_{i=1}^{n} \left(x_i - \bar{x}\right)^2}{n}}. \tag{4}$$

TABLE 13: YEARLY PRODUCTION VOLUME - WORLD 1999 - 2021

Year	Total Production World	1st diff.	2nd diff	Growth rate (yoy)	ø Growth rate (4 y)
1999	***56 258 392***	x	x	x	
2000	58 374 162	2 115 770	x	1,038	1,001
2001	56 304 925	-2 069 237	-4 185 007	0,965	
2002	58 994 318	2 689 393	4 758 630	1,048	
2003	60 463 225	1 468 907	-1 220 486	1,025	1,043
2004	64 496 220	4 032 995	2 564 088	1,067	
2005	66 719 519	2 223 299	-1 809 696	1,034	
2006	66 222 975	-496 544	-2 719 843	0,993	
2007	73 266 061	7 043 086	7 539 630	1,106	0,984
2008	70 729 696	-2 536 365	-9 579 451	0,965	
2009	61 762 324	-8 967 372	-6 431 007	0,873	
2010	77 583 519	***15 821 195***	24 788 567	***1,256***	
2011	79 880 920	2 297 401	-13 523 794	1,030	***1,095***
2012	84 236 171	4 355 251	2 057 850	1,055	
2013	87 595 998	3 359 827	-995 424	1,040	
2014	89 776 465	2 180 467	-1 179 360	1,025	
2015	86 780 583	-2 995 882	-5 176 349	0,967	1,028
2016	94 976 569	8 195 986	11 191 868	1,094	
2017	***97 302 534***	2 325 965	-5 870 021	1,024	
2018	95 635 300	-1 667 234	-3 993 199	0,983	
2019	91 786 851	-3 848 449	-2 181 215	0,960	***0,955***
2020	77 621 582	***-14 165 269***	-10 316 820	***0,846***	
2021	80 065 988	2 444 406	16 609 675	1,031	
min	56 258 392	-14 165 269	-13 523 794	0,846	0,955
max	97 302 534	15 821 195	24 788 567	1,256	1,095
$R_{(max - min)}$	41 044 142	29 986 464	38 312 361	0,410	0,140
ø	75 514 535	1 082 163	15 649	1,019	1,018
Median	77 583 519	2 201 883	-1 809 696	1,027	1,014
SMDT	13 447 482	5 825 769	8 843 544	0,080	0,045

Source: (ACEA, own preparation, 2022)

From the Table 13 and done calculations is visible the worst time period 2018 – 2021.

According the production volume in the world the 1st difference shows decline from 91,78 millions in 2019 to 77,62 in 2020, that means decrease by 14,16 mil yoy. Also the growth rate 0,846 menas the worst decrease 2019 to 2020 yoy. The average growth rate 0,955 in the time period 2018 – 2021 is also the worst. For the first time view (without regression and correlation analyses in the meantime) can be said that the global Automotive Industry is very sensitive to the global macroeconomic situation measured by GDP and so on. The author would like to calculate also the EU 27 from the reason that the analysed companies are from the EU and the EU located productions are the most influencing.

TABLE 14: TOTAL PRODUCTION IN EU 27 2007 - 2021

Year	Total Production EU 27	1st diff.	2nd diff	Growth rate (yoy)	ø Growth rate (4 y)
2007	15,2	x	x	x	1,138
2008	17,5	*2,3*	x	1,148	
2009	*19,7*	*2,3*	0,0	1,129	
2010	16,9	-2,8	-5,1	0,858	0,955
2011	17,7	0,8	3,6	1,047	
2012	16,2	-1,5	-2,3	0,915	
2013	16,2	0,0	1,5	1,000	
2014	17,2	1,0	1,0	1,062	1,049
2015	18,4	1,2	0,2	1,070	
2016	19,0	0,6	-0,6	1,033	
2017	19,6	0,6	0,0	1,032	
2018	19,2	-0,4	-1,0	0,980	*0,894*
2019	18,5	-0,7	-0,3	0,964	
2020	13,0	*-5,5*	-4,8	*0,703*	
2021	*12,1*	-0,9	4,6	0,931	
min	12,1	-5,5	-5,1	0,703	0,894
max	19,7	2,3	4,6	1,148	1,138
$R_{(max-min)}$	7,6	7,8	9,7	0,445	0,244
ø	17,1	-0,2	-0,2	0,991	1,009
Median	17,5	0,3	0,0	1,016	1,002
SMDT	2,2	2,0	2,7	0,111	0,093

Source: (ACEA, own preparation, 2022)

From the Table 14 is visible that the situation in EU 27 car production is worse than in the world. In 2021 the production volume is 12,1 mil cars and it is worse than 2007 (financial crisis). The worst decline from 2019 to 2020 -5,5 mil. 2021 is worse than 2020 due to -0,5 mil cars in production. In Appendix 1 and 2 there are the tables and calculation

regarding car registration in the world and EU 27 totally. There can be see the biggest registration volume decrease from 2019 – 2020 but the continual decrease has been already from 2017. In Appendix 2 of the Master thesis there is the Total new car registration in EU 27 pretty the same facts. The worst time period acc 1st difference calculation is from 2019 to 2020 (decline 6,8 mil registrations) from 18,5 mil in 2019 to 11,7 mil in 2020. Also 2021 is worse than 2020, additional decrease 0,1 mil. If counted year-to-year (yoy) growth rate there is continual decrease from 2017 to 2021 with the highest decrease 2019 – 2020 0,63 which means -36,8%.

Regarding the research question 1.: "Has been the Automotive Industry (AI) influenced with the global economic situation?"

The answer is based on the used data research and already used statistic calculations. The Automotive Industry (AI) has been significantly and negatively influenced with the macroeconomic situation especially during the time period 2018 – 2021. All the surveys and calculations above show the negative impacts during the time period on the AI. Especially the pandemic era 2020 – 2021 with consequences to 2022 and on there have been the most negative impacts on the AI.

Also the hypothesis H1: "It is expected that the AI has been significantly and negatively influenced during the defined time period", is confirmed based on mentioned calculations and figures. The higher space regarding the results, hypothesis confirmation etc. will be at the endo of this chapter and also in the chapter called Discussion.

For the second research question: "Are there any relationships between basic economic indicators and Automotive Industry indicators?" the author prepares various calculations esp. regression and correlation analysis. In the following part of the research the preparation for making correlation matrix was done using calculations of variability extent. The dispersion was counted according to the pattern:

$$s_x^2 = \frac{\sum_{i=1}^{n} \left(x_i - \bar{x}\right)^2}{n} \quad . \tag{5}$$

and determinant margin of error square root of dispersion according to:

$$s_x = \sqrt{s_x^2} = \sqrt{\frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n}}. \tag{6}$$

For finding causal relationships among statistic marks there was used regressive and correlation analysis. For counting was used mostly used type so called Linear regression which was expressed with the help of mathematic entry of regressive line:

$$y = A + B_x \tag{7}$$

at estimate of Regressive analysis parameters according to A, B according to patterns:

$$A = \frac{\sum y - B \times \sum x}{n} \tag{8}$$

$$B = \frac{n \times \sum xy - \sum x \times \sum y}{n \times \sum x^2 - \left(\sum x\right)^2} \tag{9}$$

Particularly the method of Regressive and correlative analysis, chosen by the author, is usable and used for this type of economic research. It is important to mention that this method has its certain restrictions. One of the major restrictions seems to be the choice of suitable type of regress function (in MT chosen Linear regression) and also the fact that the analysis of numbers can only limitedly cover the whole substance of researched economic quantities and phenomenon as on the level of macro surrounding and the AI.

In the case of calculation of correlation coefficients with linear regression the correlation equalled 1.0 means that between two variables there exists positive linear relationship. In the case of correlation equalled -1.0 there exists negative linear relationship, in case 0.0 then the linear relationship does not exist. Restrictions of correlation is the fact that correlation is a statistic term for expressing the extend of linear relationship and it concerns the term measurement. The cause and consequence concern deterministic dependence. It is important to analyze and additionally explain causal connections, as was written by Sedláček (2012). For the analysis were chosen: GDP in EU27 in bl EUR (2007

– 2021) as dependent variable *y* and Total car production in EU 27 in million cars (2007 – 2021) as independent variable *x*. The correlation coefficient is calculated too to get the result about the relationship between these two variables.

TABLE 15: CORRELATION AND REGRESSION ANALYSIS GDP EU27 AND TOTAL PRODUCTION EU27

No	Year	y_i (In bl EUR)	x_i (In mil pcs)	$y_i * x_i$	x_i^2	Y_i	$y_i - Y_i$
1	2007	10 738,8	15,2	163 229,7	231,0	12 428,2	-1 689,4
2	2008	11 085,3	17,5	193 992,5	306,3	12 132,6	-1 047,3
3	2009	10 587,6	19,7	208 574,8	388,1	11 849,8	-1 262,2
4	2010	10 980,3	16,9	185 567,6	285,6	12 209,7	-1 229,4
5	2011	11 323,9	17,7	200 433,7	313,3	12 106,9	-782,9
6	2012	11 391,9	16,2	184 549,5	262,4	12 299,7	-907,7
7	2013	11 520,2	16,2	186 627,3	262,4	12 299,7	-779,5
8	2014	11 784,0	17,2	202 685,2	295,8	12 171,1	-387,1
9	2015	12 214,8	18,4	224 752,3	338,6	12 016,9	197,9
10	2016	12 552,6	19,0	238 500,3	361,0	11 939,8	612,9
11	2017	13 076,9	19,6	256 306,7	384,2	11 862,6	1 214,2
12	2018	13 529,9	19,2	259 773,7	368,6	11 914,0	1 615,8
13	2019	14 016,5	18,5	259 305,9	342,3	12 004,0	2 012,5
14	2020	13 450,5	13,0	174 856,0	169,0	12 711,0	739,4
15	2021	14 507,1	12,1	175 535,5	146,4	12 826,7	1 680,3
	∑	182 760,3	256,4	3 114 690,6	4 455,0	182 772,9	-12,5
	ø $\bar{y}$	12 184,0	x				
	ø $\bar{x}$	x	17,1				
	Correl	-0,23111	x				

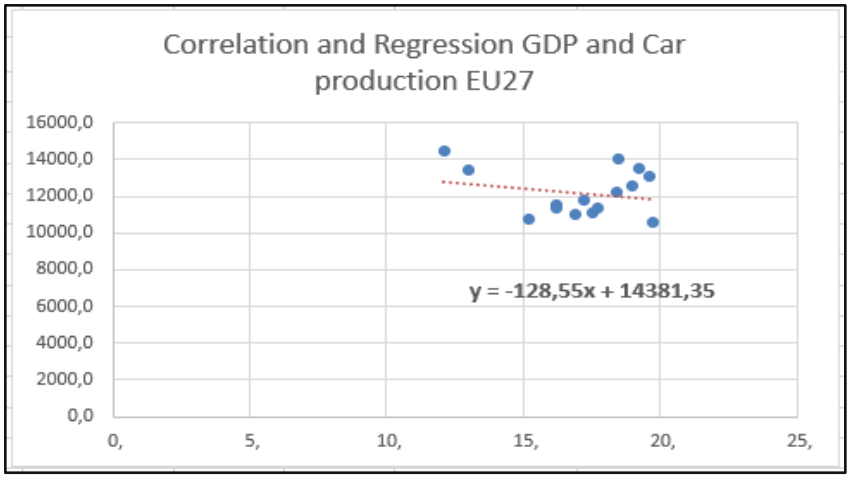
Y = 14381,35 - 128,55x

Source: (ACEA, OECD, own preparation, 2022)

Based on the results can be described the relationship between the dependent variable y (GDP EU27) on independent variable x (Car production in EU27) as very low or weak. The Correlation coefficient is -0,2311 which means there negative linear relationship. Also from the Figure 19 is visible that the linear correlation is not so precious but for the purpose of basic description is enough. The negative linear relationship means if the car production in EU27 is rising with 1,0 mil cars than the GDP EU27 decreases on average -128,55 x 1.000.000 = -0,1285 bn EUR. It shows the AI generates additional Sales, on one

hand size. But on the other hand e.g. the profitability can be in other sectors higher than in AI. This kind of statement needs to be confirmed via additional research.

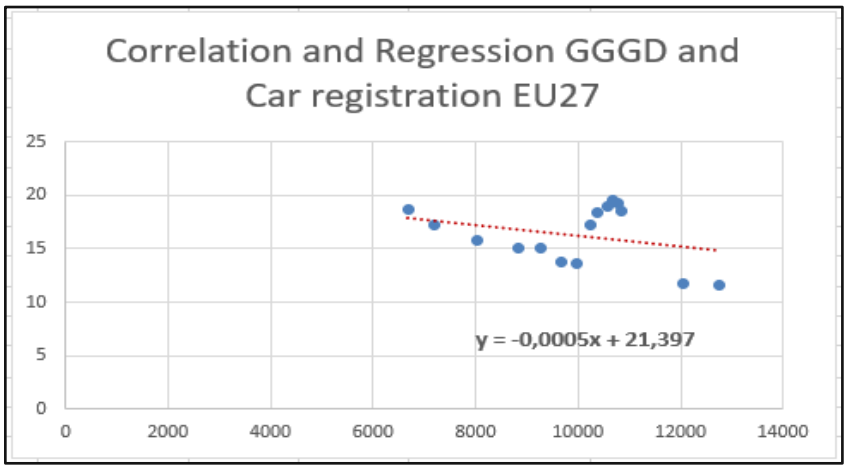
FIGURE 19: CORRELATION CHART - GDP AND PRODUCTION EU27



Source: (ACEA, OECD, own preparation, 2022)

For the second RC analysis were chosen: Total car registration in EU27 in mil pcs (2007 – 2021) as dependent variable *y* and General government gross debt in EU 27 in million EUR (2007 – 2021) as independent variable *x*.

FIGURE 20: CORRELATION CHART - GGGD AND REGISTRATION EU27



Source: (ACEA, OECD, own preparation, 2022)

TABLE 16: CORRELATION AND REGRESSION ANALYSIS - GGGD AND CAR REGISTRATION EU27

No	Year	y_i (In mil pcs)	x_i (In bl EUR)	$y_i * x_i$	x_i^2	Y_i	$y_i - Y_i$
1	2007	18,7	6 686,0	125 027,6	349,7	24,9	-6,2
2	2008	17,3	7 203,5	124 260,9	297,6	25,1	-7,9
3	2009	15,8	8 016,9	126 667,5	249,6	25,5	-9,7
4	2010	15,1	8 824,8	133 254,0	228,0	26,0	-10,9
5	2011	15,1	9 255,4	139 757,2	228,0	26,2	-11,1
6	2012	13,7	9 679,2	132 605,5	187,7	26,4	-12,7
7	2013	13,6	9 988,6	135 844,8	185,0	26,6	-13,0
8	2014	17,2	10 233,2	176 010,5	295,8	26,7	-9,5
9	2015	18,4	10 385,4	191 090,9	338,6	26,8	-8,4
10	2016	19,	10 569,7	200 824,3	361,0	26,9	-7,9
11	2017	19,6	10 673,9	209 209,0	384,2	26,9	-7,3
12	2018	19,2	10 767,6	206 737,2	368,6	27,0	-7,8
13	2019	18,5	10 856,5	200 845,2	342,3	27,0	-8,5
14	2020	11,7	12 065,7	141 168,3	136,9	27,6	-15,9
15	2021	11,6	12 740,6	147 790,5	134,6	28,0	-16,4
	∑	244,5	244,5	2 391 093,5	4 087,5	397,5	-153,0
	ø $\bar{y}$	16,3	x				
	ø $\bar{x}$	x	9 863,1				
	Correl	-0,31534	x				

Y = 21,397 - 0,000517x

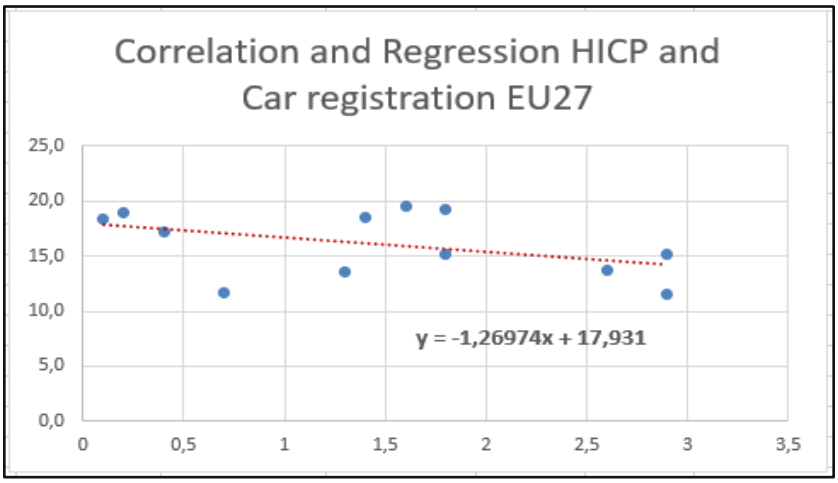
Source: (ACEA, OECD, own preparation, 2022)

The correlation equalled -0,13534 that means that there exists negative linear relationship, which shows the fact that if the total of General Gross Government Debt in EU27 increases the new car registration in EU goes down. Also the correlation coefficient shows that the relationship between these two chosen elements is higher than in the Table 15. Of course, in case 0,0 the linear relationship does not exist, in the Table 16 the correlation coefficient is -0,31534. Restrictions of correlation is the fact that correlation is a statistic term for expressing the extent of linear relationship and it concerns the term measurement. The cause and consequence concern deterministic dependence. It is important to analyse and explain causal connections. It can show that the Linear correlation is not suitable for this relationship, but for the basic imagination is enough.

To describe the Linear regression which was expressed with the help of mathematic entry of regressive line and at estimate of Regressive and correlation analysis parameters the results tell the fact that, if the independent variable *x* (GGGD EU27) increases about 1.0

bl EUR than the dependent variable *y* Car registration in mil pcs decreases by Y = 21,397 – 0,000517. Yes, for this kind of statement or prediction all the limitations of Linear regression analysis need to be taken into account.

FIGURE 21: CORRELATION CHART - HICP AND REGISTRATION EU27



Source: (ACEA, OECD, own preparation, 2022)

TABLE 17: CORRELATION AND REGRESSION ANALYSIS - HICP AND REGISTRATION EU27

No	Year	y_i (In mil pcs)	x_i (In %)	$y_i * x_i$	x_i^2	Y_i	$y_i - Y_i$
1	2010	15,1	1,8	27,2	3,2	20,2	-5,1
2	2011	15,1	2,9	43,8	8,4	21,6	-6,5
3	2012	13,7	2,6	35,6	6,8	21,2	-7,5
4	2013	13,6	1,3	17,7	1,7	19,6	-6,0
5	2014	17,2	0,4	6,9	0,2	18,4	-1,2
6	2015	18,4	0,1	1,8	0,0	18,1	0,3
7	2016	19,0	0,2	3,8	0,0	18,2	0,8
8	2017	19,6	1,6	31,4	2,6	20,0	-0,4
9	2018	19,2	1,8	34,6	3,2	20,2	-1,0
10	2019	18,5	1,4	25,9	2,0	19,7	-1,2
11	2020	11,7	0,7	8,2	0,5	18,8	-7,1
12	2021	11,6	2,9	33,6	8,4	21,6	-10,0
	Σ	**192,7**	**17,7**	**270,4**	**37,0**	**237,6**	**-44,9**
	ø $\bar{y}$	**16,1**	x				
	ø $\bar{x}$	x	**1,5**				
	Correl	**-0,42683**	x				

Y = 17,931 - 1,26974x

Source: (ACEA, OECD, own preparation, 2022)

The last Linear regression and correlation analysis shows the Figure 21 and Table 17. This analysis is limited with the available data time series (2010 – 2021; 12 positions). The analysis tries to find out the answer on a potential linear relationship between Inflation rate (measured by HICP) as the independent variable *x* and the dependent variable *y* Car registration in EU27. The assumption is, if the inflation ratio measured by HICP EU27 in % goes up, the new car registration will go up too. The estimated reason is, if money loose its value, the cash holders will get rid them off quicker e.g. to buy a new car. The Correlation coefficient (linear correlation) is negative -0,42683 which characterized the strongest relationship from all mentioned analyses. The same shows the Figure 21. Estimated Regressive and correlation analysis parameters are A = 17,931 and parameter B_x = -1,26974. The explanation is, if the Inflation ratio grows up about e.g. x = 2%, than according this linear regression the new car registration decreases according the formula *Y = 17,931 – 1,26974*2* (x).

All the Linear regression and correlation analyses between the macroeconomic indicators and basic Automotive Industry indicators were done with the described results.

Regarding the mentioned analyses in relation to the **Research question 1.** can be said in short that the Automotive Industry has been strongly influenced with the global economic situation and enormously with he pandemic situation in 2019/2020 which has brought the most significant decrease not only in the Automotive sector. Also it is possible **to confirm** the **Hypothesis H1**, the Automotive Industry has been significantly and negatively influenced during the define period 2019 – 2020. The confirmation is done based on the research and the results are shown on the Figure 15, 16, 17, 18 and Tables 13, 14.

Concerning the **Research Question 2.** the author can say that there are some relationships between basic makroeconomic indicators and some Automotive Industry indicators. For this kind of research the Linear regression and correlation analysis was chosen with its advantages and also limits. The limits or restrictions of correlation is the fact that correlation is a statistic term for expressing the extent of linear relationship and it concerns the term measurement. The cause and consequence concern deterministic dependence. Of course, in case 0,0 the linear relationship does not exist but the calculations which were

done for GDP EU27 and Total car production EU27 where the Correlation coefficient is -0,2311 which means there negative and weak linear relationship, in case of the Correlation coefficient for GGGD and Car registration in EU27 -0,31534 can be said the same and in case of HICP and Cart registration in EU27 -0,42683 the situation is a bit different due to the stronger linear relationship. Also the Figure 21 practically shows more possibility to the linear correlation regarding the Research question 2. The calculations have confirmed some relationships but it is important to mention that this method has its certain restrictions. One of the major restrictions seems to be the choice of suitable type of regress function (in work chosen Linear regression) and also the fact that the analysis of numbers can only limitedly cover the whole substance of researched economic quantities and phenomenon as on the level of micro so in macro surrounding. The next analyses are devoted to the chosen companies from the Automotive Industry level Tier 2. That can give the answers for the Research questions 3. and 4. Plus confirm or refuse the Hypotheses H2 and H3.

4.9. The Automotive Industry - Tier 2 research and analyses

The years of 20019 – 2022 in the world history will be primarily connected with the entrance and marks of economic crisis connected with the Covid 19 pandemic situation, secondarily with its expansion in the form of worldwide economic recession and with declining activity of most economic subjects (states, companies, consumers, etc.) in the real economies. Various recession marks with different intensity have influenced the present and also the company future. This kind of knowledge would bring a new view on firm strategic thinking, planning and decision making according Sedláček, 2012.

Standard concept of company or concern strategies is possible to be defined as the ability of the company to reach its aims, its readiness to the future and company ability to face future world conditions. Determination and accomplishment of these strategies in most companies are observed by means of so called KPI – Key Performance Indicators and so called Strategic Gap Analysis. Company KPI are usually set internally. Among used and

in this MT analyzed Tier 2 company KPI belong for example Sales (S), Gross Profit (GP), EBIT Margin (EM) and some others.

Current global era introduces substantial changes in thinking and in practice of business and company control. The areas of strategy controlling and planning is also changing. [5]. That is why it is not possible to understand the strategy only internally on the level of the company. It is required to observe the fulfilment and update in the relationship to external i.e. economic company surrounding written by Sedláček, 2013. For this MT and the last part of the research companies from the AI were chosen. These similarities, for a better possibility to compare, are from the Tier 2 of AI, focusing on plastic moulding for the lighting kind of final products. This kind of research can bring the answers for these research questions:

3. If there are some crisis similarities are there also some recovery similarities in companies in AI at the level Tier 2?

4. Are there universal recommendations for recovering the companies, managing them and being prepared for the future?

For these research questions were chosen already known and used statistical methods simple arithmetic mean according (1), median (2), R - variation range (3), SMDT standard deviation (4) and also the Linear regression and correlation analysis according (7). Last but not least the method called Facilitated discussion was used between the author to understand internal company aspects and also to get to know the companieś managers and owners oppinions. The author should be able to confirm or to refused the hypothesis:

H3: It is expected that there are some symptom similarities between unsuccessful companies which have the highest profit decrease during the defined time period.

As first the author would like to analyse (based on the Correlation analysis) if there are some linear relationships between some companies KPIs and the global Automotive Industry indicator. Than tries to find some similarities between KPIs during the time period and than presents the result from the facilitated discussions with some definition of recommendations in the end of the Master thesis.

The first Correlation analyses were done between the companies´ indicator Sales yoy growth rate (Table 18) + EBITDA Margin growth yoy rate (Table 19) and Total car production EU27; Total new car registration EU27, Total car production World and Total new car registration World growth yoy rate 2010/09 – 2021/20.

TABLE 18: CORRELATION EU27/WORLD AND SALES GROWTH

SALES growth in %	Correl Poduction EU27	Correl Registration EU27	Correl Poduction WORLD	Correl Registration WORLD
Böhm Plast - Technik	0,61	0,69	0,32	0,41
Formplast Purkert	0,63	0,77	0,37	0,48
Isolit-Bravo	0,17	0,43	0,41	0,13
PPT	0,51	0,30	0,42	0,23
Viscuma	0,29	0,31	0,53	0,51
Viscuma Plastic	-0,18	-0,16	-0,30	0,13
Montix	-0,01	0,01	0,00	0,17

Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

TABLE 19: CORRELATION EU27/WORLD AND EBITDA MARGIN GROWTH

EBITDA Margin growth in %	Correl Poduction EU27	Correl Registration EU27	Correl Poduction WORLD	Correl Registration WORLD
Böhm Plast - Technik	-0,43	-0,32	-0,09	-0,01
Formplast Purkert	0,32	0,17	-0,18	-0,11
Isolit-Bravo	0,01	-0,23	-0,01	-0,18
PPT	0,08	0,10	-0,28	-0,20
Viscuma	0,16	0,08	-0,03	0,16
Viscuma Plastic	0,08	0,08	0,00	-0,07
Montix	0,17	0,10	-0,12	-0,28

Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

A was mentioned in the case of calculation of correlation coefficients with linear regression the correlation equalled 1.0 means that between two variables (e.g. Sales and Total production EU27 yoy growth rate; see Table 18) there exists positive linear

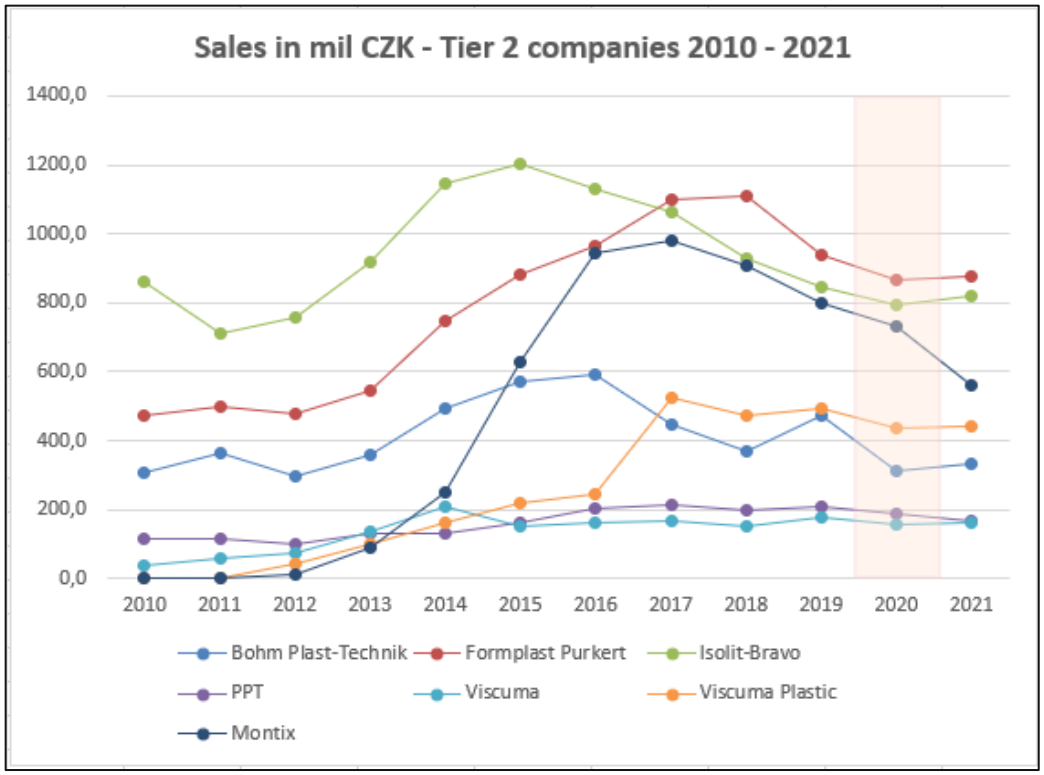
relationship. In the case of correlation coefficient equalled -1.0 there exists negative linear relationship, in case 0.0 then the linear relationship does not exist. From the Table 18 can be read that there are weak linear relationships between these KPI (Sales yoy growth rate) and the Automotive Industry indicators (EU 27 Total new car production and registration yoy growth rate and World total new car production and registration yoy growth rate). Correlations coefficients are higher between companies and EU27 than the World but still so weak. The maximum regarding Sales growth rate has Formplast Purkert (0,63; 0,77) and the minimum than the companies PPT (0,08; 0,10) and Montix (-0,01; 0,01). Concerning the Total world new car production and registration the maximum of the linear relationships has the company Viscuma (0,53; 0,51) and the minimum Montix (0,00; 0,17). As a results based on the lienar correlation analysis can be said that the relationship between these indicators of companies (Sales yoy growth rate) and Automotive Industry (EU27/World new car production and registration yoy growth rate) are so weak or don´t exist.

Concerning the indicator EBITDA Margin yoy growth rate (companies) and the same AI indicators can be said following. In the Table 19 World new car production and registration yoy growth rate is mentioned that the linear correlation coefficients between company indicators and AI indicators are smaller or weaker then the previous one. The maximum with EU27 has Böhm Plast – Technik (-0,43; -0,39) means negative correlation; the higher is the EU27 production and registration is, the lower EBITDA Margin the company realized. The minimum than company Viscuma Plastic (0,08; 0,08). Generaly we can be said that there are very limited linear relationships between AI and company indicator Sales. This kind of results also told that there is a very limited possibility to make some prediction of the future situation at the companies internally and predict the Sales based on the information from the market which are mostly one year later available.

Of course, as was written, restrictions of correlation is the fact that correlation is a statistic term for expressing the extend of linear relationship and it concerns the term measurement. The cause and consequence concern deterministic dependence and need to be analyzed with other methods which are more precious. But for the needs of this Master Thesis the methodology behind is acceptable.

As a first analysis of the Tier 2 chosen companies the author decided to go through the total Sales and year-to-year (yoy) growth during the time period 2010 – 2021.

FIGURE 22: SALES 2010 - 21 - CHOSEN TIER 2 COMPANIES



Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

TABLE 20: SALES 2010 - 2021 CHOSEN TIER COMPANIES 2 2010 – 2021

SALES mil/CZK	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	ø	Median	s^2_x/1000	ø growth
Bohm Plast-Technik	305,3	362,9	297,6	358,2	492,1	571,9	591,9	448,6	369,8	472,2	314,5	334,7	409,97	366,35	9,69	3,39
Formplast Purkert	470,7	500,3	477,7	543,5	745,5	881,3	963,2	1099,5	1111,1	938,6	866,8	877,2	789,61	872,00	51,59	6,68
Isolit-Bravo	862,6	709,0	758,5	918,8	1146,1	1203,4	1129,9	1061,5	928,2	846,5	792,3	817,7	931,18	890,71	25,01	0,30
PPT	113,7	117,4	98,0	133,1	129,3	159,7	203,6	211,8	200,6	208,8	187,5	169,3	161,06	164,48	1,58	4,88
Viscuma	37,0	59,9	74,9	136,0	206,5	149,8	161,5	168,8	150,3	177,7	157,3	159,5	136,60	153,80	2,43	18,39
Viscuma Plastic	0,0	1,2	41,9	97,5	160,3	221,0	243,3	523,3	472,5	494,0	436,3	441,2	261,04	232,13	37,78	330,64
Montix	0,0	1,5	13,0	91,6	251,5	627,6	944,9	978,7	906,9	799,8	731,2	560,1	492,25	593,86	143,28	154,44
MAX	862,6	709,0	758,5	918,8	1146,1	1203,4	1129,9	1099,5	1111,1	938,6	866,8	877,2				
MIN	0,0	1,2	13,0	91,6	129,3	149,8	161,5	168,8	150,3	177,7	157,3	159,5				
R	862,6	707,7	745,4	827,2	1016,8	1053,5	968,4	930,7	960,8	760,9	709,5	717,7				
ø	255,6	250,3	251,6	325,5	447,3	545,0	605,5	641,7	591,3	562,5	498,0	480,0				
Median	113,7	117,4	98,0	136,0	251,5	571,9	591,9	523,3	472,5	494,0	436,3	441,2				

Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

In the Figure 22 and Table 18 can be seen that during the defined time period 2010 – 2021 the Sales copied mostly the development in the Automotive Industry. The Sales in each company went up during the 2012-2017 but then the trends went mostly down 2017 – 2021 with the decrease acceleration during the pandemic period 2019/20. In 2021 some continue with the decrease, some rising slowly. The highest sales had during the time Isolit-Bravo company on average, the smallest company PPT. How stable the companies were we can get from the result of dispersion s^2_x. The higher variability had the company Montix 148,28; the second one Formplast Purkert 51,59; the third one Viscuma Plastic 37,78. Viscuma Plastic and Montix were mostly influenced with the 0 Sales in 2010 due to founding of the companies. According the average the Sales maximum was reached at 2016, according median 2017 (in total), then from 2017 the Sales were going down till 2020. In some cases (Montix; PPT) till 2021. This is the first signal of the situation in companies Montix and PPT during the time period.

TABLE 21: COMPANY SALES YOY GROWTH RATE IN % 2010 - 2021

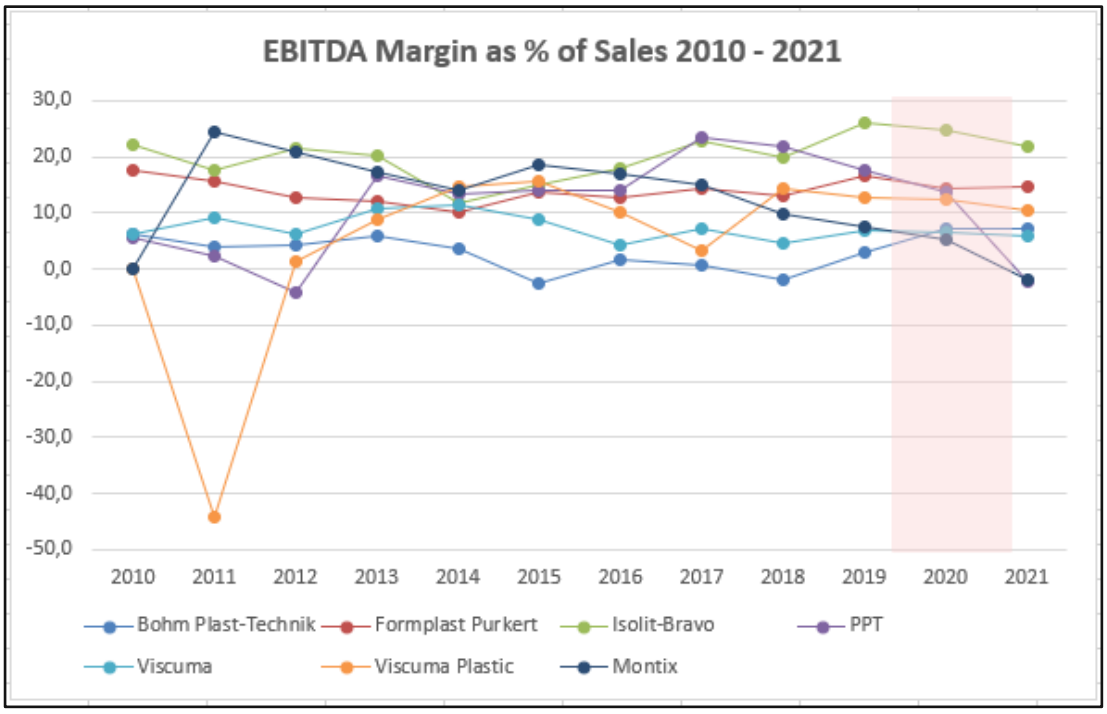
SALES yoy growth in %	11/10	12/11	13/12	14/13	15/14	16/15	17/16	18/17	19/18	20/19	21/20	ø	Scale
Böhm Plast - Technik	18,89	-17,99	20,36	37,38	16,22	3,50	-24,21	-17,57	27,69	-33,40	6,42	-4,21	
Formplast Purkert	6,29	-4,52	13,78	37,17	18,22	9,29	14,15	1,06	-15,53	-7,65	1,20	-5,23	
Isolit-Bravo	-17,81	6,98	21,14	24,74	5,00	-6,10	-6,05	-12,56	-8,80	-6,40	3,20	-6,14	2
PPT	3,26	-16,53	35,85	-2,89	23,51	27,52	4,02	-5,30	4,13	-10,20	-9,73	-5,27	3
Viscuma	61,82	24,89	81,67	51,83	-27,43	7,79	4,49	-10,95	18,23	-11,48	1,40	-0,70	
Viscuma Plastic	0,00	3292,38	132,98	64,37	37,85	10,08	115,12	-9,71	4,54	-11,67	1,12	-3,93	
Montix	0,00	769,27	602,47	174,62	149,51	50,56	3,58	-7,34	-11,81	-8,58	-23,40	-12,78	1

Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

The Table 21 shows the Sales yoy growth rates during the 2011/10 – 2021/20 period. To find some potential indicators about the current situation in the companies the author was going through the whole time period with a special focus on the 18/17 and 19/18 (two years before the pandemic 20/19 situation) to find some similarities and the final score is done based on the average of four year yoy growth 2018/17 - 2021/20. It is visible that each companies realized significant decline in 18/17 period, the most Böhm Plast – Technik (-17,57%) and Isolit Bravo (-12,56%). On the other hand during the whole period the scale is calculated as average of these four years the highest decline of Sales realized

Montix (-12,78%), Isolit Bravo (-6,14%) and PPT (-5,27%). Loosing of Sales can be the first indicator gives the information about some problems in the company. The answesr can be devided into these reasons: 1. Decrease of volume on current production, 2. A few new projects, 3. Customerś dissatisfaction and back-relocation of some projects. In this case, the worst one company Montix suffered with the reasons 3. (-25% of projects in production) and 2. (not being able to calculate and offer the whole project management) and especially during the pandemic situation (-20% of volume, rest of the projects). The PPT company suffered especially with the reason 2. and 1. For Isolit Bravo the problem was 1. one, but from the highest basis, so the company suffered a little. The next one detailed analysis was done based on the critical discussion with the managers and owners of the companies. They mostly preferred the EBITDA margin. The acronym EBITDA stands for earnings before interest, taxes, depreciation, and amortization. Knowing and using the EBITDA margin according them allows for a comparison of one company's real performance in time and also to others in its industry.

FIGURE 23: EBITDA MARGIN 2010 - 21 - CHOSEN TIER 2 COMPANIES



Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

TABLE 22: EBITDA MARGIN 2010 – 2021 CHOSEN TIER 2 COMPANIES

EBITDA Margin in %	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	ø	Median	s^2_x/1000	ø growth
Bohm Plast-Technik	6,2	4,1	4,4	5,9	3,5	-2,5	1,6	0,6	-1,9	3,1	7,1	7,3	3,27	3,81	0,01	-88,70
Formplast Purkert	17,5	15,7	12,8	12,2	10,2	13,8	12,9	14,2	13,1	16,7	14,3	14,6	14,00	14,02	0,00	-0,33
Isolit-Bravo	22,3	17,7	21,5	20,3	11,6	15,1	17,8	22,8	20,0	26,1	24,8	21,7	20,14	20,91	0,02	2,65
PPT	5,7	2,4	-4,1	16,8	13,4	14,0	13,9	23,4	21,8	17,7	13,7	-2,4	11,35	13,81	0,07	-86,92
Viscuma	6,2	9,1	6,3	10,8	11,6	9,0	4,2	7,3	4,7	6,8	6,5	5,9	7,38	6,67	0,00	7,82
Viscuma Plastic	0,0	-44,2	1,5	8,9	14,8	15,5	10,3	3,3	14,4	12,9	12,3	10,4	4,99	10,33	0,25	61,97
Montix	0,0	24,5	21,0	17,4	13,9	18,7	16,8	15,0	9,8	7,6	5,3	-2,0	12,32	14,42	0,06	-23,82
MAX	22,3	24,5	21,5	20,3	14,8	18,7	17,8	23,4	21,8	26,1	24,8	21,7				
MIN	0,0	-44,2	-4,1	5,9	3,5	-2,5	1,6	0,6	-1,9	3,1	5,3	-2,4				
R	22,3	68,7	25,6	14,4	11,2	21,2	16,2	22,8	23,7	23,0	19,5	24,1				
ø	8,3	4,2	9,1	13,2	11,3	11,9	11,1	12,4	11,7	13,0	12,0	7,9				
Median	6,2	9,1	6,3	12,2	11,6	14,0	12,9	14,2	13,1	12,9	12,3	7,3				

Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

In the Table 22 is visible that the EBITDA margin as % of Sales during the whole time period gives the result that on average the best one is Isolit Bravo (20,14), then the second Formplast Purkert (14,02) and third surprisingly Montix (12,32). Also median confirmed these results except Montix is the second (14,42), Formplast Purkert the third one (14,02).

According the dispersion s^2_x, author would like to mentioned that this indicator can give a better view how the stabile the EBITDA margin during the period is. The stable the better. Dispersion s^2_x shows that the most unstable is Viscuma Plastic (0,25), then PPT (0,07) and Montix (0,06). Viscuma Plastic and Montix are influenced with the establishing of the companies in 2011 (Sales and EBITDA Margin in 2010 = 0). A better view can bring also the EBITDA margin yoy growth rate analyses.

TABLE 23: EBITDA MARGIN YOY GROWTH RATE IN % 2010 - 2021

EBITDA Margin growth in %	11/10	12/11	13/12	14/13	15/14	16/15	17/16	18/17	19/18	20/19	21/20	ø	Scale
Böhm Plast - Technik	-34,04	8,03	32,59	-40,22	-171,62	-161,73	-61,28	-423,49	-257,72	131,74	2,00	-136,87	1
Formplast Purkert	-10,07	-18,50	-4,84	-16,43	35,53	-6,67	10,33	-7,75	27,13	-14,48	2,15	1,76	
Isolit-Bravo	-20,55	21,40	-5,70	-42,75	29,75	18,05	28,29	-12,61	30,64	-4,80	-12,57	0,16	
PPT	-58,38	-273,36	-510,80	-20,33	4,44	-0,39	68,10	-6,81	-19,01	-22,41	-117,20	-41,36	3
Viscuma	46,07	-30,36	71,14	7,05	-22,41	-52,77	72,23	-35,14	44,10	-4,80	-9,07	-1,23	
Viscuma Plastic	0,00	-103,28	513,63	65,66	5,04	-33,67	-67,64	332,85	-10,55	-4,80	-15,52	75,49	
Montix	0,00	-14,11	-17,40	-20,02	34,77	-10,00	-11,16	-34,67	-22,65	-29,60	-137,17	-56,02	2

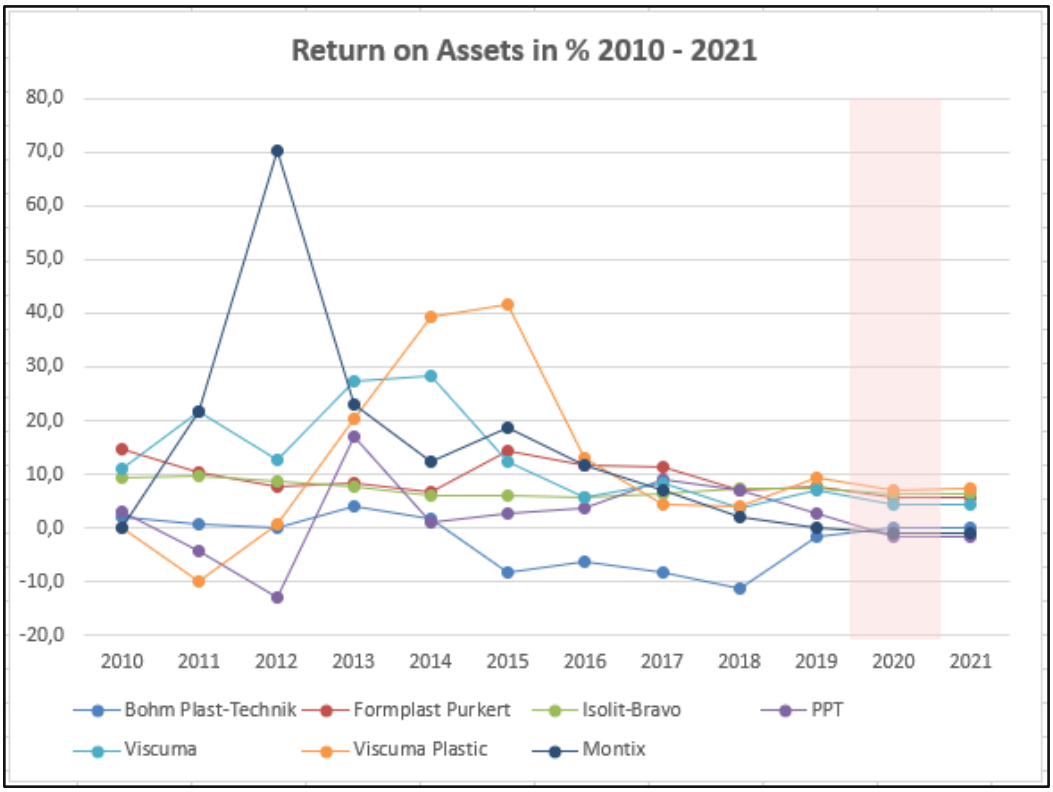
Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

The EBITDA Margin yoy growth rate analysis at the Table 23 shows that on average in the period 2018/17 – 2021/20 the worst results (scale) achieved the company Böhm Plast – Technik (-136,87%) then Montix (-56,02%) and PPT (-41,36%). Montix and PPT were also the worst ones during the pandemic situation 2020/19 and 2021/20. The companies Montix and PPT are calculated again as the worst companies form the analysed group.

The next analyses and calculations were devoted to the indicator ROA – Return on Assets. Return on Assets, or ROA, is a metric used to evaluate how efficiently a company is able to generate profit with the assets it has available.

Usually is the indicator expressed as a percentage, a higher ROA indicates a more efficient use of company resources and on the other hand a lower ROA indicates a less efficient company and its using assets for operative activities.

FIGURE 24: RETURN ON ASSETS 2010 - 21 - CHOSEN TIER 2 COMPANIES



Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

TABLE 24: RETURN ON ASSETS 2010 – 2021 CHOSEN TIER 2 COMPANIES

Retrun on Assets in %	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	ø	Median	s^2_x/1000	ø growth
Bohm Plast-Technik	2,0	0,6	0,1	3,9	1,7	-8,2	-6,2	-8,4	-11,4	-1,7	0,0	0,0	-2,30	0,01	0,02	195,55
Formplast Purkert	14,5	10,2	7,6	8,4	6,6	14,3	11,8	11,4	7,1	7,8	5,8	5,4	9,24	8,09	0,01	-2,92
Isolit-Bravo	9,3	9,5	8,7	7,7	6,0	6,0	5,8	6,3	7,3	7,4	6,2	6,7	7,24	7,00	0,00	-2,29
PPT	2,9	-4,5	-13,0	17,0	1,1	2,6	3,6	8,9	6,9	2,6	-1,7	-2,1	2,02	2,56	0,05	-26,45
Viscuma	11,1	21,6	12,5	27,3	28,2	12,2	5,5	8,4	3,7	7,1	4,2	4,3	12,18	9,72	0,07	10,26
Viscuma Plastic	0,0	-9,9	0,6	20,2	39,4	41,8	12,8	4,5	4,1	9,5	7,1	7,4	11,46	7,26	0,22	277,63
Montix	0,0	21,7	70,3	23,1	12,4	18,5	11,7	6,8	2,0	0,0	-1,0	-1,0	13,71	9,27	0,36	-1 177,15
MAX	14,5	21,7	70,3	27,3	39,4	41,8	12,8	11,4	7,3	9,5	7,1	7,4				
MIN	0,0	-9,9	-13,0	3,9	1,1	-8,2	-6,2	-8,4	-11,4	-1,7	-1,7	-2,1				
R	14,5	31,6	83,3	23,4	38,3	50,0	19,0	19,7	18,7	11,2	8,9	9,5				
ø	5,7	7,0	12,4	15,4	13,6	12,5	6,4	5,4	2,8	4,7	3,0	3,0				
Median	2,9	9,5	7,6	17,0	6,6	12,2	5,8	6,8	4,1	7,1	4,2	4,3				

Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

According the Table 24 and statement that ROA evaluates how efficiently a company is able to generate profit with the assets it has available the author could be able to say that the best scale according the average achieved company Montix (13,71%) then Viscuma (12,18%) and Viscuma Plastic (11,46%). On the other hands the worst Bohm Plast – Technik (-2,30%) and PPT (2,02%). But these results are highly influenced at the beginning (2012 – 2015) which is confirmed by the dispersion s^2_x and variability of the indicators. Based on that the worst one is Montix, Viscuma Plastic and Böhm Plast – Technik (see Table 24). Montix is the worst company with PPT due to the negative trend and decline from 2016 especially 2017. The better view can give the yoy growth rate.

TABLE 25: RETURN ON ASSETS YOY GROWTH RATE IN % 2010 - 2021

Retrun on Assets yoy growth in %	11/10	12/11	13/12	14/13	15/14	16/15	17/16	18/17	19/18	20/19	21/20	ø	Scale
Böhm Plast - Technik	-71,13	-78,86	3080,61	-56,92	-588,06	-24,28	35,80	36,51	-85,22	-100,52	3,10	-36,53	3
Formplast Purkert	-29,45	-25,78	10,51	-20,85	114,76	-17,22	-3,86	-37,65	9,80	-24,96	-7,46	-15,07	
Isolit-Bravo	3,06	-9,28	-11,14	-21,68	-0,23	-4,26	8,82	16,35	1,35	-15,63	7,46	2,38	
PPT	-251,74	191,11	-230,79	-93,75	140,50	40,16	147,62	-22,50	-62,99	-168,58	20,07	-58,50	2
Viscuma	95,36	-41,99	117,70	3,17	-56,63	-54,73	51,37	-56,15	94,15	-40,55	1,12	-0,36	
Viscuma Plastic	0,00	-106,38	3090,50	95,00	6,21	-69,29	-64,93	-9,66	133,74	-25,01	3,80	25,72	
Montix	0,00	224,51	-67,10	-46,26	49,21	-36,93	-41,47	-70,50	-100,39	-12860,81	1,12	-3257,64	1

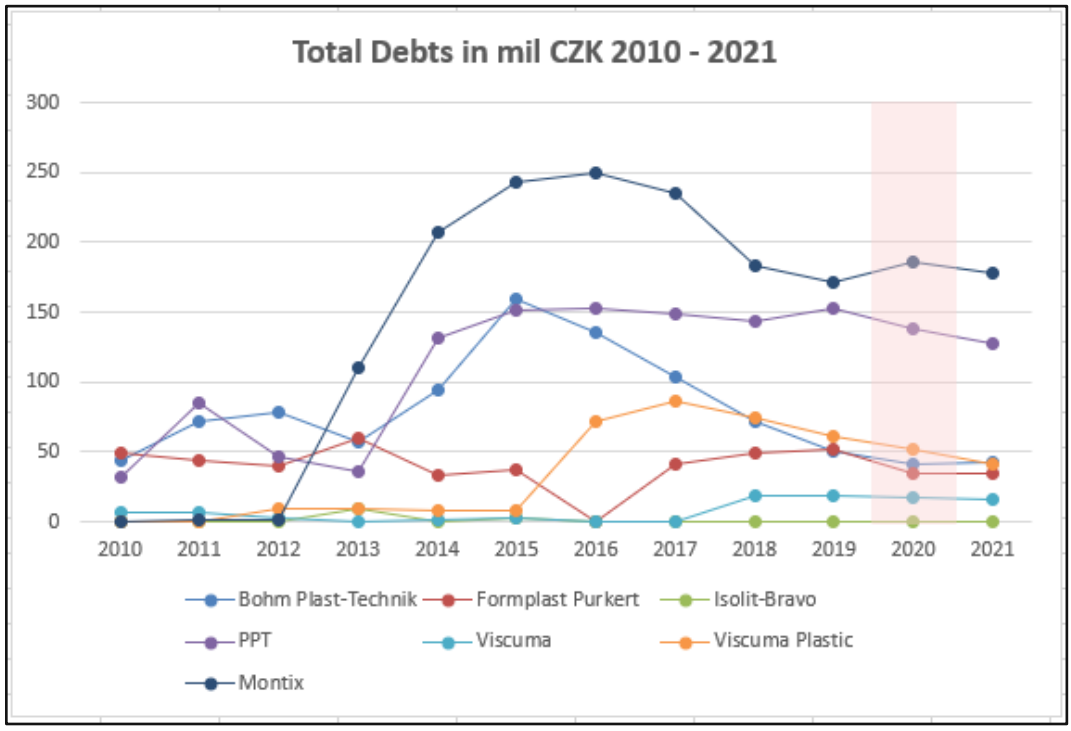
Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

Based on ROA yoy growth rate the whole period the situation is completely different.

The calculations in the Table 25 show that during the whole period the worst one was company Montix on average but also in the period 2020/19 and 2021/20, the second one was PPT also in both periods, the third one Böhm Plast – Technik. Based on the ROA indicator we could completely say that the company Montix was the most inefficient company with using assets for operative activities. Based on up to now done there are two inefficient companies: Montix and PPT with very significant similar results and trends.

The next indicator based on the critical discussion with the managers and owners were assigned as Total Debt and Net Debt. The Total debt indicator means the Total short term debts plus the Total long term debts. These indicators are important by themselves and also e.g. in the ratio with Total Assets, Equity tec. But for the purpose of this Master Thesis the separate indicators were used. The pressure to reduce or pay back the Total Debts is necessary especially before some crisis comes. In the crisis period is the most important to have the level of the debts at the minimal level in the relationships to e.g. Assets, Equity.

FIGURE 25: TOTAL DEBTS 2010 - 21 - CHOSEN TIER 2 COMPANIES



Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

TABLE 26: TOTAL DEBTS 2010 – 2021 CHOSEN TIER 2 COMPANIES

Total Debt in mil CZK	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	ø	Median	s^2_x/1000	ø growth
Bohm Plast-Technik	44,3	72,0	79,0	57,5	94,0	159,8	135,6	103,9	71,7	50,4	40,8	42,1	79,26	71,85	1,33	5,77
Formplast Purkert	48,7	43,7	39,5	60,3	32,7	37,8	0,0	41,3	48,8	51,3	35,0	34,2	39,44	40,38	0,20	-9,85
Isolit-Bravo	0,0	0,0	0,0	9,6	0,6	3,4	0,0	0,0	0,0	0,0	0,0	0,0	1,13	0,00	0,01	24,21
PPT	31,7	85,2	46,3	36,4	131,1	151,3	152,5	148,3	144,0	153,1	138,1	127,5	112,13	134,62	2,14	32,83
Viscuma	7,2	7,2	2,3	0,0	1,8	2,2	0,0	0,0	19,1	19,3	17,5	15,4	7,67	4,77	0,06	-23,89
Viscuma Plastic	0,0	0,0	9,0	9,2	8,6	8,1	71,8	86,6	74,4	61,0	52,1	41,9	35,21	25,52	0,98	66,63
Montix	0,0	1,6	1,9	110,5	207,2	242,6	249,5	234,5	183,8	171,2	186,2	178,2	147,27	181,00	8,38	8,77
MAX	48,7	85,2	79,0	110,5	207,2	242,6	249,5	234,5	183,8	171,2	186,2	178,2				
MIN	0,0	0,0	0,0	0,0	0,6	2,2	0,0	0,0	0,0	0,0	0,0	0,0				
R	48,7	85,2	79,0	110,5	206,6	240,4	249,5	234,5	183,8	171,2	186,2	178,2				
ø	18,8	30,0	25,4	40,5	68,0	86,5	87,1	87,8	77,4	72,3	67,1	62,8				
Median	7,2	7,2	9,0	36,4	32,7	37,8	71,8	86,6	71,7	51,3	40,8	41,9				

Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

For the results discussion can be better used the next Table 27 and its Total Debts yoy growth rate but in total can be written e.g. that the highest Total Debts were realized in 2016 with company Montix (249,5 mil CZK) then PPT (152,5 mil CZK). The third one was Böhm Plast – Technik (135,6 mil CZK). The 2017 was the year when the AI and also the macroeconomic surrounding started went down. Based on that the rapidity of the Total Debts decrease should have been increased. But if compare 2019 and 2020 the Total Debts only in Montix went up from 171,2 mil CZK to 186,2 mil CZK. The year 2021 could be critical not only for Montix but also for PPT. The best one Isolit Bravo during the whole period 0 mil CZK Total Debts. Too high Total Debts above the border 100 mil CZK seem to be critical esp. with the Sales around 200 mil CZK (PPT) and 570 mil CZK (Montix).

TABLE 27: TOTAL DEBTS YOY GROWTH RATE IN % 2010 - 2021

Total Debt growth in %	11/10	12/11	13/12	14/13	15/14	16/15	17/16	18/17	19/18	20/19	21/20	ø	Scale
Böhm Plast - Technik	62,53	9,72	-27,22	63,48	70,00	-15,14	-23,38	-30,99	-29,71	-19,05	3,19	-7,93	
Formplast Purkert	-10,20	-9,75	52,70	-45,67	15,43	-100,00	0,00	18,18	5,18	-31,82	-2,43	-2,72	1
Isolit-Bravo	0,00	0,00	0,00	-93,70	459,97	-100,00	0,00	0,00	0,00	0,00	0,00	0,00	
PPT	168,92	-45,67	-21,32	259,83	15,37	0,83	-2,79	-2,89	6,30	-9,76	-7,68	-3,51	2
Viscuma	-0,07	-67,35	-100,00	0,00	25,25	-100,00	0,00	0,00	0,81	-9,10	-12,30	-5,15	3
Viscuma Plastic	0,00	0,00	1,67	-6,56	-5,58	789,01	20,63	-14,08	-18,03	-14,47	-19,66	-16,56	
Montix	0,00	18,97	0,00	87,55	17,13	2,84	-6,01	-21,65	-6,83	8,78	-4,30	-6,00	

Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

According the indicator Total Debts yoy growth rate the situation seems to be a bit different because of the average scores measured from 2018/17 till 2021/20 yoy changes. The less decrease was realized by Formplast Purkert (-2,72%), then PPT (-3,51%) and Viscuma (-5,15%). But for Formplast Purkert the absolute value of the Total Debts in comparison with e.g. the Sales and for company Viscuma too the smaller decrease can be acceptable. The second position for PPT and fourth for Montix with their absolute values the situation was much worse.

If we compare the results of indicator Net Debts, which is calculated the Total Debts minus Cash and Cash equivalence we can get very similar results (see Table 28 and 29).

TABLE 28: NET DEBTS 2010 – 2021 CHOSEN TIER 2 COMPANIES

Net Debt in mil CZK	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	ø	Median	s^2_x/1000	ø growth
Bohm Plast-Technik	39,2	70,0	78,2	54,2	38,0	151,8	129,5	101,7	68,6	42,7	38,8	41,3	71,17	61,41	1,34	20,01
Formplast Purkert	26,9	24,5	-18,0	-5,9	-17,4	-95,6	-193,0	-158,0	-141,4	-138,7	-121,2	-124,7	-80,20	-108,43	5,47	43,30
Isolit-Bravo	-639,9	-704,9	-794,0	-871,5	-911,9	-866,1	-926,8	-629,6	-691,3	-720,7	-738,2	-739,7	-769,54	-738,90	9,69	0,60
PPT	29,4	84,3	46,1	35,3	129,8	148,1	143,1	142,5	141,2	151,9	137,2	127,5	109,72	133,51	2,05	35,06
Viscuma	2,8	2,9	-6,0	-10,2	-22,7	-28,8	-22,7	-29,6	-15,4	-27,1	-25,1	-24,0	-17,16	-22,75	0,13	-14,54
Viscuma Plastic	-2,5	-1,2	8,8	9,1	8,0	-1,0	67,9	86,5	69,4	60,7	51,2	39,2	33,01	24,17	0,99	-674,16
Montix	0,0	-7,7	-8,3	104,8	183,2	225,4	229,6	228,8	176,4	167,3	183,2	174,6	138,10	175,48	7,90	7,73
MAX	39,2	84,3	78,2	104,8	183,2	225,4	229,6	228,8	176,4	167,3	183,2	174,6				
MIN	-639,9	-704,9	-794,0	-871,5	-911,9	-866,1	-926,8	-629,6	-691,3	-720,7	-738,2	-739,7				
R	679,1	789,3	872,2	976,3	1095,2	1091,5	1156,3	858,4	867,7	888,0	921,3	914,2				
ø	-77,7	-76,0	-99,0	-97,7	-84,7	-66,6	-81,8	-36,8	-56,1	-66,3	-67,7	-72,2				
Median	2,8	2,9	-6,0	9,1	8,0	-1,0	67,9	86,5	68,6	42,7	38,8	39,2				

Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

TABLE 29: NET DEBTS YOY GROWTH RATE IN % 2010 - 2021

Net Debt growth in %	11/10	12/11	13/12	14/13	15/14	16/15	17/16	18/17	19/18	20/19	21/20	ø	Scale
Böhm Plast - Technik	78,57	11,71	-30,69	-29,89	299,47	-14,66	-21,53	-32,50	-37,75	-9,15	6,49	-18,23	
Formplast Purkert	-8,86	-173,33	-67,36	196,45	449,74	101,83	0,00	-10,50	-1,93	-12,58	-2,86	-6,96	3
Isolit-Bravo	0,00	0,00	0,00	4,63	-5,03	7,01	0,00	0,00	0,00	0,00	0,00	0,00	
PPT	186,82	-45,28	-23,43	267,35	14,13	-3,41	-0,40	-0,91	7,56	-9,66	-7,07	-2,52	1
Viscuma	3,64	-303,96	70,29	0,00	26,65	-21,03	0,00	0,00	-76,40	-7,34	-4,60	-22,09	
Viscuma Plastic	0,00	0,00	4,26	-12,59	-111,90	-7251,47	27,36	-19,83	-12,49	-15,60	-23,46	-17,84	
Montix	0,00	8,94	0,00	74,86	23,02	1,85	-0,35	-22,91	-5,14	9,48	-4,68	-5,81	2

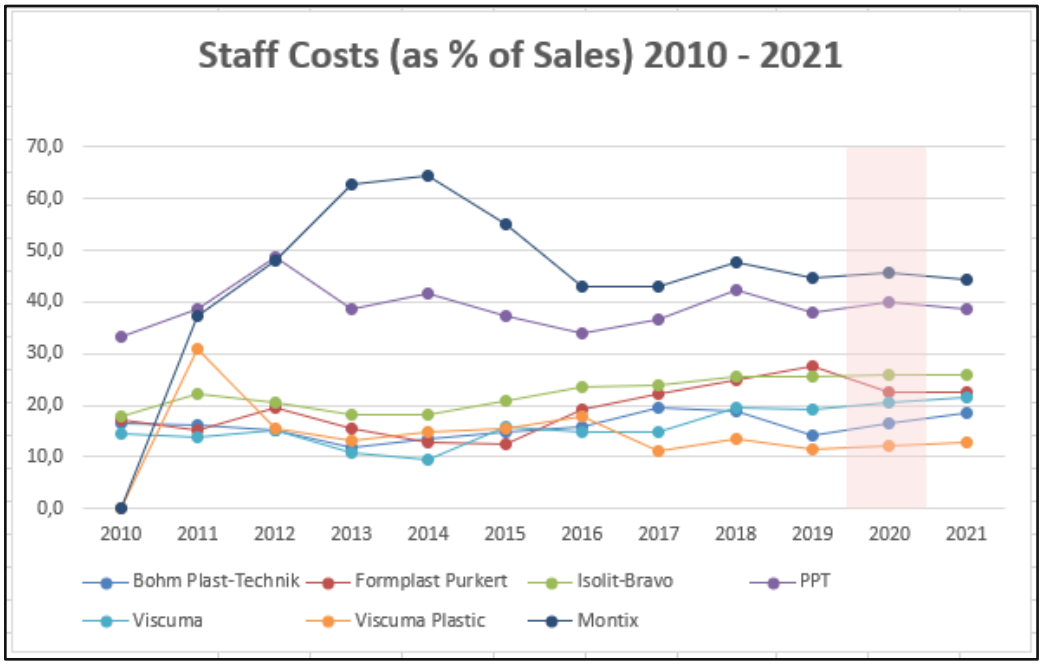
Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

The scale for the indicator Net Debts says that the worst one is PPT with the average decline rate -2,52% during the period 2018/17 – 2021/20 is the smallest, followed by Montix at the second worst position with -5,81% and the third one Formplast Purkert with -6,96% score. Thit means that the rapidity of the Net Debts growth decrease was in comparison with the best one company Viscuma -22,09% very low. Also based on this indicator the author can say that the companies PPT and Montix have some similarities and very similar status esp. during the period 2018/17 – 2021/20. That is a partial answer for the Research question 3.

The last indicators mentioned directly in the master Thesis is the Staff Costs (as % of Sales). With the Material Consumption (as % of Sales) which will be mentioned by the author later as one of the universal recommendations is the Staff Costs (as % of Sales) one of the mentioned indicators during the critical discussion.

The other indicators are mentioned further in the text and their calculations and figures are a part of Appendix 4.

FIGURE 26: STAFF COSTS 2010 - 21 - CHOSEN TIER 2 COMPANIES



Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

TABLE 30: COSTS STAFF 2010 – 2021 CHOSEN TIER 2 COMPANIES

Staff Cost (As % of Sales)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	ø	Median	s^2_x/1000	ø growth
Bohm Plast-Technik	16,5	16,0	15,0	11,7	13,5	14,8	15,8	19,6	18,9	14,2	16,4	18,4	15,90	15,94	4,80	2,14
Formplast Purkert	17,4	15,3	19,5	15,7	12,8	12,6	19,2	22,3	24,8	27,4	22,5	22,6	19,34	19,35	20,44	2,95
Isolit-Bravo	18,0	22,2	20,6	18,4	18,3	20,7	23,6	23,8	25,5	25,4	26,0	26,0	22,38	22,93	8,89	2,46
PPT	33,1	38,7	48,8	38,6	41,7	37,2	34,0	36,5	42,4	38,0	39,8	38,7	38,95	38,62	15,50	2,35
Viscuma	14,4	13,8	15,1	10,9	9,6	15,8	14,8	14,9	19,6	19,1	20,6	21,7	15,86	15,01	12,87	4,12
Viscuma Plastic	0,0	30,9	15,5	13,1	15,0	15,6	18,0	11,3	13,4	11,6	12,3	13,0	14,13	13,24	43,34	-0,15
Montix	0,0	37,2	48,1	62,9	64,3	55,0	42,9	42,9	47,5	44,8	45,7	44,3	44,63	45,26	241,92	-2,74
MAX	33,1	38,7	48,8	62,9	64,3	55,0	42,9	42,9	47,5	44,8	45,7	44,3				
MIN	0,0	13,8	15,0	10,9	9,6	12,6	14,8	11,3	13,4	11,6	12,3	13,0				
R	33,1	24,9	33,8	52,0	54,7	42,4	28,1	31,6	34,1	33,2	33,4	31,3				
ø	14,2	24,9	26,1	24,4	25,0	24,5	24,1	24,4	27,4	25,8	26,2	26,4				
Median	16,5	22,2	19,5	15,7	15,0	15,8	19,2	22,3	24,8	25,4	22,5	22,6				

Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

The Cost Staff (as % of Sales) indicator gives the answer for the question how big consumption of Sales according the staff and its salaries in the company is. There can be two main problems if the portion is higher than the acceptable. The first one the Sales are so low, or the second one the salaries are too high. Both problems are deserved its own analysis. But for the Master Thesis we can analyse the Staff Costs as % of Sales only.

Based on the figures in the Table 30 cyn be seen that the worst results had company Montix 44,63% on average confirmed also by the median result 45,26% also the variability/dispersion s^2_x 241,92. The second one PPT (38,95; 38,62; 15,50) and the third one Isolit Bravo (22,38; 22,93; 15,50). Also that measurement confirmed similarities between Montix and PPT as companies in crises according the Research Question 3.

TABLE 31: STAFF COSTS YOY GROWTH RATE IN % 2010 - 2021

Staff Cost (As % of Sales)	11/10	12/11	13/12	14/13	15/14	16/15	17/16	18/17	19/18	20/19	21/20	ø	Scale
Böhm Plast - Technik	-2,87	-6,34	-22,12	15,18	9,54	7,38	23,50	-3,56	-24,72	15,26	12,27	-0,19	
Formplast Purkert	-11,69	27,18	-19,63	-18,12	-1,77	52,26	0,00	11,16	10,85	-17,90	0,11	1,05	
Isolit-Bravo	0,00	0,00	0,00	-0,56	13,60	14,06	0,00	0,00	0,00	0,00	0,00	0,00	
PPT	16,80	26,13	-20,93	8,10	-10,68	-8,72	7,24	16,38	-10,48	4,80	-2,76	1,98	3
Viscuma	-4,63	9,92	-28,16	0,00	63,70	-5,91	0,00	0,00	-2,66	7,75	5,34	2,61	2
Viscuma Plastic	0,00	0,00	-15,42	14,47	3,85	15,59	-37,37	19,02	-13,16	5,69	5,69	4,31	1
Montix	0,00	0,00	0,00	2,24	-14,42	-22,06	-0,03	10,84	-5,70	1,99	-3,02	1,03	

Source: (ACEA, OECD, Helgi Library, own preparation, 2022)

On the other hand the Table 31 which describes Staff Costs (as % of Sales) in yoy growth rate brought different results. The worst one Viscuma Plastic, the second one Viscuma and the third one PPT. But it is based on the growth. In this case the absolute values and figures are more important because in the crisis period (esp. 2020/19 – 2021/20) the Staff Costs could not have been solved in a short term time period to react to the general macroeconomic and industry situation.

For the final evaluation the Figure 27 was prepared. There are mentioned the results of the companies in each criteria or indicators. As first is needed to mention that the indicators EBIT (Earning before interests and taxes), Gross profit, EBIT Margin, ROE (Return on Equity) and Cost per Employee are enclosed to the Appendix 4.

TABLE 32: THE FINAL SCORE AND EVALUATION

	Sales	EBIT	Gross Profit	EBIT Margin	ROE	ROA	EBITDA Margin	Total Debt	NET Debt	Cost per Employee	Staff Cost	Score	Evaluation
Bohm Plast-Technik			3		3	3	1					**13**	**Bad**
Formplast Purkert								1	3			11	
Isolit-Bravo	2									3		6	
PPT	3	2	2	2	2	2	3	2	1	1	3	**53**	**Worse**
Viscuma								3		2	2	11	
Viscuma Plastic		3		3							1	12	
Montix	1	1	1	1	1	1	2		2			**70**	**Worst**
	1 = 10 points				*2 = 5 points*				*3 = 1 points*				

Source: (Own preparation, 2022)

Through the Figure 27 in short can be seen that EBIT indicators in the yoy growth rate comparison was the worst one at the company Montix (with negative growth rate; -3.243,65 in 2021/20), the second one was PPT (-127,08) and Viscuma Plastic (-15,06) as the third one was. Regarding Gross Profit indicator (also in yoy) the worst one was Montix (-163,21) then PPT (-57,59) and the third one Böhm Plast – Technik (-18,79). Evaluation of the EBIT Margin means the worst position for Montix, followed by PPT and Viscuma Plastic. Concerning the indicator ROE (Return on Equity) the worst one was again Montix

during the last period 2018/17 – 2021/20 with the average yoy growth rate (-3257,64), the second was PPT (-58,50) and the third one Böhm Plast – Technik (-36,53). The Cost per Employee indicator measures, in absolute value in CZK, how much money each emaployee costs in the company. The highest means the worst but we can discussed later if e.g. the most expensive people can bring higher Sales or Profit into the company. The highest Costs for Employee has the company PPT (40.534,64 CZK), followed by the company Viscuma (39.539,42) and Isolit-Bravo (36.918,07 CZK) on average during the period 2010 – 2021. The last indicator is Staff Costs (as % of Sales). This indicator tells you, how much or how big portion from the Sales is consumed with the salaries, wages etc. In absolute figures the worst company was Montix with 44,63% (in yoy growth rate Viscuma Plastic), the second worst company was PPT with 38,95% (in yoy growth rate Viscuma) and the third one was Isolit-Bravo with 22,38%.

Base on the final Table 32 can be said that the very similar results in each categories brought the similarities between two worst companies: Montix and PPT.

Based on these mentioned results and also on the critical discussion with the managers and owners the similarities leading to the critical situation before and especially during the Covid 19 pandemic period are:

- Significant decrease of the Sales before the critical period and highest fall during the period 2019 – 2020,
- Earnings Before Interests and Taxes at the low level and relatively high speed of decline two years before the critical situation 2019 – 2020,
- EBIT Margin is significantly low during the whole period except the period 2011 – 2013 when the Automotive Industry was recovered from the crisis 2007 – 2009,
- ROA, ROE below the average of the industry especially with a enormous decline during 2016 – 2019,
- Net Debt and its level in relationship with the low EBITDA ans EBITDA Margin means that company is not able to cover its debts and interests,

- EBITDA Margin and its negative values during the 2020/21which means that the company was not able to cover its operational costs (the most valuable and critical indicator based on the critical discussion),
- The rest (Cost per Employee; Staff Costs) are not so important according the critical discussion and with limited value.

Based on that we can partially answer the **Research Question**:

3. If there are some crisis similarities are there also some recovery similarities in companies in AI at the level Tier 2?

The crisis similarities were identified very preciously especially in the financial field because the financial field aggregates all the problems and details in the company. So, that means the author is able to say that there are a lot of crisis similarities or symptoms that companies have or will have a lot of troubles during the decrease of the Automotive Industry itself and also the macroeconomic surrounding. Recovery similarities, the answer, the author would like to describe separately. Answer for the **Research question 3**. sounds in short yes, **there are many crisis similarities** from the lost or decline of Sales, decreasing company profit based on not effective activities in operation, increase or stabile situation with debts and a long period of cash cycle conversion. Based on the critical discussion the author can also say that one of the main problem of the companies with problems with their financial situation is:,

- "lack of leadership" as first,
- secondly operative data in rabish like machine cycle times, performance norms,
- missing internal controlling functions,
- chaotic and firefighting daily management,
- owners´ and stakeholders´ distance from daily management,
- weak risk analysis and survival plans,

- limited or none of strategy meeting,
- limited adoptability on external factors like market decrease (esp. AI),
- quite a huge range of product portfolio, limited specialization,
- products with a low additional value,
- low cost of project and production program relocation to another supplier,
- and the last one but the most important one “no vision, no strategy definition, no perspective” as a daily North star like “Strategy as everyones´ everyday job”,
- and some others but not so important, with the same level of importance.

All the mentioned results of the research according the usage of data, statistical methods and calculations and, of course, the results from the critical discussions the author can make some decision for **the last hypothesis**:

H3: It is expected that there are some symptom similarities between unsuccessful companies which have the highest profit decrease during the defined time period.

This hypothesis **H3 can be finally confirmed**. There are many similarities or symptoms in defined unsuccessful companies Montix and PPT. The methodology of the research and calculated results were also confirmed by the real companies´situations. The company Montix was sold in May 2021 by the owners for a small part of the original value because the company was approximately two months before the insolvency and some investment and debts refinancing procedure was absolutely needed. The company PPT on the other hands and its owners of the company tried to sell the company from June 2021 till July 2022 without success. That means the company ended in the insolvency procedure and bankrupt in the end.

Also based on these mentioned symptoms of problematic companies and based on the critical discussion with the managers the definition of the recovery procedures or similarities as the second part of the Research question 3 can be answered. Also the answer can be defined based on the status that the author tried to offer the solution or the way to

recovery in the first step and in the second step also to buy the companies Montix and PPT. That means that the **second part of the Research question 3**. can´t be smartly and shortly answered because both companies changed their status in 2021 or 2022. Concerning the answer for the **Research question 3. that can be replied** that some general recovery similarities can be found or defined but **only on a theoretical level** due to the changes in the analysed companies and the recovery procedures mostly depend on the current and specific situation of each company and it is very difficult to make some generalization. The author would like to specify instead of the recovery similarities, which could not be possible to analysed in the own research, the general strategic recommendations, which are also mentioned in the **Research question 4.**:

Are there universal recommendations for recovering the companies, managing them and being prepared for the future?

From authorś point of view there are generally a lot of basic recovery similarities and also some strategic recommendations. In the following text author would like to define some strategic recommendations not only for the company from the Tier 2 level in the Automotive Industry but mostly for all which would like to be ready for the unpredictable future in the permanently changing world.

The universal strategic recommendations on a theoretical level are mentioned and described because of having mostly, but not completely, the same principles with some specific features for each independent company not only in Automotive Industry in the Czech Republic. But the author focused on them and AI, so the strategic recommendations are defined not only on the theoretical level but used a lot of details from the authorś own survey, research and experience.

The strategic recommendations are devided into two parts. The first one is devoted to the macroeconomic surrounding and Automotive Industry situation. The second one to the companies themselves based on the financial details and internal features too. Both parts are results form the own research, statistical calculations, critical discussions and authors own experience due to spending some years in the Automotive Industry.

The macroeconomic surrounding situation and strategic recommendations are and the companies need to be ready for:

- macroeconomic stagnation during the next 2 - 3 year time period till 2025 as latest
- increasing grow of state debts which have to be covered from the company and also citizen or public resources
- additional economic or market liberalization at other regions than the EU (BRICS, South America, etc.) with the living standard increase than there
- economic freedom and conditions for making profitable business will be additionally limited in the EU, socialism, collectivism and central economy planning with technology and sources control slowly coming
- industrial production of the final goods movements to the East or closer to the raw material resources
- dangerous increase of the "Green Deal" state regulations in the EU
- high level of inflation (between 10-15% next 2 years) with consequence of higher interest rates for investments, loans etc.
- increasing of Staff Costs and lack of working able and willing people in the EU
- the continual decrease of the EU competitiveness against the rest of the world
- Euro as a currency could mean the problem in a longer time period (5 – 10 years)

Based on the macroeconomy survey and calculations plus economic freedom analyses (see the chapters 4.1 and 4.2) the companies which would like to exist and make profit higher than average they need to be ready for these mentioned facts separately and also in some unpredictable combinations. According the Research question 4. Can be written **the most important general recommendations** need to be addressed **as**: following and seeing the macroeconomy trends, prepare the risk potential analysis with the impacts on the company, invest after having a signed contract only, avoid

keeping cash above the needs, implement automatization as much as possible according effectiveness.

Regarding the megatrends in Automotive Industry especially in the Central Europe the author would like to recommend these things as some recommendations for megatrends in Automotive Industry mostly as general recommendations for the Tier 2 suppliers and how to be ready for them:

1. **Globalization / Glocalization**: standard process of globalization seems to be in the end, glocalization is the trend and for the Tier 2 suppliers means to shorten the distance closer to the main Customer and also „Foot print" production which means that the product getting its additional value on the shortest way to customer.

2. **Digitization and Big Data:** steer the company based on the Internet of Things ideal, digitalization of the processes their measurement, online information sharing in production / quality / logistic / personal / purchaising / sales etc. processes. As supplier also shared the data with the main Customer, not only EDI or Call Off data, but complete data Exchange.

3. **Connected Car**: that means for the Tier 2 suppliers to come with the concept or products which can give them the possibility to be connected with the metasystem of the cars (being connected with the driving unit). The simple products with low additional value like e.g. plastic parts are cańt enable to realize higher profit than +5-7% as maximum. That can not make possible to invest and also being secured from the production program relocation to the more cheaper locations or suppliers.

4. **New Work:** try to absorb or create the modern approach to the workforce, flexible production team, learning organization, independent teams, work in flexible organization struktures, creativity, support the DoE (design of experiments), etc.

5. **3D-Printing:** try to implement into the companies aktivities especially into design and development 3D printing for prototyiping etc. Also follow very deeply the trends in this field because 3D printing in plastics can replace the current plastic injection machines esp. for the complicated parts, low series parts etc.

The next part of **the general recommendations** is devoted to the **strategic, financial and production fields** in the Tier 2 companies. This topic and guestion which kind of things are the most important and which recommendations are mostly valid was many times discussed with the Tier 2 managers and owners. In this MT the author mentioned only these which were accepted by managers and owners and which should be used in each company in each financial situation. **The main strategic recommendations**:

1. Have a vision – very preciously establish the main company goal; to where and why the company goes
2. Strategy definition and stratégy targets fulfilment – stratégy as „Everyoneś everyday job"; continual process of strategy fulfilment
3. To have a plan – with priorities, sources, timing schedules etc.
4. Leadership as first – and steering changes from the up to bottom
5. Company levels allignment – all company levels are working together on the defined goals and targets; each process has its own supplier – owner – customer.
6. All the activities according the Customer requirements only – not less, not much with defined effeciency and performance.

Thomas Bat'a, the most famous Czech interpreneuer, defined **10 rules for being successful** not only during the crisis period. They are still valid:

1. *Company on the world level of excelence* – each activity with the best one effeciency, quality and profitability
2. *Cooperation* – inside and outside the company, nets of cooperation, partnerships
3. *Selfmanagement* – selfcontrol ability
4. *Participation* – on financial results, on working results for all
5. *Participation on ownership* – company internal funds, account and bank

6. *Competition* – 100% transparency for the results, benefits and profits
7. *Independent management* – each subsidiaries, process etc. has its own responsibles
8. *Intercompany markets* – slaes and costs to every company activities
9. *Synergy* – for all of the company functions, activities etc.
10. *Service* – everything to be done for the Customer additioanl value increase.

To be able to implement these above mentioned and Thomas Bat'a recommendation means that the company can easily be a „Strategic Focused Organization". The only way is to start, physically to do, not only having all these steps as a paper work or presentation.

The last group of recommendations have been done **based on the analyses** in the Chapter 4.8 and 4.9. During the critical discussions with the managers and owners of the Tier 2 companies we defined which measures or indicators are the most interesting for them from the practical or daily management point of view. Of course, there are some existing concepts for that, e.g. EVA – Economic Value Added, or some strategical concepts like Balanced Scorecards etc. But sometimes in the Tier 2 level has some specific needs to be manageable on daily activities but also with some aggregade functiones. The last general recommendations with some special focus:

1. **EBITDA Margin** above the Automotive Industry average – that gives a good view on the operative results without the investment costs and depreciation/amotization. EBITDA margin needs to be above the industry average. In case of the Automotive Industry in the Czech Republic the long term average is 15,7%. Also Tier 1 companies are involved. Focus on EBITDA Margin can give a certaincy to cover all the operative costs. In case of the Tier 2 suppliers the best ones have the long term average around 17 – 19%.
2. **Material Consumption** is one of the most critical indicator not only needs for recovery but also needs for the standard company existence. The lower the better is. The higher level of material consuption than 20 – 23% from Sales means start of the problems because there are only three potential reasons: material consuption

for some products are higher than calculated and agreed with the customer, the scrap rate is higher than calculated or the products themselves are wrongly calculated (too low) and realizing the production the situation is worse nad worse.

3. **Staff Costs Margin:** the second main indicator which give to anybody a good inside view into the company existence. Too high ratio means two things only: the staff costs more money than usual and the performance measure by the Sales in relationship to the Staff Costs is lower than the average. The Tier level long term average is less than 27%. The higher ratio means some financial problems.

4. **Net Debts:** the last from the most important measures of the company activities is the Net Debts which means Total debts minus Available Cash and Cash Equivalents. According the analysed companies companies and long term average the ideal Net Debts level is 8% of Sales as maximum on yearly basis. The reason is very simple, when the Sales goes down rapidly the company needs to be able to manage its debts with having enough money for the payment back.

These above mentioned recommendations from the Tier 2 company survey and also based on the critical discussions with the managers can give or help to the managers not only to survive but also to steer the companies during the calm and secured time periods. Of course with some focus to extend the company activities and their business too. The gola is not only to survive ome crises but to make business continualy.

4.10. Short summary of the Chapter 4

Most of the necessary analyses regarding the AI in Tier 2 level were done in the Chapter 4. The analyses were done with usage of the statistical methods and approach mostly as well as the critical discussion with the managers and owners were used. Based on the results the companies were devided into the most problematic group (Montix and PPT members) and the res. Than the recommandations were than defined. All the research questions (2; 3; 4) were answered also with the hypothesis H2 and H3 were confirmed.

5. DISCUSSION

There main task of the Master Thesis was to understand the current situation in Automotive Industry. Especially it should help to analyse and identify some macroeconomic situations and also some impacts including the Covid 19 pandemic situation on companies in the Automotive Industry even if the industry itself.

I paid my special attention to companies from the Tier 2 level (sub-suppliers) which some analyses were made in this field. Because the topic is very wide for understanding, I decided to analyse the economic freedom as the basis for some economical activities, then the macro situation of the states then Automotive Industry as one of the biggest industrial sector in the world and the reflection on the current situation in Tier 2 level in AI. Based on that I wanted to know if there were some crisis or potentially dangerous similarities for the future existence of the companies in the Tier 2 level focusing on plastic moulding for lighting. Also I wanted to know if were some recovery similarities which should be transferred into the general recommendations.

Because the Master Thesis or their theme was so wide I decided to split the topic into three main areas.

1. Understanding of the current economic situation in the world is needed as first. Based on that I needed to analyse the market economy as a system of business relationship and prepared some analysis of the micro structure of the market economy. Based on that there was a more simple way to fully understand the market economy and its own balance status. For that I use the TLM method (Theoretical Logical Method) with trying to find the first basic relationship in the analysed problem and between the basic entities Buyer – Seller who were focus on the goods / its value and a common transaction with the additional value for both. Based on that model I wanted to also show how sensitive the first or basic relationship is especially for the external forces represented by the state, or group of states or some entities above the states (EU). Based on that modelling everybody

could see that this kind of market economy has its own prerequisites for some crisis status when the external forces or impacts are so strong and the microstructure of the market economy is permanently destroyed. Based on that I analysed the level of the Economic freedom in chosen states and EU. The main results were the Economic Freedom Score 2014 – 2020 when I found that the cores were going down during the time period in each analysed countries. The highest decline was calculated in Spain and Poland., on the other hand the lowest decrease in Germany, Spain and Czech Republic. Based on that the second part was to analyse the Business Cycles. There was calculated how much critical periods the chosen economy had during the time period 1999 – 2021 and how long took from the top to the ground. The results were: France 8 crisis periods, the longest 36 months, the second one Italy 8 crisis periods too, 35 months long. The shortest then Czech Republic and Slovakia 6 times and 30 months long.

2. The second analyses were focused on the macroeconomy situation because the Automotive Industry seemed to be very sensitive for the macro situation. For this kind of analyses I used qualitative research analysis and quantitative research analysis too. Especially some data mining and also some statistic methods like Growth Rate, Simple Moving Average, Correlation and Regression Analysis and others. From the macroeconomic point of vie I decided to analyse some chosen indicators in their absolute values and also in their growth rate values. The chosen indicators were GDP, GDP per Capita, General Government Gross Debts and Inflation measured via Harmonised Indices of Consumer Prices. Each indicators in absolute value during the period 2013 – 20212 and also in the growth rate values in % year-to-year.

   Especially I was focused on the period 2019 – 2021 because there were most issues e.g. some new phenomenon the Covid 19 pandemic situation all around the world. The analyses were done in the group of countries where the companies from Tier 2 level supply esp. where the car manufacturers are located. The findings or result were mostly positive in the beginning of the analysed time period but negative on average during the 2018 – 2019. Due to the Covid 19 pandemic satiation there was

a critical situation in every analysed country, e.g. GDP -12% in the first two quarters 2020, GGGD (government debts) increased enormously with the ratio e.g. +19,58% 2020/2019 and additionally +26,07% 2021/2020. The other countries had similar resuls. Concerning inflation the ratios were +/- stable but during the year 2020 and 2021 incerased in every countries, e.g. in the Czech republic +3,3%. Current situation is completely worst, in the Czech republic the inflation measured with CPI is about +16,5% according 2021! Also in this chapter I mentioned some predictions especially for the inflation.

Some part of this chapter was devoted to the Covid 19 pandemic situation and its influence or impacts on the real economies and indicators. Concerning worldwide health situation the Covid 19 means a significant increase in mortality with all the impacts behind and also that was mentioned and analysed.

3. The third part of the Master thesis I devoted to the Automotive Industry and especially to the companies on the Tier 2 level (sub-suppliers). Regarding the Automotive Industry as the whole I analysed especially the Total production during the time period 201 – 2021 in the world and European Union, the New car registrations also in the world and EU etc. For this kind of analyses I used regression and Correlation analyses (linear kind) between the macroeconomic indicators like GDP, GGGD and HICP (inflation) and Total production in the World and EU. Also New car registration in the world and EU I used. The results were mostly surprising due to the negative linear regression and corellations.

   The second part of this chapter was devoted to the companies from the Tier 2 level in the Czech Republic. The aim was to find some crisis similarities and potentially some recovery similarities. Based on the results and used methods I found some crisis similarities based data analyses with usage the statistic methods and also based on the critical discussions which I had with the managers and oners of the companies. On the other hand I was not successful completely concerning findings of recovery similarities. As was written one of the aim of the MT was to define some general strategic recommendations and that was done in the end of MT.

6. CONCLUSION

The main aim of this Master Thesis was to reveal impacts of the global economic situation and megatrends on the Automotive Industry especially some companies from the Tier 2 level in the time period 2019 to 2021 when the new phenomenon, except existing, like worldwide pandemic situation appeared. These negative influences on the company existence are mostly manageable but during this time period there has been a mix of them and also a lot of additional problems such a customer call offs decrease, raw material shortages, enormous electricity and gas price rising, lack of worker staff and so on. All these influences at the same time have been a mix of negative impacts on the company performance and in some cases the company existence too.

One of the aims of this Master Thesis was to try to find some crisis similarities in the group of companies from the Tier level in the Automotive Industry. Before these findings the author analyzed the market economy microstructure for a better understanding of relationships and interests inside, then also economic freedom in chosen countries, business cycle situations, macroeconomic situations and historical, current and potentially future status of the Automotive Industry as a whole too. The biggest part of the authors own research was devoted to the level Tier 2 in the Automotive Industry.

Some Research Questions were asked and answered during the Master Thesis working and also three hypotheses were defined at the very beginning of the own survey. Further a short overview of the hypotheses and their final conclusion is seen.

Based on the results the author is able to say that some crisis similarities based on the knowing surrounding and economic situation too are known.

If they are known, it means, that there can be also the answer how to be ready for the current and potential next market situations. The way doing the right things in a right way and in the right time is described and mentioned many times before. This Master Thesis can also applied how to do that in the Automotive Industry at the level Tier 2 (sub-supllier level). This is the main advantage and benefit of this MT.

TABLE 33: HYPOTHESIS EVALUATION

Nr.	Hypothesis	Conclusion
H1	It is expected that the AI has been significantly and negatively influenced during the defined time period.	**confirmed**
H2	It is expected that in the course of the defined time period 2019 – 2021 there have been significant production volume, performance and profit decrease in AI and each of analysed companies.	**confirmed**
H3	It is expected that there are some symptom similarities between unsuccessful companies which have the highest profit decrease during the defined time period.	**confirmed**

Source: (Own preparation, 2022)

How to avoid the consequences the author offers some recovery way of procedures and also defines some general strategic recommendations in the end of the Master Thesis. These general strategic recommendations are defined also with the authorś personal experience because he worked in some company in the Tier 2 level and also tried to buy some of them. The recommendations are written also according the known approaches mostly represented by the famous managers, owners and writers like Thomas Baťa, Henry Ford, Taiichi Ohno, Peter Drucker, Ján Košturiak, Robert Kaplan, Lee Iacocca, Mike Rother, Petr Karásek, Václav Novák and many others.

This MT can also bring some recommendation for the future research because there are some mathematical method called GUHA (General Unary Hypothesis Automaton) which can define, based on the input data, hypothesis automatically and then also tries to confirm or refused them. It is a high level of logic, mathematics and statistics but the results including macro and micro sectors can be very interesting.

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List of abbreviations

MBA – Master of Business Administration

MT – Master Thesis

GDP – Gross Domestic Products

GGGD – General Government Gross Debt

KPI – Key Performance Indicators

EVA – Economic Value Added

AI – Automotive Industry

HICP – Harmonised Indices of Customer Prices

EU – European Union

YOY – Year – to – Year

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Appendix 1: World and EU27 car registration 2007 - 2021

Year	Total registration World	1st diff.	2nd diff	Growth rate (yoy)	ø Growth rate (4 y)
2007	66,2	x	x	x	0,956
2008	63,4	-2,9	x	0,957	
2009	***60,5***	-2,9	0,0	0,955	
2010	70,0	*9,5*	12,4	*1,157*	1,092
2011	78,5	8,5	-1,0	1,121	
2012	82,1	3,6	-4,9	1,046	
2013	85,6	3,5	-0,1	1,043	
2014	89,3	3,7	0,2	1,043	1,037
2015	90,8	1,5	-2,2	1,017	
2016	94,9	4,1	2,6	1,045	
2017	***98,9***	4,1	0,0	1,043	
2018	98,1	-0,8	-4,9	0,992	***0,962***
2019	93,3	-4,8	-4,0	0,951	
2020	80,3	*-13,0*	-8,2	***0,861***	
2021	83,9	3,6	16,6	1,045	
min	60,5	-13,0	-8,2	0,861	0,956
max	98,9	9,5	16,6	1,157	1,092
$R_{(max - min)}$	38,4	22,5	24,8	0,296	0,136
ø	82,4	1,3	0,5	1,020	1,012
Median	83,9	3,6	-0,1	1,043	0,999
SMDT	12,1	5,6	6,6	0,072	0,056

Year	Total registration EU 27	1st diff.	2nd diff	Growth rate (yoy)	ø Growth rate (4 y)
2007	18,7	x	x	x	0,919
2008	17,3	-1,5	x	0,922	
2009	15,8	-1,5	0,0	0,916	
2010	15,1	-0,7	0,7	***0,956***	0,964
2011	15,1	0,0	0,7	1,000	
2012	13,7	-1,4	-1,4	0,907	
2013	13,6	-0,1	1,3	0,993	
2014	17,2	*3,6*	3,7	1,265	1,100
2015	18,4	1,2	-2,4	1,070	
2016	19,0	0,6	-0,6	1,033	
2017	***19,6***	0,6	0,0	1,032	
2018	19,2	-0,4	-1,0	0,980	***0,892***
2019	18,5	-0,7	-0,3	0,964	
2020	11,7	*-6,8*	*-6,1*	***0,632***	
2021	***11,6***	-0,1	6,7	0,991	
min	11,6	-6,8	-6,1	0,632	0,892
max	19,6	3,6	6,7	1,265	1,100
$R_{(max - min)}$	8,0	10,4	12,8	0,632	0,208
ø	16,3	-0,5	0,1	0,976	0,969
Median	17,2	-0,3	0,0	0,986	0,942
SMDT	2,6	2,2	2,9	0,128	0,080

Appendix 2: Correlation and regression GDP EU27 and Car production EU27 2007 – 2021

VÝSLEDEK

Regresní statistika	
Násobné R	0,231110018
Hodnota spolehlivosti R	0,05341184
Nastavená hodnota spole	-0,019402633
Chyba stř. hodnoty	1276,128451
Pozorování	15

ANOVA

	Rozdíl	*SS*	*MS*	*F*	*Významnost F*
Regrese	1	1194561,766	1194561,766	0,733533289	0,407250945
Rezidua	13	21170549,7	1628503,823		
Celkem	14	22365111,46			

		Koeficienty	*Chyba stř. hodnoty*	*t Stat*	*Hodnota P*	*Dolní 95%*	*Horní 95%*	*Dolní 95,0%*	*Horní 95,0%*
Hranice	A	14381,35	2586,642928	5,559849571	9,22968E-05	8793,243267	19969,44788	8793,243267	19969,44788
Soubor X 1	Bx	-128,55	150,091909	-0,85646558	0,407250945	-452,8024097	195,7053019	-452,8024097	195,7053019

	Sloupec 1	*Sloupec 2*
Sloupec 1	1	
Sloupec 2	-0,231110018	1

Appendix 3: Correlation and regression GGGD EU27 and Car registration EU27 2007 – 2021

VÝSLEDEK									
Regresní statistika									
Násobné R	0,315336066								
Hodnota spolehlivosti R	0,099436835								
Nastavená hodnota spolehlivosti R	0,030162745								
Chyba stř. hodnoty	2,680793856								
Pozorování	15								
ANOVA									
	Rozdíl	*SS*	*MS*	*F*	*Významnost F*				
Regrese	1	10,31580924	10,31580924	1,435411639	0,252270432				
Rezidua	13	93,4265241	7,1866557						
Celkem	14	103,7423333							
	Koeficienty	*yba stř. hodnc*	*t Stat*	*Hodnota P*	*Dolní 95%*	*Horní 95%*	*Dolní 95,0%*	*Horní 95,0%*	
Hranice A	21,397	4,313104567	4,960965377	0,000260327	12,0792665	30,71505834	12,0792665	30,71505834	
Soubor X 1 Bx	-0,000517	0,000431628	-1,198086657	0,252270432	-0,001449603	0,000415348	-0,001449603	0,000415348	
	Sloupec 1	*Sloupec 2*							
Sloupec 1	1								
Sloupec 2	-0,3153	1							

Appendix 4: EBIT, EBIT Margin, Gross Profit, ROE, Cost per Employee

EBIT mil/CZK	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	ø	Median	s^2_x/1000	ø growth
Bohm Plast-Technik	9,4	4,5	3,0	12,1	11,5	-27,7	-15,2	-32,5	-29,7	2,8	9,7	10,8	-3,44	3,75	0,28	7,31
Formplast Purkert	56,6	47,6	27,3	40,2	45,4	86,7	86,9	109,6	88,9	100,6	72,5	69,2	69,30	70,83	0,62	7,33
Isolit-Bravo	151,7	94,2	135,3	156,1	91,2	127,3	129,2	170,8	105,0	147,0	107,3	109,2	127,04	128,27	0,62	2,63
PPT	4,0	-2,8	-11,3	16,6	9,5	10,5	15,8	36,0	28,7	19,4	4,1	-11,4	9,92	9,97	0,19	-42,40
Viscuma	2,2	4,9	4,0	13,7	22,5	12,0	5,0	10,1	4,3	9,3	5,2	5,7	8,24	5,47	0,03	39,75
Viscuma Plastic	0,0	-0,5	0,4	8,3	23,1	33,2	22,3	13,2	4,8	6,2	3,9	4,3	9,92	5,46	0,11	189,12
Montix	0,0	0,1	3,1	18,7	40,3	58,4	131,9	102,7	68,5	12,0	0,2	-25,3	34,22	15,37	2,06	-835,93
MAX	151,7	94,2	135,3	156,1	91,2	127,3	131,9	170,8	105,0	147,0	107,3	109,2				
MIN	0,0	-2,8	-11,3	8,3	9,5	-27,7	-15,2	-32,5	-29,7	2,8	0,2	-25,3				
R	151,7	97,0	146,6	147,8	81,7	155,0	147,1	203,3	134,7	144,2	107,1	134,5				
ø	32,0	21,2	23,1	38,0	34,8	42,9	53,7	58,6	38,6	42,5	29,0	23,2				
Median	4,0	4,5	3,1	16,6	23,1	33,2	22,3	36,0	28,7	12,0	5,2	5,7				

EBIT mil/CZK	11/10	12/11	13/12	14/13	15/14	16/15	17/16	18/17	19/18	20/19	21/20	ø	Scale
Böhm Plast - Technik	-52,13	-33,33	303,33	-4,96	-340,87	-45,13	113,82	-8,62	-109,43	246,43	11,34	34,93	
Formplast Purkert	-15,87	-42,70	47,31	13,03	90,77	0,29	26,12	-18,93	13,22	-27,93	-4,64	-9,57	
Isolit-Bravo	-37,86	43,55	15,38	-41,56	39,58	1,46	32,22	-38,51	39,97	-27,01	1,75	-5,95	
PPT	-169,14	310,84	-246,10	-42,69	10,15	51,62	127,23	-20,36	-32,22	-78,90	-376,83	-127,08	2
Viscuma	128,36	-18,34	241,18	63,77	-46,78	-58,37	102,89	-57,69	116,86	-43,60	8,99	6,14	
Viscuma Plastic	0,00	-167,40	2160,33	177,48	44,03	-32,91	-40,96	-63,89	29,87	-37,32	11,11	-15,06	3
Montix	0,00	3014,00	501,41	115,39	44,71	126,04	-22,20	-33,31	-82,45	-98,34	-12760,50	-3243,65	1

EBIT Margin v %	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	ø	Median	s^2_x/1000	ø growth
Bohm Plast-Technik	3,1	1,2	1,0	3,4	2,3	-4,8	-2,6	-7,2	-8,0	0,6	3,1	3,2	-0,40	1,12	0,02	25,63
Formplast Purkert	12,0	9,5	5,7	7,4	6,1	9,8	9,0	10,0	8,0	10,7	8,4	7,9	8,71	8,70	0,00	0,11
Isolit-Bravo	17,6	13,3	17,8	17,0	8,0	10,6	11,4	16,1	11,3	17,4	13,5	13,4	13,95	13,45	0,01	3,09
PPT	3,5	-2,3	-11,6	12,4	7,3	6,5	7,8	17,0	14,3	9,3	2,2	-6,7	4,98	6,94	0,07	-39,16
Viscuma	5,8	8,2	5,4	10,1	10,9	8,0	3,1	6,0	2,8	5,2	3,3	3,6	6,04	5,60	0,01	10,04
Viscuma Plastic	0,0	-44,2	0,9	8,5	14,4	15,0	9,2	2,5	1,0	1,2	0,9	1,0	0,87	1,13	0,21	61,36
Montix	0,0	23,9	20,4	16,0	9,3	14,0	10,5	7,5	1,5	0,8	0,0	-4,5	8,29	8,43	0,07	-1 539,15
MAX	17,6	23,9	20,4	17,0	14,4	15,0	11,4	17,0	14,3	17,4	13,5	13,4				
MIN	0,0	-44,2	-11,6	3,4	2,3	-4,8	-2,6	-7,2	-8,0	0,6	0,0	-6,7				
R	17,6	68,1	32,0	13,6	12,1	19,9	14,0	24,2	22,3	16,8	13,5	20,1				
ø	6,0	1,4	5,7	10,7	8,3	8,4	6,9	7,4	4,4	6,5	4,5	2,5				
Median	3,5	8,2	5,4	10,1	8,0	9,8	9,0	7,5	2,8	5,2	3,1	3,2				

EBIT Margin v %	11/10	12/11	13/12	14/13	15/14	16/15	17/16	18/17	19/18	20/19	21/20	ø	Scale
Böhm Plast - Technik	-59,73	-18,71	235,10	-30,82	-307,26	-46,98	182,12	10,86	-107,38	420,14	4,62	82,06	
Formplast Purkert	-20,85	-39,99	29,48	-17,60	61,36	-8,23	10,49	-19,78	34,03	-21,96	-5,77	-3,37	
Isolit-Bravo	-24,39	34,18	-4,75	-53,15	32,93	8,05	40,74	-29,67	53,48	-22,02	-1,40	0,09	
PPT	-166,96	392,19	-207,54	-40,99	-10,82	18,89	118,44	-15,91	-34,91	-76,50	-406,66	-133,50	2
Viscuma	41,12	-34,62	87,80	7,87	-26,67	-61,38	94,17	-52,49	83,43	-36,29	7,48	0,53	
Viscuma Plastic	0,00	-101,99	870,20	68,82	4,48	-39,06	-72,56	-60,01	24,22	-29,04	9,88	-13,74	3
Montix	0,00	-14,39	-21,57	-42,00	50,13	-24,88	-28,02	-80,10	-45,11	-96,68	-16628,04	-4212,49	1

Gross Profit	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	ø	Median	s^2_x/1000	ø growth
Bohm Plast-Technik	70,4	74,5	57,7	62,8	86,7	87,9	134,3	136,4	103,5	135,6	44,8	38,0	86,05	80,60	1,11	0,97
Formplast Purkert	164,1	153,6	143,5	164,3	197,3	244,6	324,9	466,3	654,6	552,2	490,7	497,5	337,79	284,72	31,02	12,45
Isolit-Bravo	291,6	260,3	322,2	373,3	446,9	476,8	479,3	479,6	549,4	473,6	426,0	421,2	416,68	436,43	7,02	4,13
PPT	45,7	48,2	45,1	73,9	71,6	82,2	105,8	122,2	77,0	99,9	21,3	-9,2	65,30	72,76	1,26	-10,03
Viscuma	2,2	4,9	4,0	13,7	22,5	12,0	5,0	10,1	4,3	9,3	5,8	6,1	8,32	5,95	0,03	40,01
Viscuma Plastic	0,0	-0,2	6,8	21,9	48,8	69,1	68,2	71,5	127,3	131,1	111,2	100,3	63,00	68,65	2,14	-336,49
Montix	0,0	0,2	3,1	18,7	40,3	58,4	131,9	102,7	68,5	12,0	5,1	-19,5	35,13	15,37	1,98	142,68
MAX	291,6	260,3	322,2	373,3	446,9	476,8	479,3	479,6	654,6	552,2	490,7	497,5				
MIN	0,0	-0,2	3,1	13,7	22,5	12,0	5,0	10,1	4,3	9,3	5,1	-19,5				
R	291,6	260,5	319,1	359,6	424,4	464,8	474,3	469,5	650,3	542,9	485,5	517,0				
ø	82,0	77,4	83,2	104,1	130,6	147,3	178,5	198,4	226,3	202,0	157,8	147,8				
Median	45,7	48,2	45,1	62,8	71,6	82,2	131,9	122,2	103,5	131,1	44,8	38,0				

Gross Profit	11/10	12/11	13/12	14/13	15/14	16/15	17/16	18/17	19/18	20/19	21/20	ø	Scale
Böhm Plast - Technik	5,80	-22,55	8,84	38,06	1,38	52,80	1,56	-24,12	31,01	-66,96	-15,11	-18,79	3
Formplast Purkert	-6,41	-6,57	14,54	20,02	23,99	32,83	43,54	40,38	-15,65	-11,14	1,40	3,75	
Isolit-Bravo	-10,71	23,77	15,85	19,71	6,69	0,52	0,07	14,55	-13,79	-10,06	-1,12	-2,60	
PPT	5,49	-6,47	63,95	-3,16	14,85	28,64	15,49	-37,01	29,81	-78,66	-143,30	-57,29	2
Viscuma	128,36	-18,34	241,18	63,77	-46,78	-58,37	102,89	-57,69	116,86	-37,67	5,88	6,85	
Viscuma Plastic	0,00	-4149,10	223,41	123,11	41,71	-1,43	4,92	77,98	3,05	-15,19	-9,87	13,99	
Montix	0,00	1457,00	501,41	115,39	44,71	126,04	-22,20	-33,31	-82,45	-57,36	-479,74	-163,21	1

ROE	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	ø	Median	s^2_x/1000	ø growth
Bohm Plast-Technik	5,8	2,3	0,8	28,4	8,0	-40,2	-47,4	-75,5	-91,0	-12,5	6,5	6,7	-17,34	1,53	1,28	248,30
Formplast Purkert	22,8	15,2	10,6	11,6	9,3	20,4	17,5	18,9	13,5	16,4	12,6	13,4	15,18	14,33	0,02	1,31
Isolit-Bravo	11,8	11,7	10,5	9,7	8,1	8,2	7,7	8,6	10,4	9,9	7,1	7,3	9,25	9,19	0,00	-3,44
PPT	18,7	-38,6	-220,6	151,1	9,1	25,6	28,1	51,8	29,6	9,7	-2,4	-14,2	4,01	14,23	6,54	-50,48
Viscuma	160,0	126,2	30,9	55,1	55,0	19,6	7,4	11,2	5,4	11,0	8,3	7,2	41,46	15,42	2,40	-7,31
Viscuma Plastic	0,0	-25,1	5,0	124,0	115,1	71,5	30,5	13,4	11,2	23,0	16,5	15,5	33,38	16,02	1,94	197,28
Montix	0,0	55,7	138,5	93,9	63,7	72,4	32,6	16,8	5,3	0,0	-1,2	-10,1	38,97	24,68	1,97	-581,47
MAX	160,0	126,2	138,5	151,1	115,1	72,4	32,6	51,8	29,6	23,0	16,5	15,5				
MIN	0,0	-38,6	-220,6	9,7	8,0	-40,2	-47,4	-75,5	-91,0	-12,5	-2,4	-14,2				
R	160,0	164,8	359,0	141,4	107,0	112,6	80,0	127,2	120,6	35,5	18,9	29,7				
ø	31,3	21,0	-3,5	67,7	38,3	25,4	10,9	6,5	-2,2	8,2	6,8	3,7				
Median	11,8	11,7	10,5	55,1	9,3	20,4	17,5	13,4	10,4	9,9	7,1	7,2				

ROE	11/10	12/11	13/12	14/13	15/14	16/15	17/16	18/17	19/18	20/19	21/20	ø	Scale
Böhm Plast - Technik	-60,13	-67,17	3668,88	-71,79	-600,95	17,94	59,15	20,53	-86,29	-152,00	3,10	-53,66	3
Formplast Purkert	-33,40	-30,32	9,97	-19,82	118,39	-14,29	8,20	-28,80	21,70	-22,95	5,76	-6,07	
Isolit-Bravo	-1,65	-10,00	-7,27	-17,05	1,41	-6,07	12,52	20,22	-4,93	-28,02	2,97	-2,44	
PPT	-305,86	471,41	-168,50	-93,95	180,44	9,63	84,23	-42,76	-67,26	-124,51	-498,11	-183,16	2
Viscuma	-21,12	-75,53	78,46	-0,16	-64,31	-62,09	50,45	-51,38	102,75	-25,24	-12,28	3,46	
Viscuma Plastic	0,00	-119,79	2393,98	-7,19	-37,83	-57,43	-55,99	-16,15	104,90	-28,24	-6,14	13,59	
Montix	0,00	148,63	-32,19	-32,13	13,64	-55,03	-48,46	-68,29	-100,39	-5452,80	-769,10	-1597,65	1

Cost Per Employee in CZK	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	ø	Median	s^2_x/1000	ø growth
Bohm Plast-Technik	24 852,1	26 944,4	24 833,3	17 458,3	17 319,8	22 048,1	27 916,7	32 958,0	35 252,5	36 075,3	37 879,1	39 204,8	28 561,87	27 430,55	53 618,71	5,44
Formplast Purkert	29 479,8	26 523,2	31 811,5	28 970,7	32 808,0	37 333,7	30 569,1	34 012,2	41 454,6	42 009,3	44 109,8	45 653,6	35 394,62	33 410,10	38 759,83	3,78
Isolit-Bravo	27 420,4	30 101,5	30 347,7	32 234,7	33 914,1	32 487,9	38 793,1	41 442,3	42 015,6	42 802,1	44 942,2	46 515,2	36 918,07	36 353,60	39 292,30	1,86
PPT	33 724,0	35 352,8	34 039,2	36 566,2	34 546,8	36 700,6	41 193,5	45 306,9	48 900,6	44 659,3	46 892,3	48 533,5	40 534,64	38 947,05	33 028,45	3,57
Viscuma	26 879,2	27 486,7	31 444,4	26 762,7	36 788,9	59 598,5	43 362,3	41 071,9	37 846,2	45 662,6	47 945,7	49 623,8	39 539,42	39 459,05	97 828,26	5,97
Viscuma Plastic	0,0	3 968,8	24 530,3	20 851,3	29 425,2	31 478,0	33 134,8	37 203,3	39 381,2	37 427,1	39 298,5	40 673,9	28 114,36	32 306,40	171 363,84	5,46
Montix	0,0	0,1	14 058,1	27 011,1	27 271,2	30 214,4	36 133,5	38 117,2	39 637,4	39 844,0	41 836,2	41 919,9	28 003,59	33 173,95	216 517,54	4,23
MAX	33 724,0	35 352,8	34 039,2	36 566,2	36 788,9	59 598,5	43 362,3	45 306,9	48 900,6	45 662,6	47 945,7	49 623,8				
MIN	0,0	0,1	14 058,1	17 458,3	17 319,8	22 048,1	27 916,7	32 958,0	35 252,5	36 075,3	37 879,1	39 204,8				
R	33 724,0	35 352,7	19 981,1	19 107,9	19 469,1	37 550,4	15 445,6	12 348,9	13 648,1	9 587,3	10 066,7	10 419,0				
ø	20 336,5	21 482,5	27 294,9	27 122,1	30 296,3	35 694,5	35 871,9	38 587,4	40 641,2	41 211,4	43 272,0	44 589,2				
Median	26 879,2	26 944,4	30 347,7	27 011,1	32 808,0	32 487,9	36 133,5	38 117,2	39 637,4	42 009,3	44 109,8	45 653,6				