

**Czech University of Life Sciences Prague**

**Faculty of Economics and Management**

**Department of Economics**



## **Bachelor Thesis**

**Influence of Covid-19 on Consumption in the Czech Republic**

**Tendai Blair Gomba**

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# CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

## BACHELOR THESIS ASSIGNMENT

Tendai Blair Gomba

Economics and Management

Thesis title

**Influence of COVID-19 on Consumption in the Czech Republic**

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### **Objectives of thesis**

The aim of the bachelor thesis is to determine and to evaluate the impact of COVID-19 on consumers behavior in the Czech Republic.

The aim will be fulfilled based on the partial aims. Then, several hypotheses will be defined and verified. Based on the results of an empirical analysis the final conclusions will be introduced.

### **Methodology**

The bachelor thesis will cover both, theoretical and empirical part. Theoretical part will contain theoretical background of the selected topic as well as the methodological framework. Scientific literature will be used to prepare the literature overview. Based on the empirical analysis the results will be presented and some recommendations will be suggested.

To fulfill the aim of the thesis the selected methods will be employed as following:

- regression analysis (trend function)
- index analysis (base index, chain index)

**The proposed extent of the thesis**

30 – 40 pages

**Keywords**

Consumer behaviour, consumption, COVID-19, trend function, Czech Republic.

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**Recommended information sources**

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## **Declaration**

I declare that I have worked on my bachelor thesis titled "Influence of Covid-19 on Consumer Behaviour" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break any copyrights.

In Prague on 30/11/2022

**Tendai Blair Gomba** \_\_\_\_\_

## **Acknowledgment**

I would like to thank Lenka Rumankova, Ph.D., for their advice and continued support during my work on my bachelor thesis

# **Influence of Covid-19 on Consumption in the Czech Republic**

## **Abstract**

The following bachelor thesis will examine and interpret how the Covid-19 pandemic has influenced the consumption of selected goods and services in the Czech Republic. It aims to assess whether consumers have spent more or less on the selected goods and services during the Covid-19 pandemic, as well as years before the pandemic so that a comparison can be made to determine if the overall consumption of the selected goods and services has been influenced by the pandemic.

The theoretical part of the thesis will focus on the theoretical background of how exactly the Covid-19 pandemic has affected consumers behavior. It will also look at the fear appeal behind the coronavirus, as well as consider how the fear appeal behind Covid-19 has caused changes in consumer behavior and highlight the differences between each generation's cohort shopping behaviors.

For the practical part of the thesis, the author will focus on the analysis of the consumption of the selected goods and services in the Czech Republic before, and during the COVID-19 pandemic. The author employs trend function analysis, using Microsoft Excel to determine if there was any long-term tendency in the consumption of the selected goods or services. Index analysis, which consists of base index and chain index analysis, will be employed to show the short-term variations in consumption of the selected goods and services and was expressed as a percentage. Calculations for the base and chain indices were done using Microsoft Excel as well.

Linear regression models containing the selected goods and services, as well as a dummy variable, denoted as Covid and time trend to estimate the long-term tendency will be created in Gretl to help determine whether the influence of Covid-19 on the selected goods and services were significant or insignificant.

Lastly, for data gathering and research, the author will use official statistical tables and approved research papers to gather data as well as understand the influence of Covid-19 on consumption and consumer behaviour.

**Keywords:** Consumer behavior, consumption, COVID-19, trend function, index analysis, linear regression, influence

# Vliv Covid-19 na spotřebu v České republice

## Abstrakt

Tato bakalářská práce bude zkoumat a interpretovat, jak pandemie Covid-19 ovlivnila spotřebu vybraného zboží a služeb v České republice. Jeho cílem je posoudit, zda spotřebitelé utratili více či méně za vybrané zboží a služby během pandemie Covid-19 a také roky před pandemií, aby bylo možné provést srovnání a určit, zda celková spotřeba vybraného zboží a služeb byla ovlivněna pandemií.

Teoretická část práce se zaměří na teoretické pozadí toho, jak přesně pandemie Covid-19 ovlivnila chování spotřebitelů. Zaměří se také na přitažlivost strachu za koronavirem a také zváží, jak apel na strach za Covid-19 způsobil změny v chování spotřebitelů a zdůrazní rozdíly mezi nákupním chováním jednotlivých generací.

V praktické části práce se autor zaměří na analýzu spotřeby vybraného zboží a služeb v České republice před a během pandemie COVID-19. Autor pomocí analýzy trendových funkcí pomocí Microsoft Excelu zjišťuje, zda ve spotřebě vybraného zboží či služeb existoval dlouhodobý trend. Pro zobrazení krátkodobých odchylek ve spotřebě vybraného zboží a služeb bude použita indexová analýza, která se skládá z analýzy základního indexu a řetězového indexu a byla vyjádřena v procentech. Výpočty pro základní a řetězové indexy byly také provedeny pomocí Microsoft Excel.

Lineární regresní modely obsahující vybrané zboží a služby a také fiktivní proměnnou, označovanou jako Covid a časový trend pro odhad dlouhodobé tendence budou vytvořeny v Gretl, aby pomohly určit, zda vliv Covid-19 na vybrané zboží a služby byly významné nebo nevýznamné.

A konečně, pro shromažďování dat a výzkum bude autor používat oficiální statistické tabulky a schválené výzkumné dokumenty ke shromažďování dat a také k pochopení vlivu Covid-19 na spotřebu a chování spotřebitelů.

**Klíčová slova:** Spotřebitelské chování, spotřeba, COVID-19, trendová funkce, indexová analýza, Lineární regrese, vliv

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## List of abbreviations

Czech Koruna (CZK)

United States Dollars (USD)



# 1 Introduction

To understand the influence Covid-19 had on consumption of selected goods in the Czech Republic, it is important to firstly explain what Covid-19 is exactly. Covid-19 or Coronavirus is a newly discovered infectious disease that is caused by a newly discovered SARS-CoV-2 virus, according to the World Health Organization. The Covid-19 virus spreads mostly through droplets generated when an infected person coughs, sneezes, or exhales.

The droplets are heavy and quickly fall onto floors or surfaces that individuals encounter daily or in their daily routine. The next person is then infected by inhaling in the virus, especially if they are close to an infected person or by touching a contaminated surface and then proceeding to touch their eyes, nose, or mouth without washing or disinfecting their hands. Covid-19 affects people in different ways but usually, when ones are affected, they tend to show symptoms of tiredness, high fever, cough, and lastly a loss of taste or smell.

Since November 2019 when the Covid-19 virus was first discovered in Wuhan, China, the world as we know it had changed. Things we took for granted like traveling, going to school, parties, clubs, sporting events, etc. were put to a hold.

As countries went under lockdown, many people died, borders had been closed and the same fate was met for companies and schools, as they were also forced to close to prevent the spread of the Covid-19 virus, as the infection rate was very high at the time, and during this very dark period in time, the world as we knew had changed. Everything changed. The new normal came into effect with frequent hand washing, sanitizing, wearing masks, social distancing, no gatherings, and no travelling.

During the pandemic, most countries worldwide normalized staying at home, as well as working from home and having students of all education levels do remote learning from home through the use of Zoom or Microsoft Teams. There was also emphasis on residents to try and do most of their activities at home, like exercising and refrain from leaving the house but only to buy products which are necessities.

According to an online article by (Gerson Lehrman Group, 2021) Zoom had seen a 151% increase in its users in March, in the year 2020, and recorded 4.84 million users daily in the US alone whereas Microsoft Teams recorded 1.56 million users. However, concerning the Czech Republic Microsoft teams are the most compatible with the university systems and are used in many universities as students are granted free access to Microsoft Office 365 which contains all application software associated with Microsoft, as well as other programs associated with educations for the duration of their study.

Since the Covid-19 pandemic started in the Czech Republic, the restrictions that were put in place by the government influenced consumer buying habits as well as shopping. As most countries around the world did, social distancing as well as the closure of shopping malls and stores were also implemented in the Czech Republic, and thus led to changes in consumer behavior, consumption, and spending habits, as they could no longer personally go these stores themselves for their shopping. This led to the introduction of stores and businesses converting to online platforms to provide goods and services to their consumers.

This meant consumers had the option to purchase goods and services, as the store has been brought to them by the use of technology. Although they were now able to do their shopping online, the Covid-19 pandemic persisted. Businesses struggled to operate with current restrictive measures that were set in place by the government and the economy was on the decline due to a lack of business operations and many people had been left unemployed because of this.

With the economy in decline, and the lack of jobs available for most, consumers had no other option but to adapt to these changes, and this meant that their behavior and spending habits likely changed as well.

The purpose of this research sought to analyze consumption of selected goods in the Czech Republic from 2020 to 2021 , as well as evaluate the influence Covid-19 had on these selected goods.

The research employed a desk research approach to data collection using secondary data from various statistical bodies and other sources, such as other studies that focused on the influence of Covid-19 on consumption and consumer behaviour. The results of the research were collected and presented in form of statistical data such as charts, line graphs, and or tables. Other methods used to present the data and results were also analysed to bring out the conclusions based on the study conducted and shared with the University for further research.

## **2 Objectives and Methodology**

### **2.1 Objectives**

In this section of the bachelor thesis, the main objective had been identified and it was to evaluate the consumption of selected goods in the Czech Republic from 2010 to 2021. In order to achieve the main objective, partial objectives were used. The partial objectives are:

- Explain long-term tendency of the consumption of selected goods
- Explain short-term variation of the consumption of selected goods
- Detect influence of Covid-19 on consumption of the selected goods
- Detect the main commodities which consumption was influenced by Covid-19 the most.

After identification of the main and partial objectives, a working hypothesis statement had been produced, which was concerned about the influence of Covid-19 on consumption in the Czech Republic. The working hypotheses were as follows:

- Covid-19 has caused a decrease in non-essential purchases and had increased the demand for essential products such as health care products and groceries.

### **2.2 Methodology**

For this section, the methodology has been split into two parts: the literature review and practical methodology.

The literature review focused on the definition of consumption and scientific literature behind the consumption and consumer behaviour, the effect of Covid-19 on consumer behaviour, and consumer behaviour during the pandemic situation.

Practical methodology focused on the methods that were used, such as trend function, regression analysis and index analysis (chain index and base index) to gather results for the main and partial objectives and were used to provide an analysis and evaluation of consumption of selected goods in the Czech Republic from 2010 to 2021.

The consumption data of selected goods in the Czech Republic was collected from the Czech statistical office. Studies on consumption, as well as consumer behaviour were used from official private company publications (such as McKinsey and Company), as well as data from the Czech Republic ministry of commerce and private companies' publications were also used for preparation of the theoretical framework.

The definition, as well as the principles and formulas on methods used for the practical methodology (trend function, regression analysis, index analysis) were given below.

### **2.2.1 Trend Function**

The trend function is primarily known as a mathematical equation, which is used for forecasting or projecting future values that are based on historical data. Trend function is commonly used in statistics, economics, as well as business forecasting as this helps to identify patterns and trends in data which can then later on be analysed.

By employing trend function, analysts are able to predict or estimate the route of certain variables, such as sales or population growth, and conclude whether they will increase or decrease as time progresses.

However, before employing trend function, it is worth noting the following principles. The first principle for trend function is that it assumes the trend in data follows a linear pattern, meaning that the values shown for the future have been estimated and based on a straight line, which represents the average rate of change.

The second principle states that trend function is very effective when it is being applied to a time series. Time series is data that has been observed and recorded over a period of time. The trend function will then analyse data in the time series and identify if there are any patterns or trends that may project into the future.

The next principle of the trend function assumes that there are no extrinsic factors. The trend function believes that no events or outside factors influence the trend function or affect the variables being examined.

The fourth principle states that when employing trend function, it often uses smoothing techniques, which serve the main purpose of eliminating random fluctuations in the data. Techniques such as moving averages aim to indicate the underlying trend by eliminating short-term fluctuations.

The last principle of the trend function is related to the forecasting accuracy. As explained above, trend function predicts what the future values of a selected variable will be based on the historical data. Therefore, it is worth noting that when employing trend function, it does not guarantee accuracy of the predictions made as factors or conditions can change from the past data. The accuracy of the trend function is then dependent on the quality, as well as the reliability of the past data and the assumptions that have been made by the analyst.

### 2.2.2 Index Analysis

When analysing time series, analysts can employ either dynamic measures or static measures to assess and describe how the variables which are being observed change over a period of time. Static measures describe how the arithmetic mean of a time series changes or the chronological order changes over a period of time. Dynamic measures allow us to assess the changes from period to period by the use of index analysis, which consists of base index and chain index.

### 2.2.3 Base Index

Base index, or fixed base index is one of the two dynamic measures which allows the author of the thesis to assess, as well as analyse and interpret changes from period to period. For this thesis, the base index and chain index were used for the one of the partial aims of the thesis, which would then help the author to achieve the main objective of the thesis.

Base index analysis, as well as Chain index analysis were used for the partial aim that focused on providing an explanation on the short-term variations in the consumption of selected goods in the Czech Republic. The time series for the period 2010-2021 on consumption of selected goods in the Czech Republic was used to calculate the base and chain indices. Below is the formula for calculating the base index according to (Idrees & Idrees, 2019).

$$I.N = P_n / P_o \cdot (100)$$

- *P<sub>n</sub> represents the Price of the current year*
- *P<sub>o</sub> represents the Price of base year and then multiply 100 by the calculation to represent the answer as a percentage*

Base index focused on measuring the differences between the years of consumption of selected goods in the Czech Republic. A base year was selected, and the results of the proceeding years would be compared to the base year, as it would be constant and remain unchanged in the analysis. The results from the calculations of the base indices were then expressed as a percentage.

#### 2.2.4 Chain Index

The next method that is still focused on index analysis is chain index. Chain index analysis is the second dynamic measure employed, that allowed the author to assess and explain the short-term variations in the consumption of selected goods in the Czech Republic.

When base index method had been employed, certain items may have been added or deleted in the series as time passed on. This potential addition and deletion of items in the series could then make it difficult to compare the results of the present conditions with those of the past period. Therefore, if such situations were to occur, the chain index method would be employed, as changing the base year would be more appropriate.

The main difference between base index analysis and chain index analysis were explained by the author of this thesis. The main difference between base index analysis (fixed base analysis), compared to chain index analysis is that the base year remained unchanged throughout the time series when the base index method was employed.

However, when chain index analysis was being employed, the base year changed each year as we went down the time series. For example, if the first year of observation was the year 2001, the base year would be the previous year, which is 2000, and for 2002 it would be 2001, and so on. Now that the main difference between the two methods have been explained, the procedures for finding and constructing the chain indices were shown below.

The first procedure when constructing chain indices is to calculate the link relatives. Link relatives are figures for each year which have been expressed as a percentage of the previous year. The formula for calculating link relatives, according to (*Chain Index Numbers: Advantages and Disadvantages*, 2019) was shown below:

$$I.N = \frac{P_n}{P_r} \cdot (100)$$

- $P_n$  represent the Price of the current year
- $P_r$  represents the Price of the previous year and then we multiply 100 by the calculation to represent the answer as a percentage

After the link relatives have been found, the second procedure was to then chain the link relatives together by consecutive multiplication to form the chain indices. The formula for the calculation of the chain indices, according to (*Chain Index Numbers: Advantages and Disadvantages*, 2019) was shown below:

$$\text{Chain index} = \frac{\text{Current year relative} \times \text{Previous year link relative}}{100}$$

After completing the two procedures, the chain indices have now been constructed and are ready for analysis. Just like the values that were found for the base indices when the base index method (fixed base index) was employed, the values for chain indices when the chain index method was employed were also expressed as a percentage

### **2.2.5 Regression analysis**

Regression analysis is a method used in statistics to estimate the relationships between one dependent variable, which can also be described as the target variable found on the y-axis, and one or two independent variables, also described as explanatory variables found on the x-axis.

Regression analysis or the regression model is primarily used to examine whether the relationships between one or more two explanatory variables are statistically significant or not and whether or not the relationship between these variables is strong or weak.

The regression model can also be used to assess and estimate how the relationships between the target variable and explanatory variable will look in the future, as time progresses. Three different versions of regression analysis are known; however, the most frequently used ones are simple linear regression and multiple linear regression.

### **2.2.6 Simple linear regression**

Simple linear regression models are used to analyse the relationship between one target variable and one explanatory variable and both variables must be quantitative. Simple linear regression models are parametric tests, which means that the data being used in the model is assumed to have homoscedasticity, independence of observations, a normal distribution, and that there is a linear relationship between the target variable and explanatory variable represented by a straight line.

Homoscedasticity in simple linear regression models states that the potential size of the error in the predictions does not change drastically across the independent variable values. Independence of observations assumes that sampling methods used to collect or record observations for the dataset are completely valid, and there is no detectable relationship between the observations in the dataset.

If in any case the dataset being used does not meet the assumptions, a non-parametric test may be employed instead. The simple regression model is expressed by the following formula, according to (Bevans, 2023b) below:

$$Y = B_0 + B_1X + \epsilon$$

- Y represents the dependent variable (target variable)
- $B_0$  represents the intercept (value of y when x is equal to zero)
- $B_1$  represents the regression coefficient (value of y when x increases)
- X represents the independent variable
- $\epsilon$  represents the Residual error or error of estimate

### 2.2.7 Multiple linear regression

Multiple linear regression, which can also be described as multiple regression, measures the relationship between several explanatory variables and one target variable. Multiple linear regression is somewhat very similar to simple linear regression, both examine the relationships between the target and explanatory variables and aim to assess the strengths of these relationships.

However, before multiple linear regression can be performed, it is necessary to test or assess, whether there is multicollinearity between the independent variables. Multicollinearity assesses whether the independent variables correlate with one another. In multi-collinearity, independent variables which have correlations less than 0.75 are preferred and more suitable for the model.

However, if the correlation between the independent models is greater than 0.75, it will be very difficult to assess the relationships between the dependent variable and independent variables, thus making the results and their interpretation incorrect. Here is the following equation for the multiple regression model, according to (Bevans, 2023a):

$$Y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \dots + \beta_nx_n + \epsilon$$

- $\beta_0$  Represents the y-intercept
- $\beta_1X_1$  represents the regression coefficient  $B_1$  of the first explanatory variable  $X_1$ ,
- $\beta_nX_n$  represent the regression coefficient of the last explanatory variable
- $\epsilon$ ...represents the residual residual error

Now, when testing the relationship between the target variable and explanatory variables, a null hypothesis and alternative hypothesis must be formed. The null hypothesis, which will be denoted by "H0" will state that there is no relationship between the target variable and the explanatory variables.

The alternate hypothesis on the other hand, which is denoted by "H1" states that there is a significant relationship between the target variable and explanatory variables. Before we can



perform the hypothesis test, it is worth noting that the parameters of the explanatory variables are unknown and the parameters must be estimated.

To estimate the parameters of the explanatory variables, the OLS (Ordinary least squares) method is employed.

Here is the formula below:

$$\sum_{i=1}^n (y_i - y'_i)^2 \rightarrow \mathbf{min}$$

- $y_i$  = observed value of the dependent variable for the  $i$ th observation
- $y'_i$  = estimated value of the dependent variable for the  $i$ th observation

After the estimated parameters have been found, they will now be incorporated into the multiple linear regression equation to form the estimated multiple linear regression equation.

Now the equation will look like this:

$$y'_i = \mathbf{a} + \mathbf{b}_1 * \mathbf{x}_1 + \mathbf{b}_2 * \mathbf{x}_2 + \dots + \mathbf{b}_p * \mathbf{x}_p$$

Now that the parameters have been calculated and are known, the fit of the function, denoted by  $R^2$ , will be assessed for the estimated multiple regression model. Fit of the function is a test performed that represents how well the observed data matches with our sample data.  $R^2$ , which is known as the coefficient of determination measures the proportion of explained variation in the dependent variable. It is calculated by the following equation:

$$R^2 = SSR/SSE$$

- $SSR$  = represents the sum of squares due to regression
- $SSE$  = represents the sum of squares due to error

The next procedure after asseing the fit of the function will be to employ tests to examine the relationships of the variables, whether they are significant or insignificant. The F-test will be used for testing the significance of the target and explanatory varaiables, where as the T-test will be used to test the significance of the independent variables only.

For the F-test, the null hypothesis, denoted by  $H_0$ ; and the alternate hypothesis, denoted by  $H_1$ ; will then be stated. For the null hypothesis to be rejected, the p-value must be less than the signifance level of alpha, which is usually set to 0,05 and this thus proves that there is no significant relationship between the target variable and the explanatory variables in the model.The equation for the F-Test is as follows:

$$F = MSR/MSE$$

- *MSR represents mean squares on account of regression*
- *MSE represents mean squares on account of error*

The T-test on the other hand, will examine the significance for each explanatory variable. A new null hypothesis will then be stated, claiming that there is no relationship between the explanatory variables. If the p-level is less than the significance level of alpha for the T-test, the null hypothesis will be rejected, thus proving that there is a significant relationship which can be observed. The equation for the T-Test is as follows:

$$t = \frac{|b_i|}{s_{b_i}}$$

*Where  $b_i$  represents the estimated parameter*

*Where  $s$  represents the standard deviation of the parameter*

## 3 Literature Review

### 3.1 Consumption theory

In their examination and analysis of consumption, economists around the world have a common theoretical framework that assumes consumers make logical purchasing decisions based on the economic situation and their current levels of income. This assumption that economists generally have about consumers cannot be tested. Nonetheless, with the absence of additional claims about how and why consumers should care about their level of consumption, a utility function is used to express the preferences of consumers. Economists genuinely believe for example, that the consumption needs of consumers will decline if the level of consumption increases (also known as decreasing marginal utility of consumption). They also assume that consumers prefer to have less, instead of more risk in their consumption and are aware of the possible risks that may arise. Lastly, economists believe that consumers implement measures to save money, as they are not certain if they will have the same level of income in the future.

In this rational framework that economists have developed, there are two approaches which can be used. The first approach, which is known as ‘the life cycle’ model that was first expressed by Franco Modigliani and Richard Brumberg in (Utility Analysis and the Consumption function, 1954), states that the spending decisions made by households are influenced by members of the household assessment over income levels and needs of the household. The life cycle also claims that consumers more likely prefer to spend as much as possible before they pass on. These life cycle models are commonly used by micro economists to create models on the consumption, income, or wealth of households.

On the contrary, Macroeconomists prefer to use the simplified version, known as the ‘permanent income hypotheses based on (A Theory of the Consumption function, 1957) by Milton Friedman. The simplified version, or ‘permanent income hypotheses used the macroeconomists does not make use of demographics in the life cycle model. Instead, it focuses on the characteristics that are applicable for macroeconomic analysis, like predictions about the essence of the consumption function. this also correlates consumer spending to other factors such as income and wealth.

For macroeconomists, the most important attribute of the consumption theory is what it states about the marginal propensity to consume, denoted by (MPC), when the level of income changes. Economist and author of (Employment, Interest, and Money, 1936), John Maynard

Keynes suggested that an increase of 90 percent in the income level would result in an instantaneous increase in the consumption.

### **3.2 Consumption and business cycle**

In more economically developed countries, the private consumption expenditure is responsible for about two-thirds of the gross domestic product (GDP). The one-third remaining consists of government spending, net exports, and businesses. Spending by government on public health is also to be considered as a consumption expenditure, as this service provided by them is valued by the consumers.

There are 3 categories for which private consumption expenditure is divided into and they are as follows: expenditures for services, for durable goods and for non-durable goods. Durable goods are classified as products that have a life-expectancy of 3 years or more. However, spending on durable goods is considered to be more volatile compared to the other two categories of private consumption expenditure. Expenditure for services consists of a wide range of items such as telephone and utility services, legal and financial services, and as well as traveling services for example. Non-durable goods consist of items which can only last for certain period of time, such as clothes and it also consists of perishable items such as food which must be utilised once they are bought.

The differentiation in the flow of consumption, which includes durable goods that are owned by households, and consumption expenditure measured or analysed through income accounts is a key factor economists use when understanding and interpreting macroeconomic fluctuations. Producers responsible for the production of durable goods only generate revenue through the sale of the product, not from its usage after the sale has been completed, therefore, the level of consumption expenditure determines the affluence of short-term macroeconomic activity.

Macroeconomists have now improved upon and extended the rational optimization framework, to provide a clearer interpretation on the nature of durable goods. The evidence and theory states that when the economy is experiencing a recession, there is a decrease in the expenditure durable goods, such as vehicles for example if consumers were considering replacing it. After the recession has passed over, and the economy is now in its recovery phase, there is an increase in the expenditure of durable goods. In conclusion, the expenditure of durable goods is considered to be more volatile, compared to non-durable goods and services as durable goods are more sensitive to interest rates and other economic catalysts that will result in an increase or decrease in its expenditure.

### **3.3 Effect of Covid-19 on consumer shopping behavior**

The worldwide Covid-19 pandemic crisis we are currently in has had a serious effect on societies and economies all over the world in many different ways. The global pandemic has affected consumers' everyday life, causing dramatic changes in consumer behavior. The global pandemic has also affected how business act.

According to (Donthu and Gustafsson 2020; Pantano et al., 2020) research on the effect of Covid-19 on businesses and research, the survey that was conducted in the article which is linked in this first paragraph was used after the first wave of covid and indicated that consumers worldwide are viewing products, as well as brands, differently.

Another study that was conducted by (Accenture 2020; McKinsey 2020), examined the impulse buying patterns as Covid-19 cases rise and as well as interpreted the impact of Czech citizens' impulse buying behavior during the epidemic (cf. Ahmed et al., 2020). As the second wave of Covid-19 cases began to rise in Europe, consumers had to reconsider their current buying and shopping habits, or maybe they had to develop or find a new way of shopping.

Since governments introduced restrictive measures to try and minimize the spread of the virus, consumers have now switched to online shopping and having goods delivered to their homes. It is worth noting, now that consumers have switched to online shopping, businesses will now need to hire retail managers and marketers to examine any changes in consumer behavior, as well as purchasing habits so that they can understand which business strategies they may need to use or change, as this change in consumer behavior affects them as well.

To understand better, the consumers' behavior and spending habits, the authors of this research paper mentioned above in the first paragraph (McKinney et al., 2004) used market segmentation. In this research paper, they used the marketing approach based on generational cohorts, due to the fact that there are similarities between the generational cohorts.

For example, people may have shopping preferences as well as the same morals which affect their attitudes toward shopping. In the research article mentioned in the first paragraph just before the literature review introduction, the authors used 3 generational cohorts to examine and compare consumer behavior and spending habits. The 3 cohorts are Baby Boomers, Generation X, and Generation Y.

To conclude this introduction of the literature overview, the main objective of the research paper done by the author was to analyze the effect that the Covid-19 pandemic had on consumer behavior and spending habits during the second wave of Covid-19, in the Czech

Republic. In the next section, the theoretical background of the research paper used to write this literature overview will be looked at next.

### **3.4 Consumers' behavior during the pandemic situation**

In this section of the literature overview, the theoretical background of the research article was explained in five sub-sections as done by the author of the research paper, which is being used to write the literature overview of this thesis. The first section that was explained is the subheading heading above which reads "Consumers' behavior during pandemic situation".

According to (Addo et al., 2020), scarcity of products can affect how consumers make decisions. During early cases of Covid-19, consumers were reported to show a massive change in buying behavior that is drastically different from their normal shopping behavior.

The reason for such a behavior change was due to the lack of products available at any given moment (scarcity). This has led to consumers' stockpiling products during the early stages of the Covid-19 pandemic. It is worth noting that government restrictions on movement and interaction to try and stop the spread of the virus have also been linked to the drastic change in consumer behavior, as consumers can't travel to their favorite store to do their shopping.

These restrictions on movement, as well as the closing down of most stores temporarily have forced many consumers to find a new way of shopping, such as using mobile applications and online websites to make purchases from the comfort of their homes.

### **3.5 Fear appeal and change in consumer behavior**

In recent literature, purchasing patterns have been known to be driven by emotional and practical stimuli. Studies done by (Addo et al., 2020; Chinazzi; et al., 2020) have shown that the fear phenomenon behind Covid-19 has led to an increase in impulse buying across the globe.

In this article, the researcher used the theory of fear appeal, which has not been used regularly for scientific research.

"Addo P.C", who is one of the authors of the research paper titled "Covid-19: fear appeal favoring purchase behavior towards personal protective equipment" and E. Wegman, another author of the research article "Online-specific fear of missing out and internet-use expectancies contribute to symptoms of internet communication disorder" have both stated that fear is an instrument to safeguard us from dangerous situations. (C. Lai et al., 2016) believes that fear comprises of 3 concepts:

- 1) Perceived efficacy
- 2) Threat
- 3) Fear

However, (Wegman et al., 2017) suggests that fear appeal can be categorized into two:

- Fear control
- Danger control

Fear control is based or focused on emotional reactions caused by risk, whereas danger control is the adaptive behavior done by customers to avoid it. Another research article done by (Addo et al., 2020) says that danger control helps guide the consumers' adaptive behavior so that they may avoid dealing with fear. For fear control on the other hand the author has stated that fear control helps determine emotional responses that have come from risk.

In general, consumers' behavior and spending habits are influenced by the affective and sensitive features of selected products. Products which are viewed by consumers as 'to get the better of' a risk or danger may be successful in reducing perceptions of danger and increasing purchases says (Addo et al., 2020; McDaniel & Zeithaml, 1984). Similar to what (Addo et al., 2020) said, the research done by the authors of this article being used to write the literature overview of this dissertation is also based on the assumptions made that believes that as covid cases continue to rise, the fear appeal will have a non-negative relationship with the purchases of certain products.

The following research focuses on the purchase assessment of essential items, like buying out of necessity and fear stimuli (Ahmed et al., 2020; Wegmann et al., 2017). Other factors also influence the way consumers make a purchase, however, consumer needs are considered to be the first step to processing consumer behavior (Maslow, 1970; Solomon, 2002). Maslow's hierarchy of needs states that the first physiological need that must be satisfied usually, but not always, appears at a time of fear, distress, or deprivation and that is the case with the Covid-19 pandemic. The first physiological needs serve as basic human needs, and this motivates consumers to satisfy these needs by acting including buying (Seeley, 1992). The desire for consumers to satisfy their basic needs has led to a large increase in demand. The resulting large increase in demand has led many stores to run out of essential and non-essential products during the Covid-19 pandemic (Accenture, 2020; Deloitte, 2020).

The lockdown and Covid-19 fear have had a very strong impact on nationals in the Czech Republic in the Autumn of 2020. At the start of the second wave, the Czech Republic was the country with the worst cases of Covid-19 as cases were increasing per hundred thousand

inhabitants. Due to the number of rising cases as well as the fear phenomenon behind Covid-19, people became more inclined towards impulse buying behavior. This was due to negative information being broadcasted over media platforms, misinformation from friends or family as well as observing the buying behavior of fellow peers. The Covid-19 pandemic has not only resulted in concerns about health and employment but has brought up the concern in people about whether they have enough access to the available resources needed to fulfill their basic needs.

### **3.6 Generation differences and shopping behavior**

The generation cohort theory states that every generation cohort differs from the other as each cohort has gone through different experiences at different times (Ignatius & Hechanova, 2014). This theory further suggests that generational differences aren't determined by age per se but rather by shared experiences and influences of a particular generation (Jones et al., 2018). Therefore, groups of people born during the same time period and have gone through the same experiences will most likely have similar views, attitudes, and beliefs as well as expectations that are constant throughout their lifetime and constitute a generational identity according to (Carpenter et. Al; 2012, Schewe & Meredith 2004). (Lissitsa & Kol, 2016; Parment, 2013) state that generational identity influences buying patterns and shopping behavior significantly, in the consumer context.

In the following sections, the selected generations in the research will be defined in short.

#### **- Baby Boomers (1945-1964)**

Described as individualistic, competitive free agents that have strong interests in achieving self-fulfillment through personal growth. They have a high job involvement that leads to job security and success in their chosen careers (Jackson et al., 2011). Known as the digital immigrants due to the fact that they were not born in the digital era, baby boomers prefer to have communication done face-to-face, through the use of a phone, or by writing letters and sending them through the mail. This group of individuals is more likely to conduct their shopping activities at one location which is close to their place of residence. They mainly prioritize reliable products that are fairly priced and within their budget says (Williams & Page, 2011). Baby boomers are characterized as being focused on family, finances, and medical services (Brosdahl & Carpenter, 2011) such as new products and technologies that improve their lives making things easier for them and saving time (Williams & Page, 2011).

#### **- Generation X (1965-1982)**



Individuals belonging to this generation grew up in the information age as the development of ICT had already begun with mobile phones being introduced and the emergence of computers. Generation X members are more capable and comfortable with using computers to communicate however they often ignore advertising directed toward them and decline marketing techniques or any form of segmentation (Lissitsa & Kol, 2016). Generally, they prefer the use of mobile phones for communication through the use of social media platforms such as Facebook, etc., however, they are not as comfortable with face-to-face communication unlike the previous generation, the baby boomers. Direct, clear, and concise communication is valued, and this influences their purchasing habits as well.

#### - Generation Y (1983-2000)

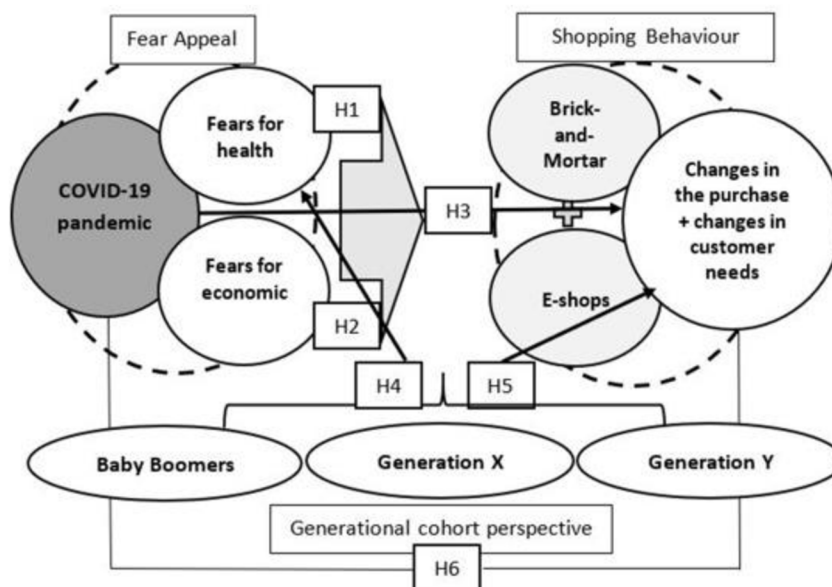
Known as the internet generation or digital natives, individuals belonging to this generation are usually confident, and ambitious, speak more than two languages, and are motivated to accomplish many achievements. They are well informed about news and current situations happening around the globe compared to the two previous generations. According to (Lissitsa & Kol, 2016) generation Y looks for changes and innovations as well as they make purchase decisions based on research they have done on the specific product. Online shopping is much preferred as this offers them a wide range of benefits compared with traditional shopping, such as an easy ordering process, delivery of products ordered, and low prices. Unlike the two previous generations, members of generation Y want products that may match their personality and or lifestyle. Consumers belonging to this generation have a tendency of devoting their spending more to personal or digital services than to apparel, suffer high levels of debt, and earn less than the previous generations. In terms of communication, social media platforms such as Facebook play an important role as well as other social media platforms and mobile resources (Lewy et al., 2019).

Each generation relates to brands differently and has diverse objectives when it comes to shopping and buying. Although they may have these differences between them, all three generations look for payment security, the ability to interact with brands easily as well as transparent promotions (National Retail Federation, 2020). Consumers from all 3 generations mentioned are beginning to make purchases more frequently on the internet and increasing smartphone usage. (Lewy et al., 2019) says that every generation is open-minded to loyalty and reward programs.

The concept of cohort generation, which consist of individuals that share major events in history that impact their personality behavior as well as consumer behavior is not new at all

(Zwanka & Buff, 2021). A comparison done by (Jindrová & Labudová, 2020), using European statistics of income and living conditions, highlighted that some of the socioeconomic determinants were rather quite small between the new and old members of EU-28 for 2018, however, the variable age in the other hand the most significant influence on self-perceived health. This statement supports the claim and generational approach from (Parment, 2013) which states that examining the purchasing behavior of generational cohorts could be useful.

The following image below is an investigation model from the research article used for the literature overview.



Source: Eger, Komárková, Egerová, Mičík, 2021

### 3.7 Theoretical background for Methodology

When this research was being conducted, the Czech Republic and many other EU countries had parts of their economies in lockdown, hoping that locking down some parts of their economies would reduce the death toll caused by Covid-19. However, locking down some parts of their economies resulted in negative consequences on the economies, businesses, and jobs (cf. Pantano et al., 2020).

A quantitative research approach in the form of a survey had been carried out during the early days of the second wave of Covid-19 in the Czech Republic at the end of September 2020. This indicates that respondents that participated in this survey have had experience from the time the first wave of Covid-19 hit which was (March-May 2020) and had a small summer

period with no restrictions on movement and no need for social distancing. Primary data was then collected by the use of an online panel at the end of September 2020.

The online panels which operate in Central and South Eastern Europe, operated through a network consisting of representative offices. Verification of user data is a control measure that was employed by the organization and it consists of random telephone checks and posts, requests for profile updates and a monthly limitation on the number of surveys taken. The online panels then made use of local expertise, management, and a centralised oversight. The online panel is a member of ESOMAR and does not violate their guidelines whatsoever (Talk online panel, 2020). Specified tracking across the selected demographic attributes gave respondents the opportunity to be selected, according to what the required sample selection characters were. The talk online panel had about 80 thousand people aged 15+. The data was collected by the use of a self-administered questionnaire (CAWI) and computer-assisted telephone interviewing (CATI).

Respondents of the questionnaire survey were consumers aged 18+ living in the Czech Republic, meaning the respondents in the survey were mainly adults. The size of the sample was set at 1000 as this is the usual size for conducting surveys in the Czech Republic (CVVM, 2021).

With the use of quota sampling and collection via Talk Online Panel (cf. Burs et al., 2017) the possibility of ensuring adequate distribution of respondents according to the demographic characteristics of the population, is much higher. Therefore, the sample could be said to be representative of the Czech internet population as 89 percent of Czechs used the internet in 2020 (Eurostat, 2021).

Unfortunately, 36 participants from generation Z and 47 from the silent generation (1925-1945) are in the sample. This means that these two groups of participants had to be excluded. The final sample, therefore, consisted of 917 participants, with 302 being baby boomers, 323 belonging to generation X, and 292 belonging to generation Y.

## 4 Practical Part

In the practical section of this thesis, the author's focus was to try and achieve the main objective of the thesis, which was: **to evaluate the consumption of selected goods in the Czech Republic for the selected period**, however, to achieve the main objective of the thesis, partial objectives were employed and defined in section 2 of the thesis which serve as a purpose to try and help prove the main objective. They have been defined again below and they are:

- Explain long-term tendency of the consumption of selected goods
- Explain short-term variation of the consumption of selected goods
- Detect influence of Covid-19 on consumption of the selected goods
- Detect the main commodities which consumption was influenced by Covid-19 the most.

The graphs produced by the author in section 4.1 show the average household expenditure on selected goods in the Czech Republic from 2010 to 2021, with CZK being the unit of measurement.

For the first partial objective listed above, trend function had been employed using Microsoft excel to show the long-term tendency of the consumption of selected goods in the Czech Republic. Data from the Czech statistical office on consumption of the selected goods were collected and then used to produce line charts in Microsoft Excel, with each selected good having a trend function displayed on the same chart to indicate the long-term tendency.

In the section 4.1, there are a number of selected line graphs for the selected goods in the Czech Republic, exported from Microsoft Excel which have the trend function shown on each graph, as well as an explanation and interpretation provided for each graph.

The selected goods that were analysed in the Czech Republic to show the long-term tendency in consumption were alcoholic beverages, clothing and footwear, communication, education, health and lastly restaurants and hotels.

After analysis of the graphs in section 4.1 and providing explanation of long-term tendency in consumption of the listed goods that were chosen for observation, the author moved on to the next partial objective, which was to explain the short-term variation in the consumption of the listed goods.

For the explanations of the short-term variation in consumption of the selected goods or services, the author employed index analysis which consisted of base index analysis and chain index analysis. In section 4.2, the explanation for the short-term variation using base index

analysis had been provided on the selected goods in the Czech Republic, and in section 4.3 the explanation for short-term variation using chain index analysis had also been provided.

For the detection of the influence Covid-19 had on consumption, as well as the main commodities which were influenced by Covid-19 the most, Gretl was employed to produce linear regression models with a dummy variable, which has been named “Covid“, that was created by the author. A time trend was also inserted into the model to ensure accuracy and to make sure no errors were present in the model.

After the preparation of the regression models was completed, each model was then analysed and a conclusion was drawn on which selected goods had been influenced by Covid-19 the most, as well as which selected goods' consumption had been influenced by Covid-19 after performing hypothesis testing in the linear regression models.

## 4.1 Trend Function analysis

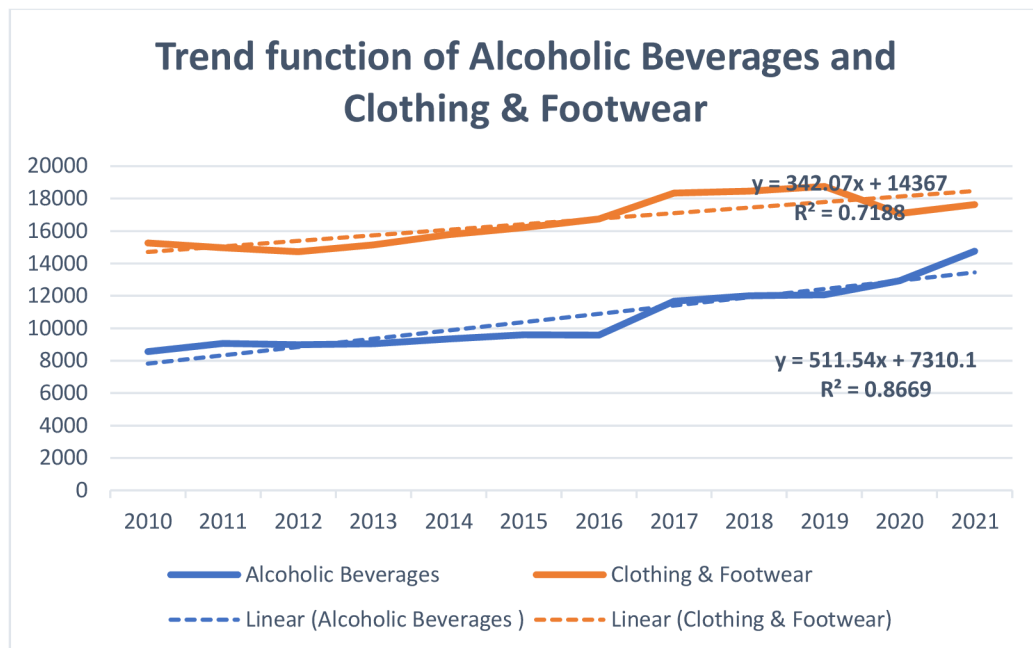
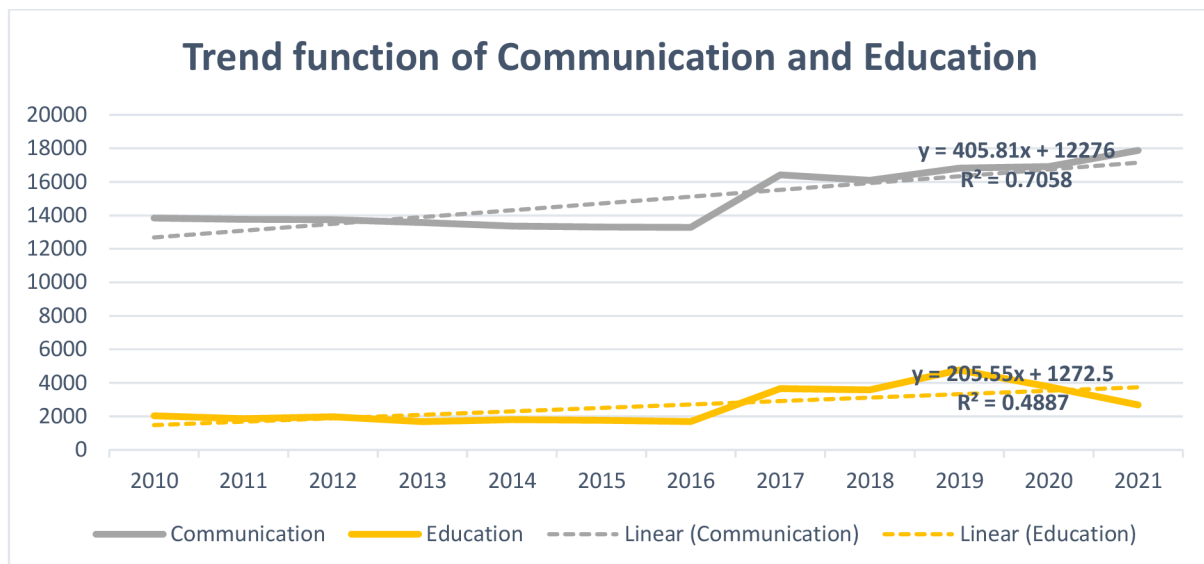


Figure 1: Trend Function for Alcoholic Beverages and Clothing & Footwear

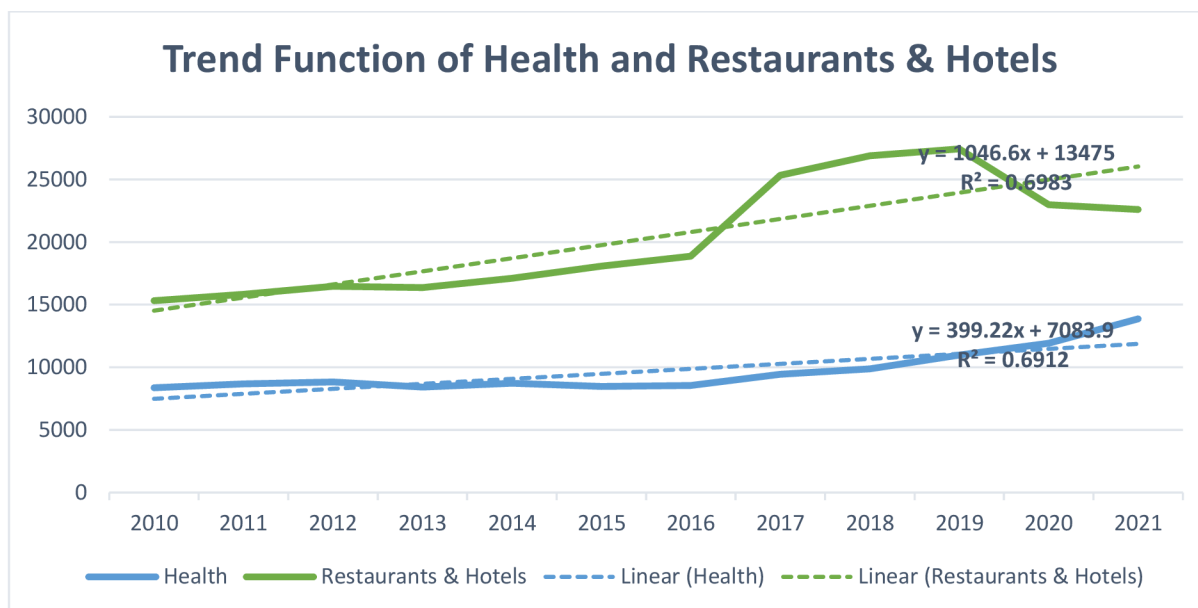
- In the Figure 1 above, the trend function of average household expenditure for clothing and footwear in the Czech Republic from the chosen time series (2010-2021) is given. The vertical axis represents the amount spent in CZK and the horizontal axis represents time. The trend function  $y=342.07x + 14367$  indicates that the household expenditure and consumption of clothing and footwear from the first year in the time series, which is 2010, increased steadily throughout the time series linearly, as the coefficient of determination, denoted by  $R^2=0.7188$ . The coefficient of determination indicates how precisely a statistical model can predict an outcome, with the outcome being represented by the dependent variable in the model. Since the value for the coefficient of determination  $R^2$  lays between 0 and 1, this indicates that the model can only partially predict the outcomes. The value  $R^2=0.7188$  then indicates that **71.88%** of variance in the dependent variable is explained by the variance of the independent variable.

- The next trend function in figure 1, which is  $y=511.54 + 7310.1$  represents the average household expenditure for alcoholic beverages. Just like clothing and footwear above, the average household expenditure on alcoholic beverages increased linearly as  $R^2=0.8669$ , and since the value of  $R^2$  lies between 0 and 1, the model is only able to partially predict the outcome as **86.69%** of the variance in the dependent variable have been explained by the variance in the independent variable.



- Figure 2 contains the trend function for average household expenditures in the Czech Republic for communication and education for the selected period (2010-2021). The trend function for communication, represented by  $y=405.81x + 12276$ , shows that the average household expenditure on communication increased linearly over the time period. The coefficient of determination denoted by  $R^2=0.7058$ . This represents that **70.58%** of the variance in the dependent variable was explained by the variance in the independent variable, and since the value for  $R^2$  is not equal to 1 but lies between 0 and 1, the model can only partially predict the outcome.

- The next trend function represents the average household expenditure for education in the Czech Republic. The trend function is  $y=205.55x + 1272.5$  and the coefficient of determination  $R^2=0.4887$ . Due to the value of the coefficient of determination being **48.87%**, it can be assumed that the correlation between the dependent variable and independent variable is weak as only **48.87%** of the variation in the dependent variable is explained by the variation in the independent variable, and since the value of  $R^2$  lies between 0 and 1, the model can only partially predict the outcome.



- Figure 3 above which is the final figure for the trend function analysis portion of the practical part of this thesis contains trend functions for average household expenditures on health and restaurants & hotels in the Czech Republic. The trend function in green represents restaurants & hotels and is  $y=1046.6x + 13475$  and the coefficient of determination is  $R^2=0.6983$ . Explained by the trend function, the average household expenditure on restaurants & hotels increased linearly throughout the time series.  $R^2$  of **69.83%** explained the variation in the dependent variable that was caused by the variation in the independent variable. Although the value of  $R^2$  is slightly lower than the value obtained in figure 1 for alcoholic beverages, it is still considered a good regression as it does lay between 0 and 1, indicating that the model can partially predict the outcome.

- The same observation can be applied for the trend function for health, which is represented in blue. The coefficient of determination for health is  $R^2=0.6912$ . Since the value for  $R^2$  is between 0 and 1, the model was partially able to predict the outcomes and the value for  $R^2$  indicates that **69.12%** of the variation in the dependent variable was explained by the variation in the independent variable. Although it isn't as perfect as the value for alcoholic beverages, it would still be considered a good regression. The trend function for health is  $y=399.2x + 7083.9$  and increased somewhat linearly throughout the time series.

The second partial objective was to explain the short-term variation of the consumption of selected goods in Czech Republic. For explaining the short-term variation, the author employed index analysis, which consisted of chain index and base index was employed.



## 4.2 Base index analysis

Year	Alcoholic Beverages	base Index
2010	8562	100.0
2011	9074	106.0
2012	8985	104.9
2013	9045	105.6
2014	9334	109.0
2015	9604	112.2
2016	9577	111.9
2017	11670	136.3
2018	12010	140.3
2019	12064	140.9
2020	12941	151.1
2021	14756	172.4

Table 1: Base index alcoholic beverages

Year	Clothing&Footwear	base index
2010	15268	100.0
2011	14965	98.0
2012	14723	96.4
2013	15151	99.2
2014	15781	103.4
2015	16212	106.2
2016	16742	109.7
2017	18343	120.1
2018	18451	120.8
2019	18750	122.8
2020	17072	111.8
2021	17628	115.5

Table 2: Base index Clothing&Footwear

- In the the two tables shown above, table 1 contains the base indices for alcoholic beverages and table 2 contains the base indices for clothing & footwear for the period 2010-2021. When employing the base index method, a base period was selected, for this method the selected base period was **2010** and its value was set to 100. After selection of the base period, the values of the subsequent periods for **2011-2021** were calculated and compared to the base year, for observation of the short-term variation in consumption of the selctected goods in the two tables above. The results were expressed as a percentage. A value which is above 100 would indicate an increase in the consumption, whereas a value which is below 100 would indicate a decrease in the consumption. For table 1 which represents alcoholic beverages, the values of the base indices increased throughtout the observed time period, as each value for each year was greater than the base year which was set to 100. The largest increases in these values, in comparison to the base year were **2020 (51.1%)** and **2021 (72.4%)**.

- The observation for table 2, in comparison to table 1, is slightly different. In table 2, the base indices represent the short-term changes in consumption of clothing & footwear. For the first 3 periods (**2011-2013**), the values of the base index recorded in each period were slightly lower than the value of the base period, thus indicating a decrease in the consumption of clothing & footwear for these periods. After this period, the values of the base indices for each period increased as each value recorded was greater than 100, with the largest increase only being observed in the year **2019 (22.8%)**.

Year	Communication	base index
2010	13840	100.0
2011	13757	99.4
2012	13745	99.3
2013	13568	98.0
2014	13356	96.5
2015	13306	96.1
2016	13281	96.0
2017	16409	118.6
2018	16096	116.3
2019	16818	121.5
2020	16909	122.2
2021	17877	129.2

Table 3: Base index for communication

Year	Education	base index
2010	2041	100.0
2011	1861	91.2
2012	1984	97.2
2013	1685	82.6
2014	1803	88.4
2015	1770	86.7
2016	1696	83.1
2017	3652	179.0
2018	3585	175.7
2019	4768	233.6
2020	3769	184.7
2021	2692	131.9

Table 4: Base index for education

- Table 3 above represents the base indices for communication, which compared the indices of the subsequent periods (**2011-2021**) to the base year (**2010**). From 2011-2013, the values of the base indices suggested a steady decrease in consumption, as the values recorded were below 100, in comparison to the base year. For 2014-2016 however, the decrease in the values was minimal and remained constant, as the values recorded during the period did not deviate that much from **96**. From **2017-2021** however, there was a significant increase in the values that was observed, as each of the base indices were all above 100, indicating there had been an increase in consumption. The largest increase in consumption, in comparison to the base year for communication was **2021 (29.2%)**

- Table 4 contained the base indices for education for the period 2011 to 2021, with 2010 being the base year, which was used for the observation and comparison of the results obtained as we progress through the selected period. From **2011-2016**, the values recorded in the base index column were all lower than the base year value of 100, suggesting that there was a decrease in the consumption for education, with the lowest decrease in consumption of education being observed in **2016 (16.9%)**. After observation of this period was completed, the values of the base indices for the remaining periods increased, as each value recorded were greater than the value of the base year (100), with the largest significant increase being observed in the year 2019.

Year	Health	base index
2010	8367	100.0
2011	8683	103.8
2012	8830	105.5
2013	8420	100.6
2014	8731	104.3
2015	8480	101.3
2016	8551	102.2
2017	9440	112.8
2018	9885	118.1
2019	10980	131.2
2020	11915	142.4
2021	13868	165.7

*Table 5: Base index for health*

Year	Restaurants & Hotels	Base index
2010	15320	100
2011	15841	103.4
2012	16473	107.5
2013	16372	106.9
2014	17112	111.7
2015	18075	118.0
2016	18879	123.2
2017	25340	165.4
2018	26896	175.6
2019	27442	179.1
2020	22986	150.0
2021	22606	147.6

*Table 6: Base index for restaurants & hotels*

- Table 5 and table 6 are the last tables that were analysed and interpreted in the base index analysis section of the practical part for the thesis. Table 5 and table 6 above contained the indices health and restaurants & hotels for the period **2010-2021**. Just like the previous tables analysed in the pages above, the base year for table 5 and table 6 was set to **2010**, and the indices for the following subsequent periods were calculated and then compared with the base to determine the degree of variation in the consumption of health and restaurants & hotels, and conclude whether the values for indices were above or below the base year value of **100**.

- For table 5, there were no significant increase observed from 2011 to 2016 when compared to the base year, as the values recorded were not that much greater than 100. However, in the following year, the value for the indice was **12.8%** and for the remaining years it continued to increase with the largest increase being recorded in **2021 (65.7%)**. Since all for the remaining periods were greater than the base year, a conclusion was drawn that there was an increase in the consumption for health compared to the base year.

- Table 6, however, had indices which were all above the value set for the base year throughout the period, with the largest value being recorded in the year **2019 (79.1%)**. Since all value of the indices for the subsequent periods were all greater than 100, the author concluded that there an increase in the consumption for restaurants & hotels compared to the base year 2010. The next section in the practical part of the thesis focused on examining the short-term variations in the consumptions of the selected goods or services in the Czech Republic by using chain index analysis.

### **4.3 Chain index analysis**

In section 4.2 , base index analysis was employed by the author and the results were analysed and interpreted. As explained in section 4.2, the base year for each of the selected goods or services in the Czech Republic remained unchanged and was the same throughout the series.

However, there was a drawback that was overlooked when employing base index analysis. As time progresses, there could be a possibility that some items may have been added or removed from the series, therefore making it challenging to compare the results of the current period with those of the past.

Due to these circumstances, it would be considered wise to changing the base year, thus the author employed chain index analysis. Chain index analysis differs from base index analysis, however, both index analysis methods aimed to explain the short-term variation in the consumption of the selected goods or services in the Czech Republic.

In base index analysis, the base year was fixed and did not change throughout the series, but when employing chain index analysis, the base year for observation changes each year as we progress down the period.

By employing chain index analysis, the values of the selected goods or services each year were expressed as a percentage of the preceding year, known as link relatives. After calculation of the link relatives was completed, the next step was to chain the values together by multiplication in order to form a chain index. The link relatives, as well as the chain indices for the selected goods and services was shown below in the form of tables.

Year	Alcoholic Beverages	Link Relatives	Chain index
2010	8562	100.0	100.0
2011	9074	106.0	106.0
2012	8985	99.0	104.9
2013	9045	100.7	99.7
2014	9334	103.2	103.9
2015	9604	102.9	106.2
2016	9577	99.7	102.6
2017	11670	121.9	121.5
2018	12010	102.9	125.4
2019	12064	100.4	103.4
2020	12941	107.3	107.7
2021	14756	114.0	122.3

Table 7: Chain index for alcoholic beverages

- Table 7 contains the chain indices, as well as the link relatives for alcoholic beverages for the period **2010-2021**.
- Since the data on alcoholic beverages for 2009 is not present in the table above, the chain index and link relative for 2010 could not be calculated.
- Thus the value of the link relatives, as well as chain indices for the year 2010, for each of the selected goods was set to 100.
- The values for the chain indices were expressed as a percentage, just like the values for base index analysis in the previous section.
- Indices above 100 indicated that there had been an increase in the consumption of the selected good or service. Indices below 100 indicated that there had been a decrease in the consumption of the selected good or service.
- For table 7 above, the chain index for the year 2011 was **106**, indicating that consumption of alcoholic beverages had increased by **6%** compared to the year 2010.
- In the year 2012, although the value for the chain index was still above 100, consumption of alcoholic beverages decreased by **1.1%** after 2011.
- The largest increase in the consumption of alcoholic beverages, compared to the previous year was found in 2017, as consumption had increased by **18.9%** from 2016 as the prices of alcohol may have decreased in 2017 therefore leading to such an increase in its consumption.
- After finding the largest increase in the consumption, the second largest increase was reported in 2021, with a **14.6%** increase in alcoholic beverages consumption from the previous year.

Year	Clothing & Footwear	Link relative	Chain index
2010	15268	100.00	100.00
2011	14965	98.02	98.02
2012	14723	98.38	96.43
2013	15151	102.91	101.24
2014	15781	104.16	107.19
2015	16212	102.73	107.00
2016	16742	103.27	106.09
2017	18343	109.56	113.14
2018	18451	100.59	110.20
2019	18750	101.62	102.22
2020	17072	91.05	92.53
2021	17628	103.26	94.02

Table 8: Chain index for clothing & footwear

- Table 8 above contains the chain indices and link relatives for clothing & footwear for the period 2010-2021.

- Indices above 100 indicated that there had been an increase in the consumption of the selected good or service. Indices below 100 indicated that there had been a decrease in the consumption of the selected good or service.

- For table 8, the chain index for the first year of observation, which is 2011, had a chain index value of **98.02**, indicating that consumption of clothing & footwear had decreased by **1.98%** compared to the year 2010.

- In the year 2012, the value for the chain index was now **96.43**, which was slightly lower than the previous year. Since the chain index value was below 100 again for the year 2012, it was then assumed that the consumption of clothing & footwear decreased by a further **1.59%** after 2011.

- In 2013, the chain index value was slightly above 100, as there was a **4.81%** increase in the consumption of clothing & footwear from the previous year, which was 2012.

- The largest recorded increase in the consumption of clothing & footwear, compared to the previous year was found in 2017, as consumption had increased by **7.05%** from 2016.

- After finding the largest increase in the consumption, the largest recorded decrease in the consumption was reported in 2020, with a **9.69%** decrease in clothing & footwear consumption compared to the previous year.

Year	Communication	Link relative	Chain index	Year	Education	Link relative	Chain index
2010	13840	100.0	100.0	2010	2041	100.0	100.0
2011	13757	99.4	99.4	2011	1861	91.2	91.2
2012	13745	99.9	99.3	2012	1984	106.6	97.2
2013	13568	98.7	98.6	2013	1685	84.9	90.5
2014	13356	98.4	97.2	2014	1803	107.0	90.9
2015	13306	99.6	98.1	2015	1770	98.2	105.0
2016	13281	99.8	99.4	2016	1696	95.8	94.0
2017	16409	123.5	123.3	2017	3652	215.4	206.3
2018	16096	98.1	121.2	2018	3585	98.2	211.4
2019	16818	104.5	102.5	2019	4768	133.0	130.6
2020	16909	100.5	105.1	2020	3769	79.0	105.1
2021	17877	105.7	106.3	2021	2692	71.4	56.5

Image 1: Chain indices for Communication and Education

- Image 1 above contains the chain indices, as well as the link relatives for communication and education for the period **2010-2021**.
- Unlike the selected goods or services which were previously analysed in this section of the thesis, communication and education have chain indices which are below 100 from **2011-2016**, indicating there was a decrease in consumption during this period.
  - For communication, the consumption for 2011 decreased by **0.6%**, compared to the previous year. The consumption for education in 2011 on the other hand, decreased by **8.8%** after 2010.
  - The chain indices for communication continued to decrease in 2012 and 2013, however, the decreases were not that significant as there was only a **0.1%** decrease in 2012 from 2011, and a **0.7%** decrease in 2013 from 2012.
  - For education on the other hand, there was an increase of **6%** in the consumption for 2012 from the previous year. However, the increase was not that significant, as the value remained below 100.
  - From 2013 to 2016 however, the values of the chain indices for education continued to fluctuate, as they would increase and decrease each year. The largest decrease in consumption for education was recorded in 2021, with a **48.6%** from the previous year.
  - From 2014-2016 the values of the chain indices for communication seemed to increase constantly, as the indices increased by **1%** on average each year.
  - After 2016, the values of the chain indices for the remaining years increased and were all above 100 for communication.

- The largest recorded increase in the consumption for communication, compared to the previous year was found in 2017, with a **22.6%** increase from 2016.
- For education, the largest recorded increase in consumption for this good was recorded in 2019, as there was a **57.9%** increase in consumption from the previous year

Year	Health	Link relative	Chain index
2010	8367	100.0	100.0
2011	8683	103.8	103.8
2012	8830	101.7	105.5
2013	8420	95.4	97.0
2014	8731	103.7	98.9
2015	8480	97.1	100.7
2016	8551	100.8	97.9
2017	9440	110.4	111.3
2018	9885	104.7	115.6
2019	10980	111.1	116.3
2020	11915	108.5	120.5
2021	13868	116.4	126.3

Table 9: Chain Index for Health

- Table 9 represents the chain indices and link relatives for health.
- Indices which are above 100 indicate an increase in the consumption. Indices which are below 100 indicate a decrease in the consumption.
- The chain index for the first year of observation, which is 2011, had a chain index value of **103.8**, indicating that consumption increased by **3.8%** from the previous year.
- In 2012, the value for the chain index was now **105.5**, which was slightly higher than the previous year, therefore the consumption of health increased by a further **1.7%** after 2011.
- In 2013 however, there was a **8.5%** decrease in the consumption from the previous year.
- The largest recorded increase in the consumption, compared to the previous year was found in 2017, as consumption had increased by **13.4%** from 2016.



Year	Restaurants & Hotels	Link relative	Chain index
2010	15320	100.0	100.0
2011	15841	103.4	103.4
2012	16473	104.0	107.5
2013	16372	99.4	103.3
2014	17112	104.5	103.9
2015	18075	105.6	110.4
2016	18879	104.4	110.3
2017	25340	134.2	140.2
2018	26896	106.1	142.5
2019	27442	102.0	108.3
2020	22986	83.8	85.5
2021	22606	98.3	82.4

Table 10: Chain index for restaurants&hotels

- The last table contains the chain indices, as well as the link relatives for restaurant & hotels.
- The chain index and link relative for the first base year was set to 100 as the data on consumption for restaurants & hotels for the year **2009** was not presented in the table.
- Therefore, the calculation of the link relatives, as well as chain index value could not be conducted for the year **2010**.
- And since it could not be conducted, the values are always set to 100
- The values for the chain indices were expressed as a percentage, just like the values for base index analysis.
- Indices above 100 indicated that there had been an increase in the consumption of the selected good or service. Indices below 100 indicated that there had been a decrease in the consumption of the selected good or service.
- In table 10 above, the chain index for the year 2011 is **103.4**, indicating that there was an increase in consumption of restaurants & hotels by **3.4%** from the first base year 2010.
- In the year 2012, the value for the chain index was still above 100, and saw an increase in the consumption for restaurants & hotels by **4.1%** after 2011.
- The largest increase in the consumption for restaurants & hotels, compared to the previous year was found in 2017, as consumption for restaurants & hotels had increased by **42.2%** from the year 2016.
- After finding the largest increase in the consumption, the largest decrease was reported in 2020, with a **29.1%** decrease in consumption from the previous year. Although the decrease is quite significant, the value for the chain index was still well above 100.

## 4.4 Regression Analysis

After preparation of the base indices and chain indices which were used for the description of the short-term variations for consumption of the selected goods, the last and most important procedure for the practical part of the thesis contained a linear regression analysis that was produced using Gretl, which focused on the detecting the significance and insignificance of the influence Covid-19 had on consumption of selected goods and services in the Czech Republic, as well as detecting which goods and services' consumption had been most influenced by Covid.

For the linear regression analysis, the selected goods that were analysed were food & non-alcoholic beverages, alcoholic beverages, clothing & footwear, housing, furnishing, health, transport, communication, recreation & culture, education, restaurants & hotels, and lastly miscellaneous goods. Data on the consumption of each of the goods and services selected for analysis were collected from the Czech Statistical Office.

The data collected on the consumption of the selected goods and services was then used to produce all the tables and graphs in the previous section using Microsoft Excel. The data on consumption of the selected goods and services for the linear regression analysis was exported from Microsoft Excel to Gretl, so that the linear regression could then be employed.

However, before the linear regression model could be employed, a dummy variable needed to be created and integrated into the model. The dummy variable added to the model identified which years Covid-19 was present with the number 1 and which years it was not present with the number 0.

Once the dummy variables had been created, the next step before preparing the linear regression models was to estimate the intercept term by using a unit vector (**UV**). This would be then be denoted by (**constant**) in the images of the linear regression models for each of the selected good which were posted below.

After finding the intercept term, the next step was to to determine and estimate the long-term tendency and determine whether it was significant or insignificant. In order to estimate the long-term tendency, a time trend was also added to the model and was denoted as (**time**).

Now that the intercept term, denoted by (**constant**) and the the time trend to estimate long term tendency denoted by (**time**) were added to the model, the linear regression models for the consumption of the selected goods and services in the Czech Republic were prepared.

The analysis for the linear regression models which are to be posted below is as follows. If the parameter of the dummy variable, denoted by **(covid)** in the images of the linear regression models is statistically significant, meaning that the level of significance or **P-value** is less than the level of significance for alpha, which is **(0.05)**, the significant influence of Covid-19 on the analysed variable can be observed.

The value of the parameters show what is the extent of the Covid-19 influence on the analysed variables in comparison to the values without the Covid-19 influence. Images of the linear regression models are posted below:

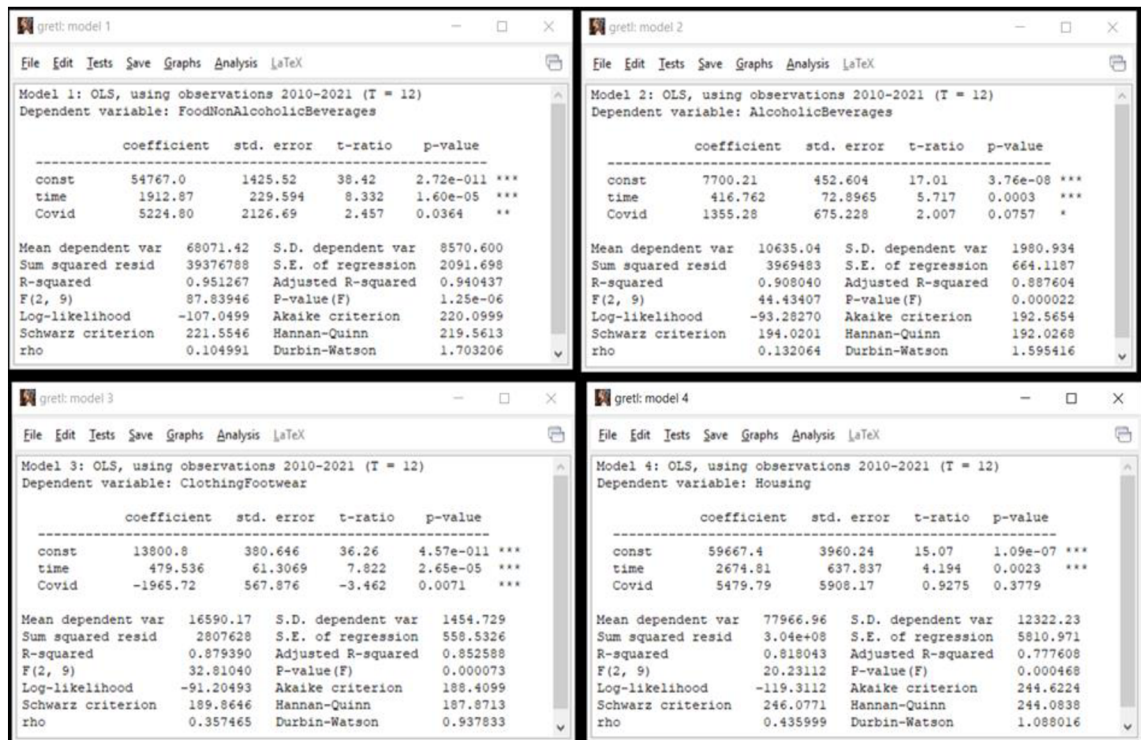


Image 2: Linear regression models

- Image 4 above contains 4 linear regression models, each with a different dependent variable. The dependent variables in image 4 are Food & Non-alcoholic beverages, Alcoholic beverages, Clothing & Footwear and lastly Housing.

- The explanatory variable in the linear regression models for each of the dependent variables is Covid.

- $R^2$  is the coefficient of determination which measures the proportion of explained variation in the dependent variable.

- For the first linear regression model which has Food & Non-alcoholic beverages as the dependent variable, the  $R^2=0.951267$ . The second dependent variable, which is Alcoholic beverages has an  $R^2=0.908040$ , Clothing & Footwear has an  $R^2=0.879390$  and lastly Housing has an  $R^2=0.818043$ .

- With the coefficient of determination being identified, hypothesis testing can now be performed for each of the analysed dependent variables. But first, the null and alternate hypothesis must be stated.

- The null hypothesis states that there is no significant relationship between the two variables, whereas the alternate hypothesis states that there is a significant relationship between the two variables.

- The P-value for Food & Non-alcoholic beverages is **0.0364**. Alcoholic beverages has a P-value of **0.0757**. Clothing & Footwear is **0.0071** and lastly the P-value for Housing is **0.3779**.

- As stated above, if the P-value is less than the level of significance for alpha (**0.05**), the significant influence of Covid-19 can be observed, and the null hypothesis will be rejected and the alternate hypothesis will be accepted.

- For image 4, Food & Non-Alcoholic beverages, and Clothing & Footwear have a significant influence of Covid-19 as each of the P-values for these two dependent variables are less than alpha, therefore we reject the null hypothesis.

- Alcoholic beverages and Housing on the other hand have P-values greater than alpha, therefore we reject the alternate hypothesis as the influence of Covid-19 on these two dependent variables cannot be observed and is therefore considered insignificant.

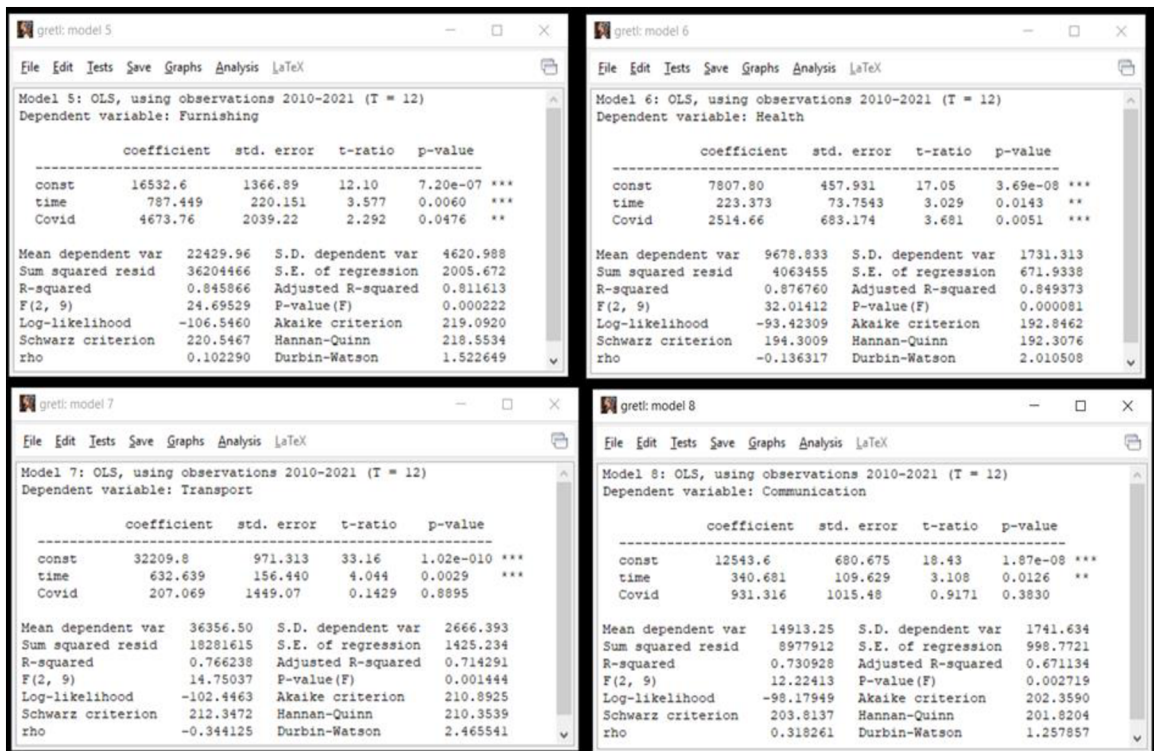


Image 3: Linear regression models

- Image 5 contains 4 linear regression models for the second set of dependent variables that are to be analysed. The dependent variables in image 5 above are Furnishing, Health, Transport and the last dependent variable is Communication.
- The explanatory variable in the linear regression models above for each of the dependent variables is Covid.
- $R^2$  is the coefficient of determination which measures the proportion of explained variation in the dependent variable.
  - For the first linear regression model, with Furnishing as the dependent variable, the  $R^2=0.845866$ . The second dependent variable, Health, has an  $R^2=0.876760$ . Transport has an  $R^2=0.766238$  and the last dependent variable Communication has an  $R^2=0.730928$ .
- The coefficient of determination has been identified and hypothesis testing can now be performed for each of the analysed dependent variables.
- The null hypothesis states that there is no significant relationship between the two variables, whereas the alternate hypothesis states that there is a significant relationship between the two variables.

- The P-value for Furnishing in image 5 above is **0.0476**. The P-value for Health is **0.0051**. Transport has a P-value of **0.8895** and lastly the P-value for Communication is **0.3830**.

- If P-value is less than the level of significance for alpha (**0.05**), the significant influence of Covid-19 can be observed, and the null hypothesis will be rejected and the alternate hypothesis will be accepted.

- In image 5 above, Furnishing and Health have a significant influence of Covid-19 as each of the P-values for these two dependent variables are less than alpha, therefore we reject the null hypothesis and accept the alternate hypothesis.

- Transport and Communication have P-values greater than alpha, therefore we reject the alternate hypothesis as the influence of Covid-19 on these two dependent variables cannot be observed and is therefore considered insignificant.

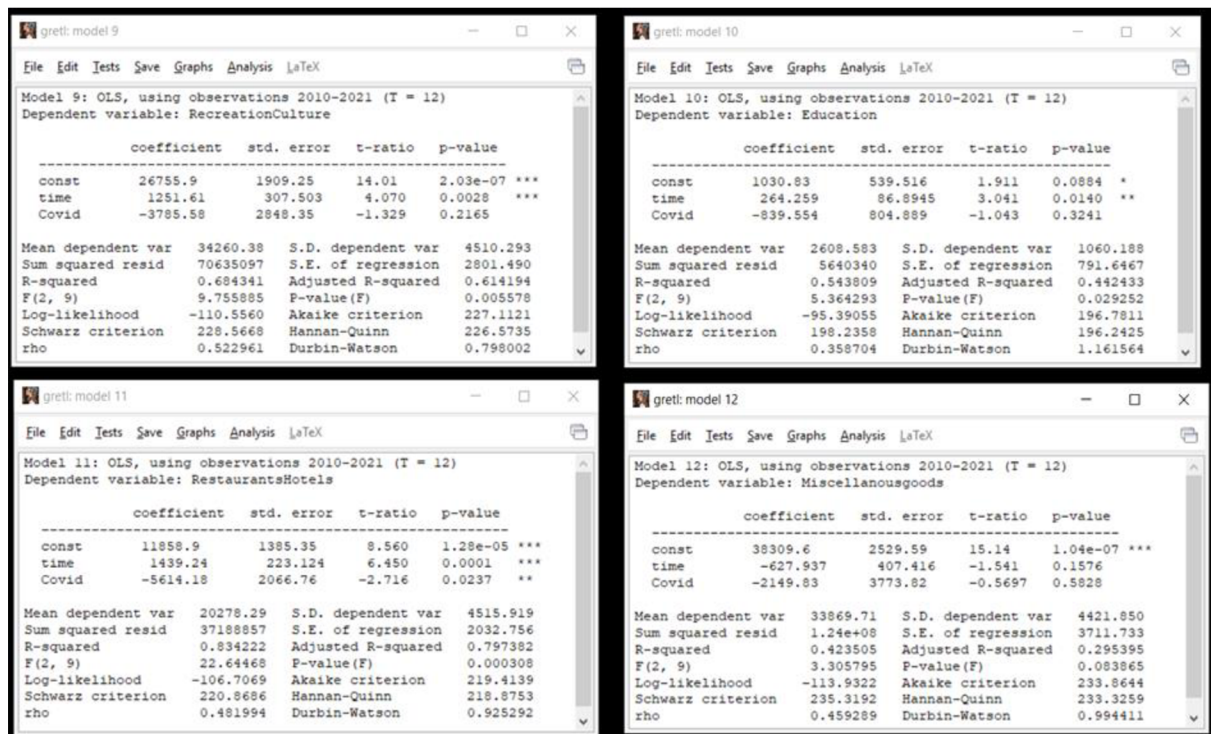


Image 4: Linear regression model

- Image 6 above contains the linear regression models for the last set of dependent variables that are to be analysed. The last set of dependent variables in image 6 above are Recreation & Culture, Education, Restaurants & Hotels and the last dependent variable is Miscellaneous goods.
- The explanatory variable in the linear regression models above for each of the dependent variables is Covid.
- $R^2$  is the coefficient of determination which measures the proportion of explained variation in the dependent variable.
- For the first linear regression model, with Recreation & Culture as the dependent variable, the  $R^2=0.684341$ . The second dependent variable, Education, has an  $R^2=0.543809$ . Restaurants & Hotels has an  $R^2=0.834222$  and the last dependent variable Miscellaneous goods has an  $R^2=0.423505$ .
- The coefficient of determination has been identified and hypothesis testing can now be performed for each of the analysed dependent variables.
- The null hypothesis states that there is no significant relationship between the two variables, whereas the alternate hypothesis states that there is a significant relationship between the two variables.



- The P-value for Recreation & Culture in image 6 above is **0.2165**. The P-value for Education is **0.3241**. Restaurants & Hotels has a P-value of **0.0237** and lastly the P-value for Miscellaneous goods is **0.5828**.

- If P-value is less than the level of significance for alpha (**0.05**), the significant influence of Covid-19 can be observed, and the null hypothesis will be rejected and the alternate hypothesis will be accepted.

- In the last image above, Restaurants & Hotels have a significant influence of Covid-19 as the P-value for this dependent variable is less than alpha, therefore we reject the null hypothesis and accept the alternate hypothesis.

- Recreation & Culture, Education and Miscellaneous goods have P-values greater than alpha, therefore we reject the alternate hypothesis as the influence of Covid-19 on these three dependent variables cannot be observed and is therefore considered insignificant.

After interpretation of the Trend function, base indices, chain indices and linear regression models, the final part of this thesis discussed the results obtained in the practical part, as well as whether the main objective of this thesis had been achieved. The discussions and conclusion of this thesis was then written below.

## 5 Results and Discussions

Consumption is a topic that is extremely crucial and should be focused on and studied more, as it does have various implications on our day-to-day lives, the environment we live in and economies. Consumption can be influenced by a number of different factors, such as the economic conditions, the advancements made in technology, societal norms and lastly, our own personal preferences.

However, in the context of Covid-19, the factors mentioned above would then be further shaped by the fear phenomenon surround the pandemic, as many consumers suffered drastic changes in income due to working less hours or losing their jobs. In response to these drastic changes brought by the Covid-19 pandemic, consumers became cautious, as well as selective when it came to making purchasing decisions.

Data on the consumption of selected goods in the Czech Republic had been gathered for the period 2010-2021 from the public database of the Czech Statistical Office. The data gathered from the Czech Statistical Office was then exported to Microsoft Excel, where a table was prepared using the consumption data of the selected goods.

After the table had been produced in Microsoft Excel, it was then used for the production of the line graphs, as well as the base and chain indices that were shown in the practical part of this thesis. The linear regression models for the consumption of selected goods also used the table from Microsoft Excel and were produced using Gretl

The first section of the practical part used line graphs produced in Microsoft Excel to evaluate the long-term tendency in the consumption of the selected goods for the period 2010-2021. Each of the line graphs contained a linear trendline to show whether consumption of the selected goods increased or decreased at a steady rate, as well as the trend function and coefficient of determination ( $R^2$ ) displayed on the graph. The selected goods that were analysed each had a trendline that upward sloping, indicating the consumption of the selected goods increased steadily over the period 2010-2021.

The second and third section of the practical part focused on explaining the short-term variations in consumption of the selected goods in the Czech Republic using index analysis. The first method of index analysis employed was base index analysis. Base index analysis measured the differences in years of consumption for the selected goods by selecting a base year and then comparing the proceeding years of consumption for the selected goods with that of the base year. The base year remained constant when this method was employed.

When the second method of index analysis (chain index analysis) was employed, it also measured the differences in years of consumption for the selected goods in the Czech Republic, just like the base index analysis. However, there was a difference between the two index analysis methods. For base index analysis, the base year remained the same and unchanged. When chain index analysis was employed, the base year of observation changed each time as we progressed down the time series.

The last section of the practical part focused on determining whether the main objective of the thesis, which was to examine the influence of Covid-19 on consumption of selected goods would be achieved. It also aimed to detect which of the selected goods had been influenced by Covid-19 the most.

Using Gretl, the author created linear regression models with a dummy variable denoted by Covid, and a time trend to denoted by time, to estimate the long-term tendency and determine whether the influence of Covid-19 on consumption of the selected goods or services were significant or insignificant.

After the linear regression models were created, hypothesis testing was conducted to determine which of the selected goods had been significantly or insignificantly influenced by Covid-19. The selected goods significantly influenced by Covid-19, after the completion of the hypothesis testing in the linear regression analysis were food & non-alcoholic beverages, clothing & footwear, furnishing, health, and lastly restaurants & hotels.

## 6 Conclusion

To summarise, the main objective of this thesis was to examine the influence Covid-19 had on consumption in the Czech Republic. The author aimed to investigate whether consumer spending increased or decreased on the selected goods and services mentioned during the Covid-19 period, causing an increase or decrease in its consumption, as well as determining whether the consumption had been significantly or insignificantly influenced by Covid-19.

After analysis of the results gathered from the practical section of the thesis, the conclusion drawn from the author of this thesis was that consumption in the Czech Republic had been influenced by the Covid-19 pandemic. The fear phenomenon surrounding the pandemic influenced consumers decision making processes when purchasing good or services as they now had to re-evaluate which goods or services would be a necessity and which would be not due to the current economic conditions that were present during the pandemic period.

Certain goods such as health, clothing & footwear, and food & non-alcoholic beverages became consumers top priority and were considered essential goods. Other goods or services which were available such as miscellaneous goods or restaurants & hotels became less of a priority for consumers and were deemed non-essential.

Thus, the main objective of the thesis had been achieved, as consumption for the selected goods and services were influenced during the Covid-19 pandemic, as some goods or services saw an increase in its consumption, whilst other goods and services saw a decrease in its consumption during the pandemic period.

The working hypothesis which stated that Covid-19 caused a decrease in non-essential purchases and an increase in the demand for essential products such as health care products and groceries was proven to be partially true. The linear regression models produced indicated that the following selected goods food & non-alcoholic beverages, clothing & footwear, furnishing, health and restaurant and hotels were significantly influenced by the Covid-19 pandemic. Food & non-alcoholic beverages, health and clothing & footwear would be considered as essential products, whilst restaurants and furnishing would be considered non-essential during the Covid-19 pandemic. However, due to the restrictions on movement that were imposed by the government, as well as the closure of most shopping malls, the author of this thesis does believe that clothing & footwear could also be considered as a non-essential good, as consumers would no longer have to keep up with the latest trends in fashion, as well as restrictions on movement and gathering were put in place, indicating that it was not possible for many individuals to see family or friends

Essential goods such as health and food & non-alcoholic beverages saw increases in consumption during the pandemic period as consumers spent more on these selected goods. Non-essential goods or services such as restaurants & hotels had decreases in consumption, as government regulations forbid them from operating during the pandemic and were to remain closed, therefore resulting in consumers spending less.

In conclusion, Covid-19 did influence consumption of selected goods and services in the Czech Republic as consumers were spending more on goods and services during the covid-19 pandemic

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