

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Statistics



Bachelor Thesis

Statistical analysis of beer consumption preferences

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

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BACHELOR THESIS ASSIGNMENT

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Thesis title

Statistical analysis of beer consumption preferences

Objectives of thesis

Bachelor thesis deals with assessment of beer consumption preferences. The main sense is to find out and assess possible factors which affect consumer behaviour. The assessment will be carried out by own questionnaire survey.

Methodology

The assessment of factors influencing consumer behaviour will be carried out by questionnaire survey. First will be determined hypotheses and will be created appropriate survey. The dataset will be analysed using categorical data analysis.

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Declaration

I declare that I have worked on my bachelor thesis titled "Statistical analysis of beer consumption preferences" 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 copyrights of any third person.

In Prague on 14. 3. 2013

Petr Vacek

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Statistická analýza preferencí ve spotřebě piva

Statistical analysis of beer consumption preferences

Shrnutí:

Bakalářská práce se zabývá preferencemi ve spotřebě piva. Hlavním cílem je určit možné faktory, které pravděpodobně mohou ovlivňovat chování spotřebitele. První část se věnuje základní metodice a objasnění teoretických východisek. Hlavní pozornost je zde zaměřena na marketingový výzkum a pravidla při tvorbě dotazníku. V této části je rovněž popsána historie piva ve světě i v České republice nebo technologický postup při výrobě piva. Poslední podkapitola první části se zabývá spotřebním chováním a faktory, které ovlivňují spotřebitele při nákupu potravin. Praktická část práce je poté zaměřena na vyhodnocení dotazníkového šetření. Nejzajímavější otázky jsou vyhodnoceny graficky. Dále jsou zde testovány stanovené hypotézy. Soubor dat je analyzován užitím kategorické analýzy dat. Stanovené hypotézy jsou na základě výsledků přijaty nebo zamítnuty.

Klíčová slova:

spotřeba, preference, marketingový výzkum, dotazníkové šetření, pivo, statistická analýza, hypotéza

Summary:

Bachelor thesis deals with beer consumption preferences. The main aim is to assess factors, which probably may influence consumer behaviour. The first part is devoted to the basic methodology and literature review. The main attention is focused on marketing research and the rules about creating a questionnaire. Both the history of beer worldwide and in the Czech Republic, and technological process of beer production are also described in this part. The last subchapter of the first part deals with consumer behaviour and with the factors, which influence the consumer when purchasing food. Thereafter, the practical part is focused on the evaluation of the survey. The most interesting questions are also evaluated graphically. The stated hypotheses are tested in this part, as well. The dataset is analysed using categorical data analysis. According to the results the stated hypotheses are either accepted or rejected.

Keywords:

consumption, preferences, marketing research, survey, beer, statistical analysis, hypothesis

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1 Introduction

Beer, which is one of the most significant products of the Czech Republic, is one of the oldest beverages made by man. There are many beers around the world with the word “Bohemia” in its name or in the description of its features. The beer brewed from malting barley is known as a Pilsner beer (also Pilsener) all around the world. The consumption per capita is the biggest in the world, as well.

However, the knowledge of consumers’ wants and desires can play a very important role in the brewing industry and it can also be a competitive advantage. Targeting and identifying the typical groups of consumers also has great importance. Generally speaking, Czechs are very conservative consumers, but influence of foreign trends, increasing supply of goods and services and open market can change this. Nowadays, there are hundreds of types of beer and the consumer has a wide variety to choose from.

Czech consumers tend to be more and more picky. Even though beer is called “liquid bread” in the Czech Republic, its consumption has decreased in the last few years. It can be caused by modern trends of healthy lifestyles, high consumption tax or strict drink-drive laws.

As has already been mentioned, each consumer has different needs and wants in choosing beer. There are many factors influencing the consumer. In the case of beer the main ones are taste, price, and brand. The brewery making tasty beer with a reasonable price does not have to be profitable if the brand is not well perceived by consumers. Each brand has its characteristics, which make it recognisable. On the other hand, there are also general factors like age, gender, or level of education.

All the breweries should identify these factors and supply different kinds of beer to different consumers. Good knowledge of the consumer as well as timing can represent a thin line between success and bankruptcy.

2 Aims and methodology

The main aim is to determine the factors, which probably may influence consumer behaviour when drinking beer. The partial aim is to statistically test the stated hypotheses and to find out, whether the random sample differs from population.

2.1 Methodology

The theoretical part is processed on the basis of knowledge reached by reading the books, research papers and internet resources. The main parts are focused on marketing research, beer and consumer behaviour.

2.1.1 Statistical hypothesis testing

A hypothesis is normally used as a basic instrument in research. Its function is to suggest the assumption, which is then tested. Hypothesis testing is the often used strategy while deciding whether the generalisation of sample data can be made. Hypothesis should be simple as well as precise and it should state the relationship between variables (Kothari, 2004).

When testing hypotheses we distinguish between a null and alternative hypothesis. A null hypothesis is generally symbolized by H_0 and it proceeds on the assumption that there is no relationship between variables. Contrasting this we state alternative hypothesis symbolized by H_1 . After testing, the null hypothesis can be accepted or rejected. Because of this, the alternative hypothesis should also be formulated precisely. H_1 can reject H_0 in three possible ways described as follows: $H_0 \neq H_1$, $H_0 > H_1$ or $H_0 < H_1$ (Kothari, 2004).

But the assurance cannot be 100%. Therefore, the level of significance must always be chosen. There is a percentage (usually 5%) and there is some risk. As a matter of fact, we can make two types of errors concerning testing. If we are talking about a Type I error, it can be expressed as the rejection of H_0 when it is true. It is also symbolized as α . On the other hand, a Type II error is accepting H_0 when it is false. It is denoted by β . The probability of a Type I error is usually determined by the level of significance. We can control a Type I error by fixing it at the lower level (1%)(Kothari, 2004).

Table 1 – Statistical hypotheses testing: Type I and Type II error

	Decision	
	Accept H_0	Reject H_0
H_0 (true)	Correct decision	Type I error
H_0 (false)	Type II error	Correct decision

As mentioned above we can commit a Type I and Type II error while testing the hypotheses. The probability of a Type I error is symbolized by α , systematically the probability of a Type II error by β . It seems logical to want to keep β as small as possible. In other words we would like $1 - \beta$ as large as possible. Accordingly $1 - \beta$ is described as the power of test (Kothari, 2004).

2.1.2 Categorical data analysis

A majority of statistical analyses distinguish between the ordinal and nominal variables. An example of an ordinal variable is educational attainment or doing some activity in terms of frequency. An ordinal variable is called the one with an ordered categorical scale. In the case of ordinal variables it is possible to define the order, but it is not possible to note how the variables differ.

On the other hand, a variable with an unordered categorical scale is called a nominal. An example is religious affiliation. We can define it if the data is the same or not. Ordinal and nominal variables are collectively called qualitative (Agresti, 2010).

Qualitative characters are mainly used in the area of research for public opinions.

Qualitative characters are expressed in words and it is possible to test the dependency and its intensity among them. They can be in two forms – here we talk about alternative characters, or in more forms – here we talk about plural characters. Dependency between alternative characters is called association dependency, dependency between plural characters is called contingency (Svatošová, Kába, 2008).

2.1.3 Analysis of dependency in association tables

An association table is used for observing two qualitative alternative statistical characters. The result of the classification is structured into the so-called association table 2×2 . The internal table fields contain the associated frequencies, which fulfil the classification according to both characters. Marginal frequencies represent the results of the classification according to the observed characters (Svatošová, Kába, 2008).

While testing hypothesis H_0 : *there is no dependency between the observed characters*, two tests can be used: a χ^2 independence test and Fisher's factorial test. The utilization of mentioned tests is followed by rules:

- 1) If the sample size is greater than 40, χ^2 independence test is used.
- 2) If the sample size is lower than 20, Fisher's factorial test is used.
- 3) If $20 < n < 40$, then the expression of expected frequencies a_0, b_0, c_0, d_0 is needed:

$$a_0 = \frac{(a+b)(a+c)}{n} \quad (\text{formula 1})$$

$$b_0 = \frac{(a+b)(b+d)}{n} \quad (\text{formula 2})$$

$$c_0 = \frac{(c+d)(a+c)}{n} \quad (\text{formula 3})$$

$$d_0 = \frac{(c+d)(b+d)}{n} \quad (\text{formula 4})$$

If all expected frequencies are greater than 5, χ^2 independence test is used.

If at least one of expected frequencies is lower than 5, Fisher's factorial test is used (Svatošová, Kába, 2008).

χ^2 independence test

H_0 : there is no dependency between the observed characters.

Table 2 – Association table 2 x 2

Character A	Character B		Total
	Yes	No	
Yes	a	b	a + b
No	c	d	b + d
Total	a + c	b + d	n

Source: (Svatošová, Kába, 2008), own elaboration

The null hypothesis of independence is tested by the test criterion χ^2 :

$$\chi^2 = \frac{n(ad-bc)^2}{(a+b)(a+c)(b+d)(c+d)} \quad (\text{formula 5})$$

Then, in the tables for the χ^2 distribution the critical values of $\chi^2_{\alpha(1)}$ are found and a comparison between the result and table value is made. If $\chi^2 > \chi^2_{\alpha(1)}$, the null hypothesis is rejected. If p-value is lower than alpha, the null hypothesis is rejected (Svatošová, Kába, 2008).

Fisher's factorial test

This test differs from the previous one in the sense that the calculated value is exactly the probability a of Type I error or α .

H_0 : There is no dependency between the observed characters.

In cases where Fisher's factorial test have to be used, the following approach is used:

- 1) The lowest associated frequency is found
- 2) This frequency decrease to 0 in auxiliary tables while keeping the same marginal frequencies. For each table the probability p_i is calculated by factorials

$$p_i = \frac{(a+b)!(c+d)!(a+c)!(b+d)!}{n!a!b!c!d!} \quad (\text{formula 6})$$

- 3) The sum of all p_i is the value of the test criterion and it is then compared to the level of significance α .

If $\sum p_i < \alpha$, the null hypothesis is rejected (Svatošová, Kába, 2008).

2.1.4 Determining of the strength of dependency in association table

According to (Svatošová, Kába, 2008), if a significant dependency between two alternative characters exists, it has to be expressed. The strength of dependency is expressed by the coefficient of the association. It is symbolized by V and calculated as follows:

$$V = \frac{ab - bc}{\sqrt{(a+b)(c+d)(a+c)(b+d)}} \quad (\text{formula 7})$$

It is located at the interval from -1 to +1 and the greater the absolute value is, the greater the strength of dependency.

The strength of dependency can also be calculated from the calculated value of the test criterion χ^2 . In this case, V is in its absolute value.

$$|V| = \sqrt{\frac{\chi^2}{n}} \quad (\text{formula 8})$$

2.1.5 Analysis in contingency tables

Contingency is the relationship of two or more qualitative statistical characters from which at least one is the plural character. The characters are structured as following:

Table 3 – Contingency table

Character B Character A	b ₁	b ₂	.....	b _j	.....	b _m	Total
a ₁	n ₁₁	n ₁₂	.....	n _{1j}	.....	n _{1m}	n _{1.}
a ₂	n ₂₁	n ₂₂	.....	n _{2j}	.....	n _{2m}	n _{2.}
.							
.							
a _i			.....	n _{ij}	.....		n _{i.}
.							
.							
a _k	n _{k1}	n _{k2}	.....	n _{kj}	.....	n _{km}	n _{k.}
Total	n _{.1}	n _{.2}	.....	n _{.j}	.....	n _{.m}	n

Source: (Svatošová, Kába, 2008), own elaboration

2.1.6 Testing the independence in contingency tables

For the purpose of testing in contingency tables the χ^2 test is used. There is a generalization of the χ^2 test for association tables. Talking about the formula, it is the difference between real (empirical) frequencies n_{ij} and theoretical (expected) frequencies n_{oj} . Theoretical frequencies are formulated as the multiplication of the appropriate marginal frequencies divided by the total sample size (Svatošová, Kába, 2008).

$$n_{oj} = \frac{n_{i.} \cdot n_{.j}}{n} \quad (\text{formula 9})$$

χ^2 independence test

H₀: There is no dependency between the observed characters.

$$\chi^2 = \sum \frac{(n_{ij} - n_{oj})^2}{n_{oj}} \quad (\text{formula 10})$$

The calculated value of test criterion is then compared to the critical value of $\chi^2_{\alpha (k-1) (m-1)}$, where k represents the number of changes of the first character and m represents the number of changes of the second character. If $\chi^2 > \chi^2_{\alpha (k-1) (m-1)}$, the null hypothesis is rejected. Other approach takes p-value into account. If p-value is lower than alpha, the null hypothesis is rejected.

Conditions for using the χ^2 test:

The proportion of theoretical frequencies lower than 5 must not exceed 20% and not any of theoretical frequencies can be lower than 1.

If these conditions are not met, the test can only be used after the synthesis into weak groups. Rows or columns are brought together in a logical way. If the synthesis is logical, the results are easy to interpret. After that, the conditions mentioned above are examined again (Svatošová, Kába, 2008).

2.1.7 Determining the strength of dependency in contingency table

The strength of dependency can be expressed in two ways. The first one is **Pearson contingency coefficient**:

$$C = \sqrt{\frac{\chi^2}{\chi^2 + n}} \quad (\text{formula 11})$$

This coefficient needs to be normalized using value C_{\max} . This value can be found in appropriate statistical tables. Normalized coefficient is formulated as follows:

$$C_n = \frac{C}{C_{\max}} \quad (\text{formula 12})$$

Final C_n is located in interval from 0 to 1. Determination of strength is based on the same principal as in case of coefficient of association. It means the greater the value is, the greater is the strength of dependency (Svatošová, Kába, 2008).

According to (Svatošová, Kába, 2008), the second possible way how to express the strength of dependency in contingency table is **Cramér's contingency coefficient**. It is symbolized by V and the strength of dependency is determined equally as in Pearson contingency coefficient. It is calculated by following formula:

$$V = \sqrt{\frac{\chi^2}{n(q-1)}}, \text{ where } q = \min(r,s) \quad (\text{formula 13})$$

2.1.8 One sample test for proportion (2-tailed test)

One sample test for proportion is used while comparing a proportion of random sample to population proportion. The assumption of large sample size ($n \geq 100$) must be met. The approach of testing is following:

- 1) Formulate null and alternative hypotheses

H_0 : There is no statistically significant difference between population proportion and random sample proportion. $p_u = p_s$, where p_u = population proportion, p_s = sample proportion

H_1 : There is statistically significant difference between population proportion and random sample proportion. $p_u \neq p_s$

- 2) Set the rejection criteria α

Usually $\alpha = 0.05$

Z- distribution table is used, critical value equals to 1.96

- 3) Calculate the test statistic according the following formula:

$$z_o = \frac{p_s - p_u}{\sqrt{\frac{p_u(1-p_u)}{n}}}$$

(formula 14)

- 4) State the results

If $z_o > z$ or if p-value < alpha, reject null hypothesis

- 5) State the conclusion (One Sample z-test for proportions, 2013) (One Sample Z-test, 2013)

3 Literature review

3.1 Marketing

Marketing is one of the basic firm's functions, which operates on the market. Marketing is defined as follows: *"The activities of a company associated with buying and selling a product or service. It includes advertising, selling and delivering products to people. People who work in marketing departments of companies try to get the attention of target audiences by using slogans, packaging design, celebrity endorsements and general media exposure. The four 'Ps' of marketing are product, place, price and promotion"*(investopedia, 2013).

Nowadays, marketing is more customer-oriented. The marketing of the 4 Ps was substituted by the alternate marketing of the 4 Cs. It is mainly focused on consumers' needs and wants, but it can be used for the mass market, too. The 4 Cs are represented by the customer, cost, convenience and communication (Alternate marketing mix - Four C's of Marketing, 2013).

Table 4 – Alternate marketing mix of 4 C's

CUSTOMER	COST
CONVENIENCE	COMMUNICATION

Source: (Alternate marketing mix – Four C's of Marketing, 2013), own elaboration

3.1.1 Marketing research

A marketing research “*is the function linking consumer, customer and public to the marketer through information*” (Kotler et al, 1999).

This information mainly defines and analyzes firm’s problems and opportunities.

According to this statement, a marketing researcher must obtain a very wide complex range of information and understand the marketing research process well. Nowadays, almost every business organization uses marketing research. At the same time, marketing research is an important component of a marketing information system (MIS), which “*consists of people, equipment and procedures to gather, sort, analyze, evaluate and distribute needed, timely and accurate information to marketing decision makers*” (Kotler et al, 1999).

A marketing information system also includes an internal information system. An internal information system involves information about orders, sales, prices, inventories, receivables, debts etc. A good analysis of these factors can help identify opportunities and problems, too.

Mainly it is about the cycle order – delivery – invoice. The analysis needs to be fast and correct. Modern companies use modern equipment (laptops) for these purposes (Kotler, 1992).

3.1.2 Marketing research system

The marketing research process consists of four main parts:

Table 5 – Marketing research process



Source: (Product Launch Learnings, 2013)

3.1.3 Defining the research objectives

Proper defining is half of the solution. Hundreds of things can be researched and if the definition is not correct, the costs (for information gathering) will be higher than the benefits (Kotler, 1992).

The marketing manager and the researcher must work very close to each other. Both must agree on the same research objectives. The manager must have a good knowledge about marketing research to help in the planning and in the interpretation of the research results.

Example: We are trying to find if the customers are able to pay more for new flavoured beer (for example 20 CZK). The definition must be neither so narrow, nor so wide. We should be able to answer the questions:

- Why should it cost 20 CZK?
- What will be the return of expended costs?
- Will there be any new consumers?
- Will people drink flavoured beer rather than ordinary beer?
- What is the target group?
- What will be the increase of consumers?
- What will be the increase of goodwill?
- What is the relative significance of other factors influencing people?

But not all the projects have the similar objectives. Basically there are three types of research projects:

- a) Exploratory research is “*marketing research to gather preliminary information that will help better to define problems and suggest hypotheses*” (Kotler et al, 1999).
- b) Descriptive research is “*marketing research to better describe marketing problems, situations or markets, such as the market potential for a product or the demographics and attitudes of consumers*” (Kotler et al, 1999). The aim is to describe the variables, for example how many people would buy the flavoured beer if the price is 20 CZK (Kotler, 1992).
- c) Causal research examines the cause-and-effect. For example if the price goes down on 15 CZK, will there be the increase of customers by 25%? (Kotler, 1992)

3.1.4 Developing the research plan

The plan must be built professionally. We, as the marketing researchers, cannot just say: “find some people and ask them, if they are able to pay 20 CZK for flavoured beer.” We also need to know the presumption of costs per realization. Imagine a situation where the brewery has a long-time profit of 1,000,000CZK. If the manager is convinced the marketing research will help increase its profit to 1,500,000CZK, this marketing research would be effective only in case the costs would be lower than 500,000CZK (Kotler, 1992).

Table 6 – Developing the research plan

Source of information	Secondary information	Primary information		
Research approaches	Survey	Groups of interest	Exploration	Experiment
Research methods	Questionnaire	Technical devices		
Selection plan	Selection unit	Sample size	Selection approach	
Contact methods	Phone	Mail	Personal contact	

Source: Kotler, 1992, own elaboration

3.1.5 Sources of information

We are able to collect two types of information – primary and secondary. Researchers usually start with the secondary information. This information was already used for some other purposes. We can use internal and external (state publications, books, commercial information) sources. The advantages of secondary information are lower costs and the speed of achieving them. On the other hand it could be old and incorrect. The primary information is collected for a specific research purpose. It is more expensive, but more significant (Kotler, 1992).

3.1.6 Research survey

Information must be gained by observing relevant people in relevant situations, for example in pubs (what people are talking about there) in our case. We can get precious information about how people choose their beer.

A group-oriented research questionnaire can be used, as well. In this case, the researcher is talking about the project in a group of 6 to 10 people. He must have good knowledge of the phenomena (beer) and people's behaviour. He should engage people in informal discussions, must understand perception and the satisfaction of the customer. The disadvantage is that the sample is too small and the people are not chosen randomly. The most scientifically valuable is experimental research. Let's say the experimental price of flavoured beer is 15 CZK. If we decrease the price to 10 CZK and the change in number of customers is the same, we would be able to explain the number of customers by the change in price (Kotler, 1992).

3.1.7 Research tools

The questionnaire is the most frequently used tool for gathering information. Nowadays, questionnaires are found everywhere (in newspapers, on social networks). But creating such a questionnaire is not very simple and the creator should follow many rules.

First of all, we can show the example of questionable questions, which should be used in the questionnaire:

Table 7 – Example of questionable questionnaire

Question	Why questionable
What is your income?	People usually do not know their income closely. The researcher should never ask directly on such a topic.
Are you “strong” or “weak” supporter of something?	What do the terms “weak” and “strong” really mean?
How many advertising operators mailed you last month?	Who can remember this?
What are the most salient and determinant attributes in you evaluation of something?	What are “salient” and “determinant” attributes? These are such big terms.
Do you think it is right to deprive your child of the opportunity to grow into mature person through the experience of adventure holidays?	This is a very loaded question, which gives the bias.

Source: (Kotler et al, 1999), own elaboration

Now it is known, which questions are not suitable. Another frequent mistake is that there are many questions, which are not needed for the research. But the questions, which are only interesting and give impertinent information, should be skipped (Kotler, 1992).

Talking about the rules of the researcher, creating the questionnaire should be done very carefully. The most important things are form, consecution, and stylization. Generally speaking there are two types of questions - closed and open. Open questions say much more, but it is difficult to analyse them. Stylization should be simple and the researcher should use direct formulation. Finally, the consecution must be taken into consideration. Here the first questions should make the respondent interested, the last ones should be more complex (Kotler, 1992).

Before making the questionnaire, we should have a clear idea what to research and the so-called research question should be defined. It is also necessary to keep the requirement of the representativeness of the sample. There are three approaches how to do that. The first one is a blind estimate, which is made subjectively in regard to the researcher's experience. The second one is a cost approach, which is based on the calculations of costs per survey. The last one, and the most scientific, is a statistical approach. It is based on statistical methods having regard to the required degree of reliability (Svatošová, Kába, 2008).

We distinguish among many types of questions:

- Close – respondent fill only one or more of the given options. These questions should predominate in the questionnaire. They are also most easily evaluated.
- Open – respondent's answer is free. Researcher gets the wide spectrum of answers. It is really difficult to analyse these questions.
- Identification – very important, based on the answer researcher can categorize the respondents.
- Contact and training – main aim is to establish better contact with respondent and to remind the fact on which the researcher wants to hear the opinion. Usually, there is no need to evaluate them.
- Filter – enables to exclude the respondents, whose next asking would not make sense (Svatošová, Kába, 2008).

The researcher's attention should also be focused on the systematic and logical order of the questions and on the number of questions. The respondent should not be influenced by answers on previous questions. Respondent should not get tired of filling in the

questionnaire. It basically means that the number of questions should be efficient for the evaluation of the problem (Svatošová, Kába, 2008; Řezanková, 2010).

The proposed answers should contain all the possible options, be clear and unambiguous. The option “I do not know” or “Others” should also be included. The exception is the case, when the respondent is able to choose more alternatives. The final questionnaire should combine all types of questions (Řezanková, 2010).

3.1.8 Selection plan

There must be 3 types of decisions:

- a) Who should be surveyed? The target group should be defined precisely.
- b) How many people should be surveyed? The more, the better. But if the construction of the selected sample is made carefully, we do not need so many people. On the other hand, the sample should not be excessively large. In other words, it should be large enough to give us a confidence interval of the desired width. This number is also known as the optimal size.
- c) How should the respondents be selected? There are many ways of selecting the sample (Kotler, 1992, Kothari, 2004).

3.1.9 Implementing the research plan

This part is the most expensive and we can easily make a mistake. There are four main problems- people are not at home (we can contact them again or choose someone else), some people reject the cooperation, some people lie, and some give dishonest responses. We, as the researchers, must not affect the responses and we must use the same approach to everyone. To analyse the data we can use many precise statistical techniques (Kotler, 1992).

3.1.10 Reporting on the results

When we are presenting the results, we should only inform about important and significant findings. We should analyse issuable questions, as well (Kotler, 1992).

3.2 Beer

3.2.1 History in the world

Beer is one of the oldest beverages made by man. It used to be a turbid beverage, not very similar to today's beer (Pilsner Urquell, 2013).

The oldest evidence of brewing is from ancient Sumer (now Iraq) 6000 years ago. Also the oldest recipe for making beer was according to Sumerian instructions. They passed their experience to the Babylonians, who began experimenting with flavour. They added various fruits to the beer to improve its taste. And in order to improve the quality, the old Babylonians drowned bad brewers in their own beer of bad quality.

Babylonians began to export the beer to Egypt. Egyptians met in the evenings in the pubs and beer became the national beverage – an aspect, which connected all social classes. In ancient Egypt, beer was also used in medicine. The medical document drafted in approximately 1600 BC describes over 700 recipes. 100 of them include the word “beer“ (Pilsner Urquell, 2013).

Together with the expansion of the Greek and Roman Empire the popularity of beer increased. The word beer, moreover, comes from the Latin “bibere” which means “to drink”.

Over the next thousand years, brewing was the agricultural thing. Even in the Middle Ages the brewing industry became significant. And during these times the beverage began to be similar to the one to which we know nowadays. Initially the European monks guarded the art of brewing. (Jackson, 1988; Pilsner Urquell, 2013)

3.2.2 History in the Czech Republic

Even passionate beer lovers very often do not know about the very important position of the Czech Republic among beer countries. Things become clear at the moment it is realized the central part of the Czech Republic is called Bohemia. There are many beers around the world with the word “Bohemia” in its name or in the description of its features. The first written mention of brewing beer comes from the Vyšehrad Chapter Charter, issued in 1088 by Vratislav the Second. During the establishment of the royal towns, these towns received some privileges and rights. One of them was permission for the townspeople to brew their own beer. On the other hand, the mile law forbade brewing beer by other people within an area of one mile. Since the beginning of the 14th century, the wealthiest feudal lords had violated the royal restrictions and had established new

breweries in their own dominions. In 1379, the first brewery of its kind there was established in Třeboň. In 1517, King Ludvik gave permission to the nobility to establish their own breweries. According to this event, the big boom began and even halfway through the 16th century there were over a thousand of these breweries (Jackson, 1988).

Bohemia was most famous in the past for its wheat beer, also called “white”. The huge development of barley beer came halfway through the 17th century. But even halfway through the 19th century, Bohemia had achieved the reputation of brewing pure light beer. This beer was brewed from malting barley and it is known as the Pilsner kind of beer (also Pilsener) all around the world. Companies like Smíchov’s Ringhoffer or Pilsner Škoda became the producers of the breweries machines. Also, the invention of “bottom fermentation” helped a lot to raise the quality. Beer, therefore, has a greater tang. Pilsner dominated during this time in Bohemia. The situation is very similar as it is today. The typical Czech characteristic is the conservativeness when selecting the beer. The lower layers are used to drink the light ten degree beers, while experts and the higher layers prefer stronger lagers. The term “Czech lager” refers to eleven-degree beer with the amount of alcohol usually around 5%. Talking about the given preferences, men prefer a light type of beer while women a dark one (Jackson, 1988).

The Czech Republic processes around 17,000,000 hl of beer annually. The majority of this amount is consumed by Czechs while only about 10% is exported. At the same time, the import from foreign countries is minimal and has almost no significance. Also the consumption per capita is breath-taking – around 150 litres. The consumption has started to decrease; it peaked in 2005 with 163.5 litres per capita. But it is still enough to safely secure the top spot followed by the Irish and the Germans (Jackson, 1988; Ask men, 2013; Trendy ve spotřebě potravin, 2013).

In 1992, a new group called The Prague Breweries (PB) was founded as the first wave of privatization. It consists of Staropramen, Braník and Měšťan. It is a nice example of the transformation from a state owned company to a dynamic company characterized by growth. As it was already said that Czechs were very conservative, in this case the exception proved the rule. Most importantly, the PB merged with BASS PLC, the largest UK brewery, in 1993. BASS brought the new efficient methodology standards, marketing, equipment and know-how. Nowadays, the PB is popular brand (Příbová, 1996).

3.2.3 What is beer?

According to definition beer is

- “a. A fermented alcoholic beverage brewed from malt and flavored with hops.*
- b. A fermented beverage brewed by traditional methods that is then dealcoholized so that the finished product contains no more than 0.5 percent alcohol.*
- c. A carbonated beverage produced by a method in which the fermentation process is either circumvented or altered, resulting in a finished product having an alcohol content of no more than 0.01 percent”* (Free online dictionary, 2013).

According to Jackson (1988) beer is any fermented beverage made from malted grain and flavoured with hops.

3.2.4 Ingredients

Beer is produced from water, hops, malt and yeasts (Pivní recenze, 2013)

Water

Water is one of the basic ingredients and has a great influence on the final product. The amount and the kind of containing salt are very important. These aspects influence the final taste. Generally speaking, soft water is preferable for making light beers (ales) and heavier for the production of dark. Some breweries chemically modify the water, so that it mostly satisfies their needs (Jackson, 1988; Pivní recenze, 2013).

Hops

The most famous hops are from the Žatec region. This kind is widely used in the Czech Republic. Hops give the typical bitter taste to beer. The leaves contain tannin, which help clean the beer. The chemical composition is very difficult. Nevertheless, the alpha acids represent the main significance because of antiseptic affects. Breweries use it mostly in the form of hop pellets. However, we can find it in the form of hop cones (Jackson, 1988; Pivní recenze, 2013).

Malt

Grain is to beer as the grapes are to wine. Malt is mostly sprouted barley grain (special varieties). Wheat and rye can be also used. At a certain stage the sprouting is stopped, then it is dried and the key (malt) is broken off. The brewers mince it to a certain size. Only high quality barley can be used. At the same time, about nine-tenths of the harvested barley is used for other purposes, mostly as cattle feed (Jackson, 1988; Pivní recenze, 2013).

Yeasts

Yeasts have a major impact on the final product. Breweries usually have their own yeasts bred they use. Yeast can be reused several times before they are replaced. Under the microscope a sample of yeast reminds us of the chain of fungal organisms, which are able to convert sugars to alcohol (Jackson, 1988; Pivní recenze, 2013).

3.2.5 Why beer differs

Most of the beers are produced in the way to satisfy the higher percentage of all consumers. The price must be competitive and the taste must not be annoying to anyone. If beer shall have its typical characteristics taste, the brewery must give it to it. The brew master can do everything correctly, but the taste can still be unsatisfactory. The study of different methods of different brew masters does not uncover the secret. Brewing remains an art as well as a science (Jackson, 1988).

As it was already mentioned, different kinds of barley are used. The area and season of cultivation, the combination of different malts, the characteristics of water, the difference of additional hops – these are only some possible factors, which significantly influence the final taste and appearance (Jackson, 1988).

3.2.6 Technological process of beer production

Although the basic principal of brewing is the same in all breweries, the concrete appearance of all equipment is different according to the brew master's needs and to options available. The whole process of production is described as follows:

1. The malt is poured through a sieve into the mill.
2. This mill mashes the malt.
3. Grist together with hot water is poured into a tub. A mash, which looks like porridge, is formed in a container.
4. The mash is cleaned in the next vat. The pure liquid, called beer wort, goes into beer vat.
5. Hops are added and the liquid starts to boil. This liquid is called wort.
6. After boiling, the hops are removed. The pure wort passes through a sieve.
7. Proteins are detached from the wort with sludge collectors.
8. The wort passes through a condenser to obtain the correct temperature to the process of fermentation.

9. Yeasts are added before starting this process.
10. After fermentation, the wort is sent to tanks, where the beer substance lies.
11. Ripened beer is then filtered.
12. After filtering, the beer enters the last tank. Then it can leave the brewery (Jackson,1988).

3.2.7 Storage

Beer is brewed to immediate consumption. The ideal place to store the beer is the fridge in most cases. Nevertheless, it must not be set to great cold. The earlier the beer is consumed, the better. On the other hand, the fermented beers should not be consumed immediately after the purchase, because the yeasts have to become stable. And the best place to store them is the cold cellar, not the fridge.

For a majority of consumers, a bottle is more suitable than a tin. In this case, the brew masters are afraid of the long-term contact of beer with metals (Jackson, 1988).

3.3 Consumer behaviour

Nowadays, the knowledge of consumer, especially his or her needs, desires and images, plays a key role on the market. Because of the influence of the global trends, the behaviour of Czech consumers still develops. Customers prefer certain criteria while deciding if to purchase or not. The knowledge of these preferences represents an advantage in the sphere of production and commerce (Hes, 2009).

3.3.1 Factors influencing the decision making during purchasing of food

Consumer behaviour is closely connected to purchasing process. Generally speaking, the consumer decides according to his or her actual needs. The consumer usually takes into consideration these factors: quality and characteristics of product, price, country of origin, own experience, purchasing conditions, recommendations, impression, and time. On the other hand, the specific factors affecting consumer behaviour during the purchasing of food are: propagation, the actual vendor – chain, availability of shop - time, health aspect, and season (Hes, 2009).

The quality and the characteristics of product are a very important aspect during the choice of beer snacks and other food services.

The consumer perception of the concrete advantage of the product plays a very important role. The example could be the nutrition and health statements on the packing of the

product (for example “low content of fat”). A health statement is any viewpoint, which is used for the advertisement of food as a benefit during the purchase. But not all these recommendations are truthful. The consumer does not have the chance to prove this information. The goal is to provide this information established on scientific evidence, which is suggested by the European Commission.

Many consumers also state, that they do not read this information on the packaging. The main reason is saving of time. It means that for example the expired shelf time date can escape to them. This negatively affects the quality of good.

Also the term “guarantee” should come to our minds at this time. Guarantees should reduce purchase risk and get consumer’s confidence on higher level. We can divide them into three main groups – brand name (mentioned later), quality labelling and geographic origin (mentioned later). By the term quality labelling is meant the significant effect of consumer’s perception of quality. It is also proven, that food with a quality label received more positive quality perceptions and lower perceived risk (Hes, 2009; Wieringa et al, 1997).

The price is still one of the most important factors for a majority of consumers.

Consumers are generally not willing to pay extra price for high quality products. Especially discount events and sales are a favourite for them (Hes, 2009).

The country of origin is another very important factor affecting the consumers.

Nowadays, consumers prefer domestic product in comparison to previous decades. They are interested in details about the producer and they should be able to read this information on the packaging (Hes, 2009).

The brand plays also important role. Consumers prefer the products from concrete producer. The specific symbols should declare quality or safe products. But some brands are not certificated by competent authority. This information may mislead the consumers. Another problem is low awareness of consumers about the significance of particular brands (Hes, 2009).

Own experience is another factor, which consumers take into their consideration. During the decision making process of purchasing, consumer usually prefer the product, which he or she already has good experience. Very often the consumers do not even think about the new product. They are buying the satisfactory good automatically (Hes, 2009).

The purchasing conditions are very important, too. The purchasing environment consists of goods, employees, equipment, customers themselves. Also the design of the store, store layout, goods presentation, staff and customers are included here (Hes, 2009).

The recommendations of friend may also have the influence. Sometimes it is even greater, than the targeted advertisement. In this case, people recommend the objective information among themselves (Hes, 2009).

The visual impression (packaging) has a promotion and communication function. It should attract consumer's attention and lead to unplanned purchase. It should also include the information about the product and its composition. The consumer's perception of packaging should not be underestimated (Hes, 2009).

The time is the factor, which also influence consumers. It is likely to buy the product near the home. The consumer appeals on the quick purchase of goods. In this case, he or she does not have to wait in the long queue and also the atmosphere is friendlier (Hes, 2009).

The propagation affects the consumers in both positive and negative sense. The advertisement is generally perceived negatively. However, almost the half of consumers say, that it influenced them during their purchase (Hes, 2009).

Nowadays, the focus is increasingly placed on **the health aspect** thanks to changing lifestyles. This trend represents organic food, which is more and more popular. At the same time, it still has a low portion of aggregate food purchase. This is mainly caused by the higher price in comparison to ordinary food (Hes, 2009).

The consumer weights **the actual vendors** and their chain stores. Each of them has a specific store environment, services, purchasing conditions, their own assortment of goods etc. Consumers choose the one, which mostly satisfies their needs and requirements (Hes, 2009).

Another possible factor affecting consumer behaviour is **the season**. The assortment of goods usually differs during the year. Consumers have different needs in each season, therefore the stores offer different goods during the year (Hes, 2009).

According to Příbová (1996), "*the direct customers of breweries are those who sell beer: pubs, hotels, restaurants, supermarkets and shops.*" The consumer has the choice, whether to pay more in the pub or less in the supermarket. Another thing, which is needed to be taken into consideration, is attractiveness of the place. On the other hand, consumers have very limited choice of beer brands in pubs (Příbová, 1996).

4 Own work

4.1 Statistical analysis of data and its evaluation

The questionnaire was used for the purpose of analysis. It was created according to the rules, which are deeply described in the theoretical part. The first question filtered the respondents. If they drank beer, they were answering the set of questions connected to beer consumption. If not, they were answering just identification questions and why they did not drink beer. Finally, there are the identification questions. All questions are closed, but many of them include the option “other”, which gives the respondents their own alternative.

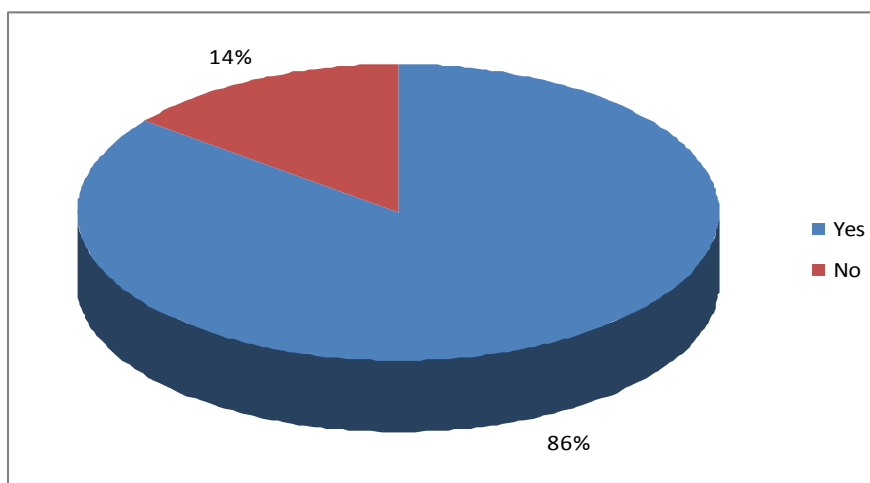
4.2 Evaluation of survey

Totally, 340 respondents filled the questionnaire in. The questionnaire was distributed both through the social networks and by paper form. The method called “snowball sampling” was used. The link or the paper form of questionnaire was provided to small number of people, these people gave the link to others etc. The questionnaire was created at web pages dotaznik.czu.cz. Especially for better imagination of results, the questions were evaluated graphically in Microsoft Excel 2010.

4.2.1 Structure of respondents

As mentioned above, the first question was filter question. It filtered the respondents into two groups. The following graph no.1 illustrates the answers on the question “Do you drink beer?”.

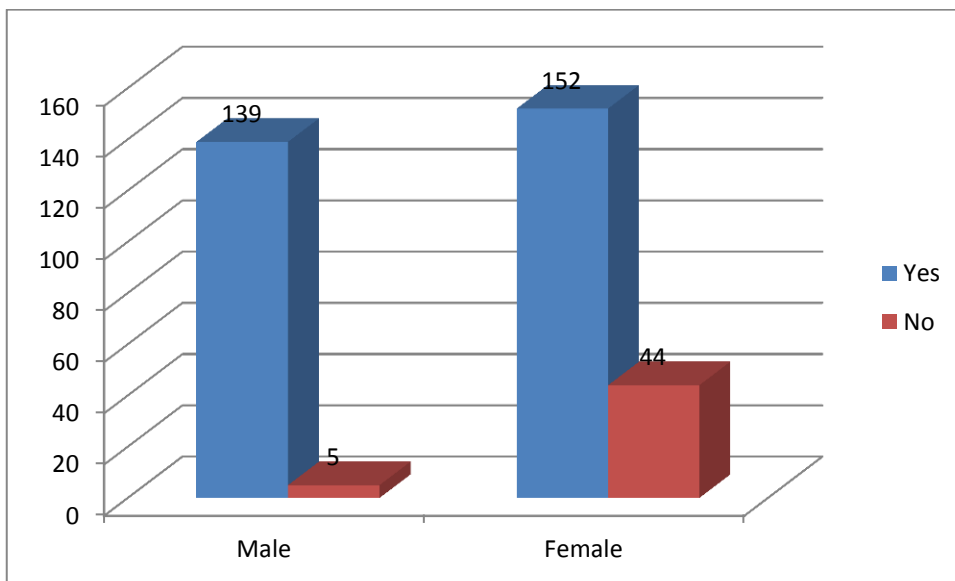
Graph 1 – Evaluation of question: Do you drink beer?



Source: own elaboration

As seen, 86 percent of respondents answered positively. Only 14 percent of respondents do not drink beer. In detail, 291 respondents answered “yes” and 49 “no”. According to gender, the proportions are as follows: 139 of males answered “yes”, only 5 chose the option “no”. The answers of females are not so unambiguous. 152 of them answered “yes”, while 44 chose “no”. It is shown on the next graph no. 2.

Graph 2 – Evaluation of question: Do you drink beer? – according to gender

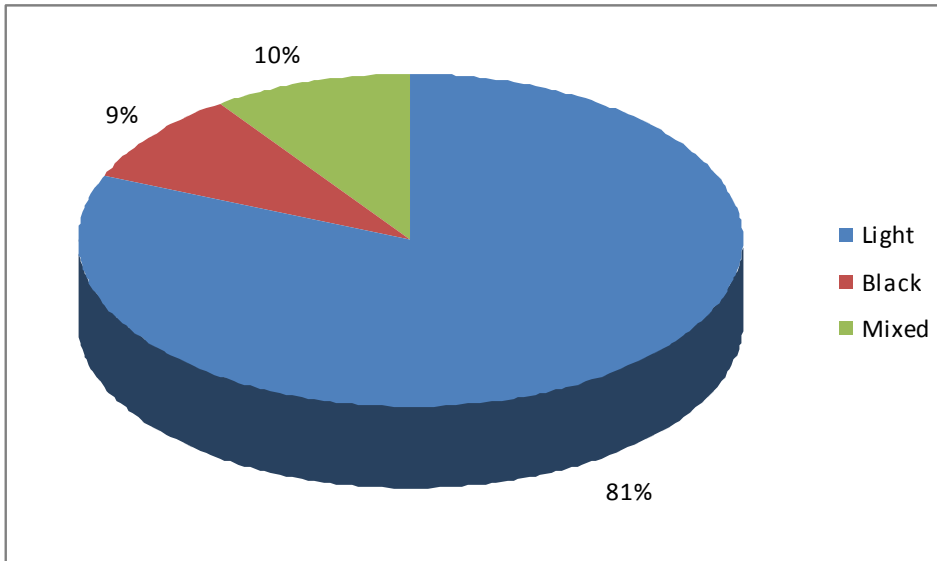


Source: own elaboration

4.2.2 Evaluation of beer drinkers

The following analyses are focused on beer drinkers. The first graph (no. 3) of this group shows the preferred type of beer.

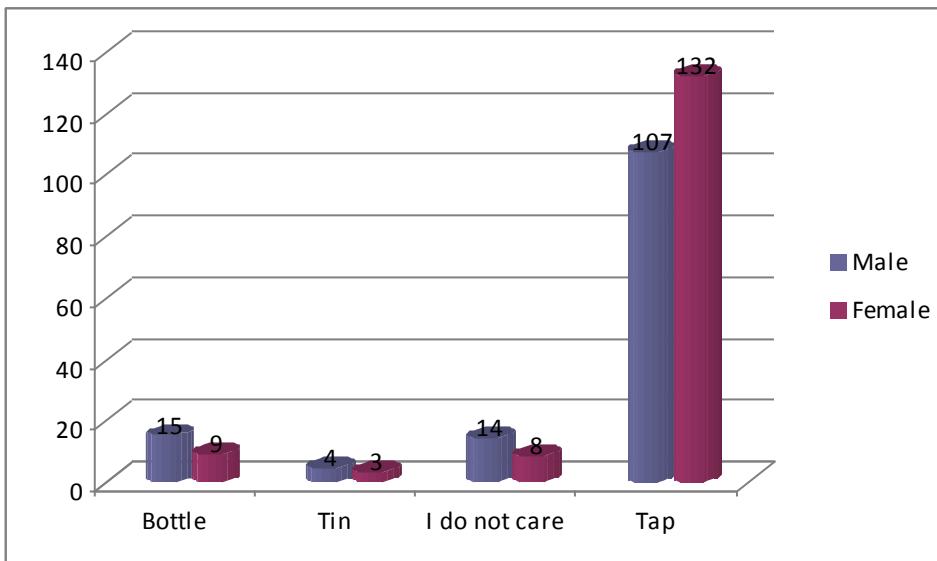
Graph 3 – Evaluation of question: Which type of beer do you prefer?



Source: own elaboration

A majority of beer drinkers prefer light beer. Only one tenth mostly drink mixed beer and even a little bit smaller amount of them prefer black beer. The complementary question to this one relates to preferred packaging. The answers are registered on the graph no. 4.

**Graph 4 – Evaluation of question: Which of the following packaging do you prefer?
– according to gender**

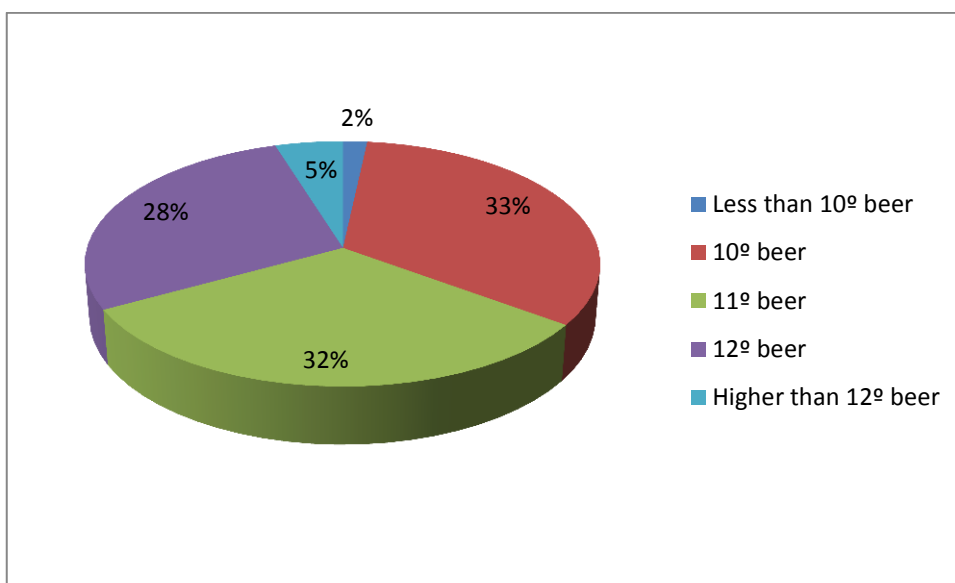


Source: own elaboration

As it is seen, a majority of respondents prefer tap beer. Accurately it is 82 percent of all beer drinkers. The proportion of females is even higher. 8 percent prefer bottle beer. Males seem to be not so choosy, while the option “I do not care” was chosen by almost double frequency in comparison to females. Tin beer is favoured only in 2 percent of cases.

Another graph no. 5 represents the answers the answers on question ”Which degree of beer do you drink mostly?”.

Graph 5 – Evaluation of question: Which degree of beer do you drink mostly?

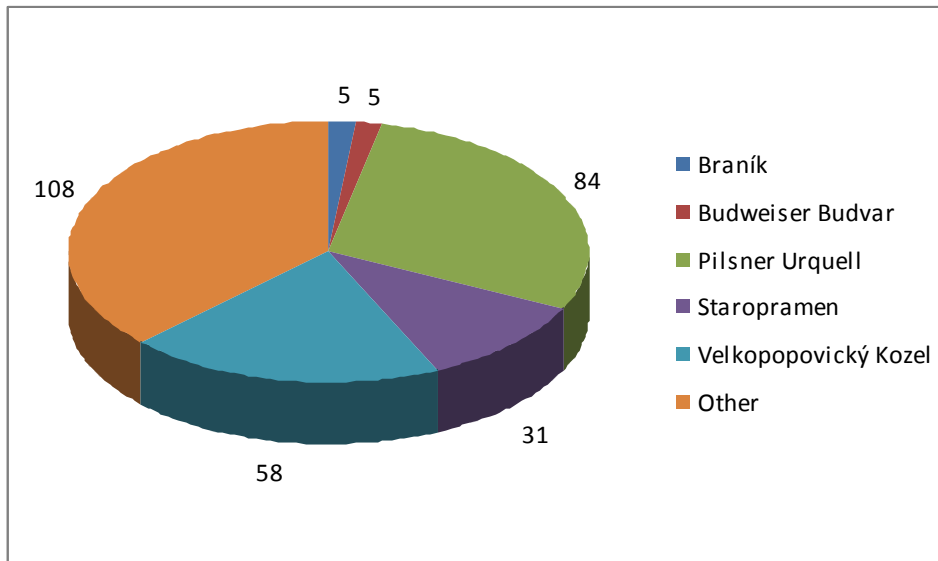


Source: own elaboration

It is obvious that beer consumers mostly choose among 10° beer, 11° beer or 12° beer. In this case, the percentages are almost equal. A minority of beer consumers mostly drink less than 10° beer. Not a big amount of people is able to pay more for beer specials (just around 5%).

Almost each beer consumer has his or her favourite beer brand. The question “Which Czech beer brand do you prefer?” was set for purpose of finding the most popular Czech beer brand. Everything is assumed on the graph no. 6.

Graph 6 – Evaluation of question: Which Czech brand do you prefer?

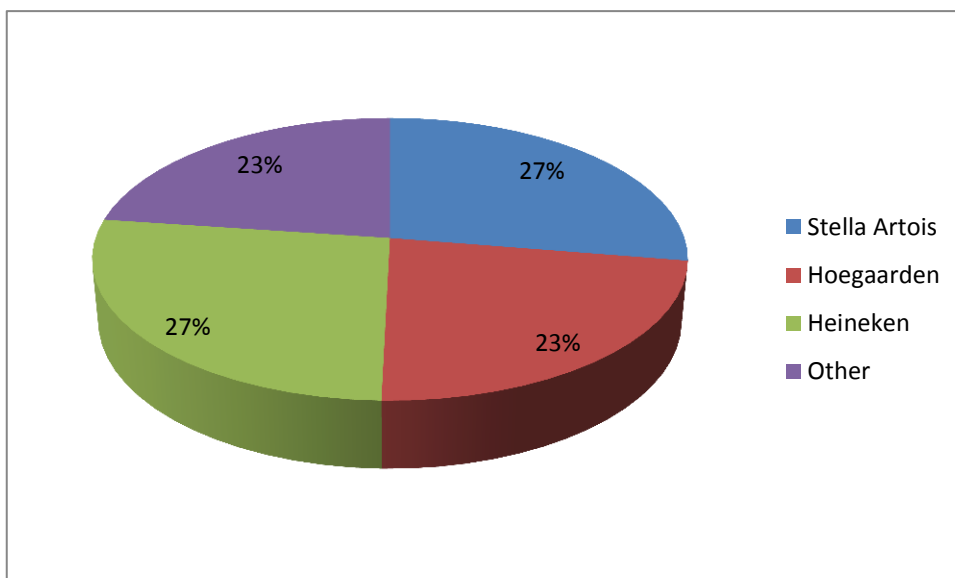


Source: own elaboration

The results sign the most popular Czech brands are Pilsner Urquell and Velkopopovický Kozel. But more than one third of beer consumers chose the option “other”. Another 28 brands were written out. The most repeated ones were Svijany, Ježek or Gambrinus.

Next question in the questionnaire “Do you drink beer of foreign brand?” filtered beer consumers into two groups. 58% of beer consumers chose the option “yes”. On the graph no.7 are shown the most preferred foreign beer brands.

Graph 7 – Evaluation of question: Which foreign do you prefer?



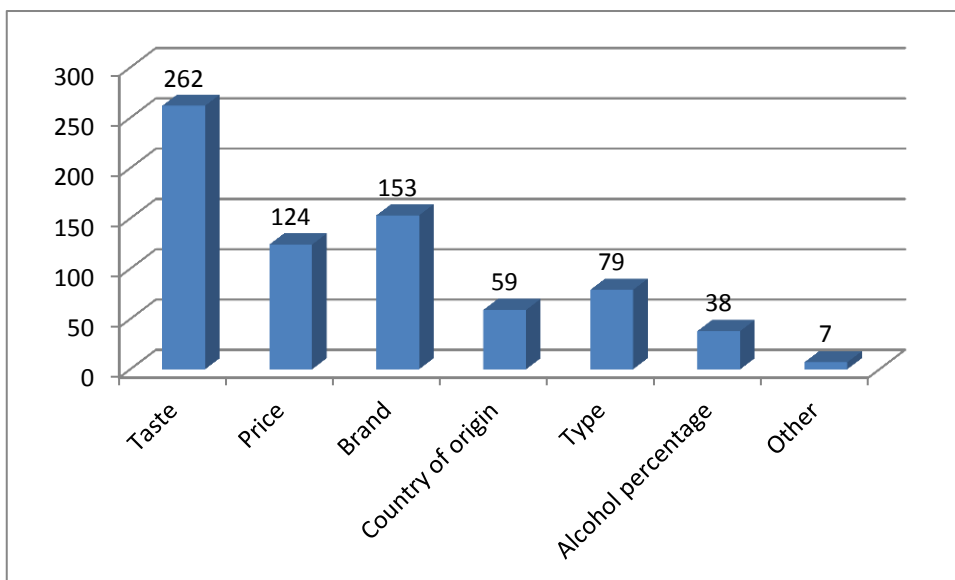
Source: own elaboration

None of the foreign beer brands has dominant position. The most consumed are Stella Artois and Heineken. But the space between them and the third most consumed foreign brand, Hoegaarden, is only 4 percent. The option “other” contained answers like Guinness, Kriek, Paulaner, Sagres, Bavaria, Lapin Kulta, Landbier, Carlsberg, Erdinger or Haacht Mystic.

Appendix no. 2 analyses the question “Estimate your weekly consumption in liters”. The average consumption was calculated as 188 liters per capita. It is a little bit more than the population average. However, there were no respondents younger than 18 years in the sample.

Next graph no. 8 analyses the most important criteria when purchasing beer. The respondents were able to choose more options.

Graph 8 – Evaluation of question: What is the important criterion when purchasing beer?



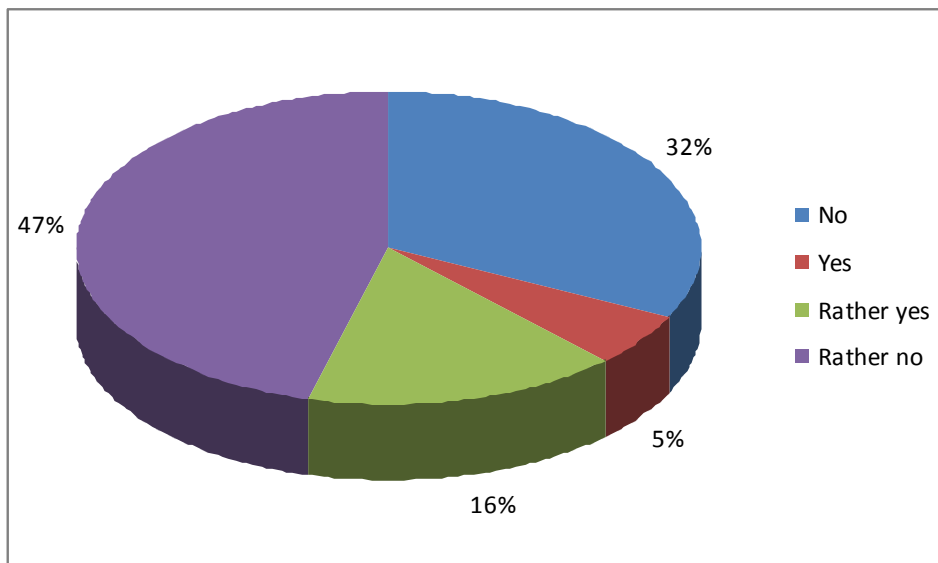
Source: own elaboration

Taste is the determining factor. People are able to pay more for their favourite brand and of course for the beer, which satisfies their taste. Type, alcohol percentage and country of

origin are not so significant factors. The answers “other” do not have any similar pattern. The most interesting ones were ”not Gambrinus” or ” beautiful waitress”.

Demand for beer is price inelastic, especially in the Czech Republic. The purpose of question “Would you think about reducing beer consumption if the price increased by 10 %?” is to determine if it is so. Its analysis is shown on the following graph no. 9.

Graph 9 – Evaluation of question: Would you think about reducing the beer consumption, if the price increased by 10 %?

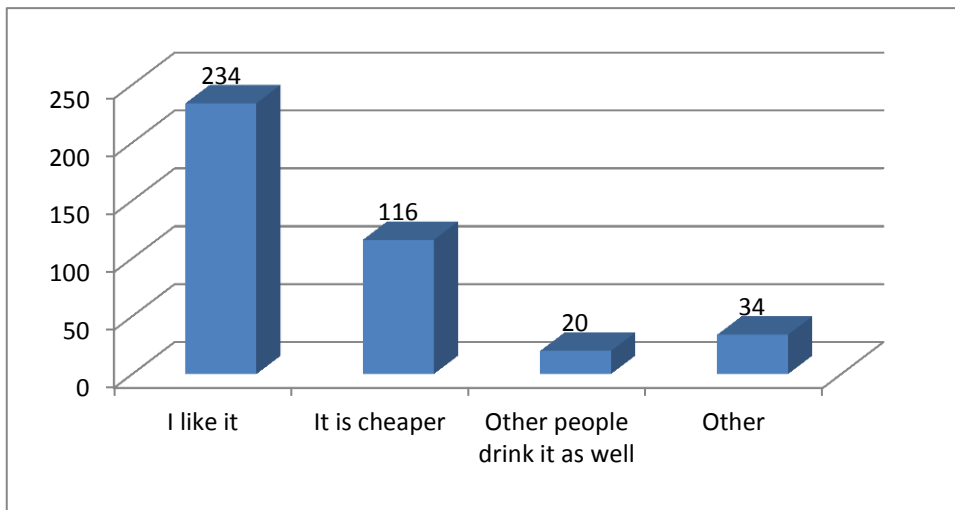


Source: own elaboration

Almost four fifths of respondents would not think about reducing their beer consumption if the price increased by 10 %. Only 5 per cent stated “yes”. It proves the statement about price inelasticity of demand of beer.

It is also very important to know the reason, why people drink beer. They can simply like it, another reason may be relatively low price in comparison to other alcoholic beverages as well as the influence of other people, who drink beer. Graph no. 10 shows the results. Respondents were able to choose more options.

Graph 10 – Evaluation of question: Why do you prefer beer to other alcoholic beverages?



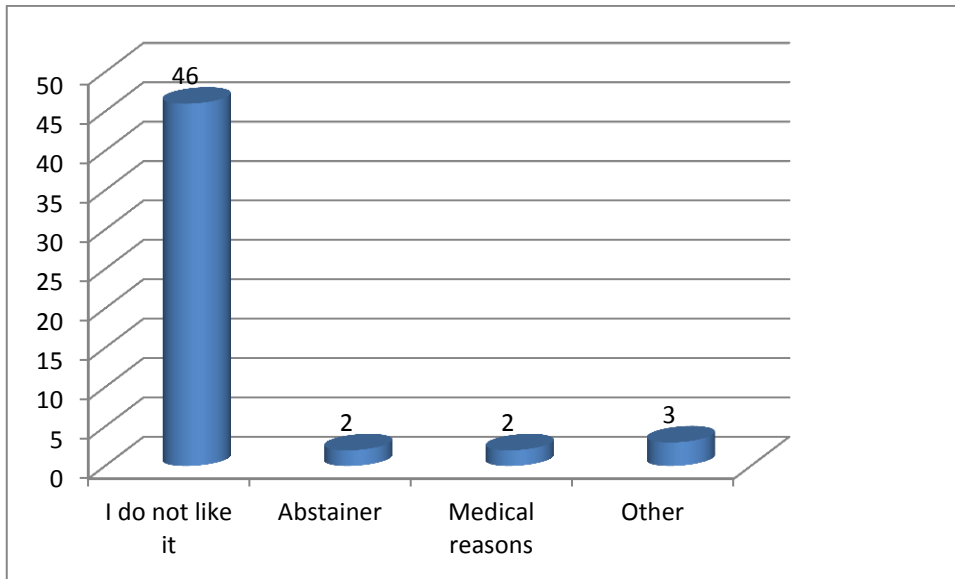
Source: own elaboration

80 percent of beer consumers drink beer, because they like it. Half of them state the reason is low price. Generally speaking, people are not influenced by others in this case. 34 respondents mentioned other reason. The most repeated reasons were: it is healthy, greater volume of alcoholic beverage, people are not drunk so quickly, it keeps down the thirstiness, it is the Czech culture. One respondent even produces beer at home.

4.2.3 Evaluation of beer non-drinkers

Only 14 percent of people do not drink beer. It is very important to know, why not. Nowadays, the beer consumption in the Czech Republic slightly decreases. Next graph no. 11 analyses this issue.

Graph 11 – Evaluation of question: Why do not you drink beer?

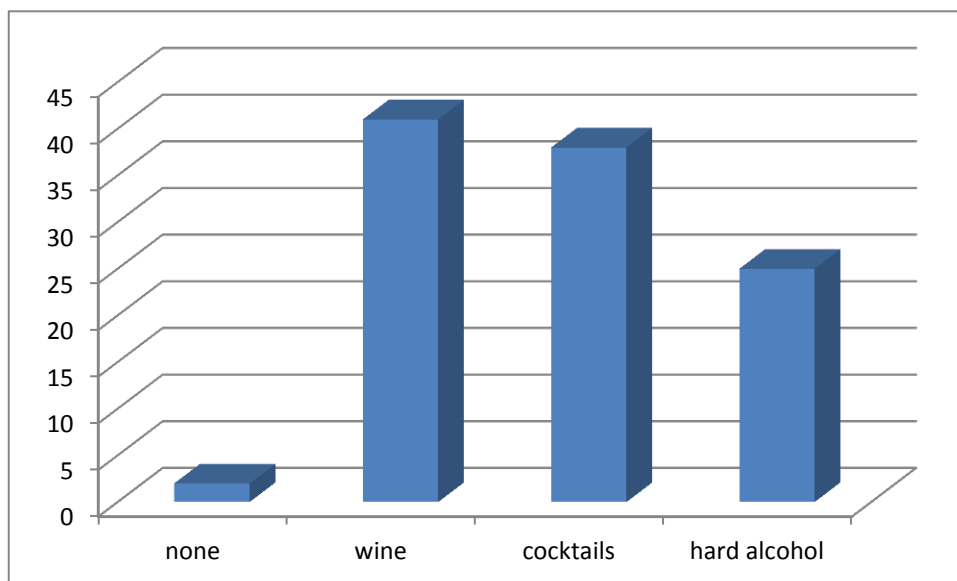


Source: own elaboration

The respondents were able to choose more options. 46 of 49 people, that do not drink beer, state the reason “I do not like it”. 2 people are abstainers, 2 people mentioned “medical reasons”. 2 people also mentioned “headache after drinking beer” and the last reason was the prioritising of other alcoholic beverages.

One could have a question “What to drink instead of beer?” This issuable question is analysed in the graph no. 12.

Graph 12 – Evaluation of question: Which other alcoholic beverage do you drink?



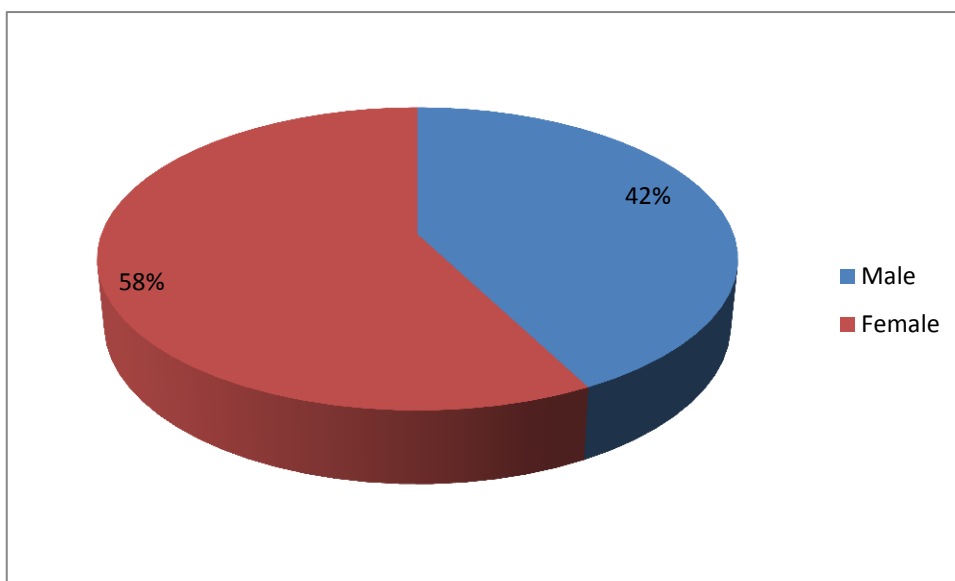
Source: own elaboration

The most favourite beverage of beer non-drinkers is wine. 84% of them cite it so, 78% also drink cocktails. More than half of people prefer hard alcohol. As mentioned above, 2 people are abstainers. Respondents were able to choose from more options.

4.2.4 Evaluation of identification questions

There were the identification questions situated at the end of the questionnaire. The first of them was related to the gender of respondents.

Graph 13 – Evaluation of question: What is your gender?

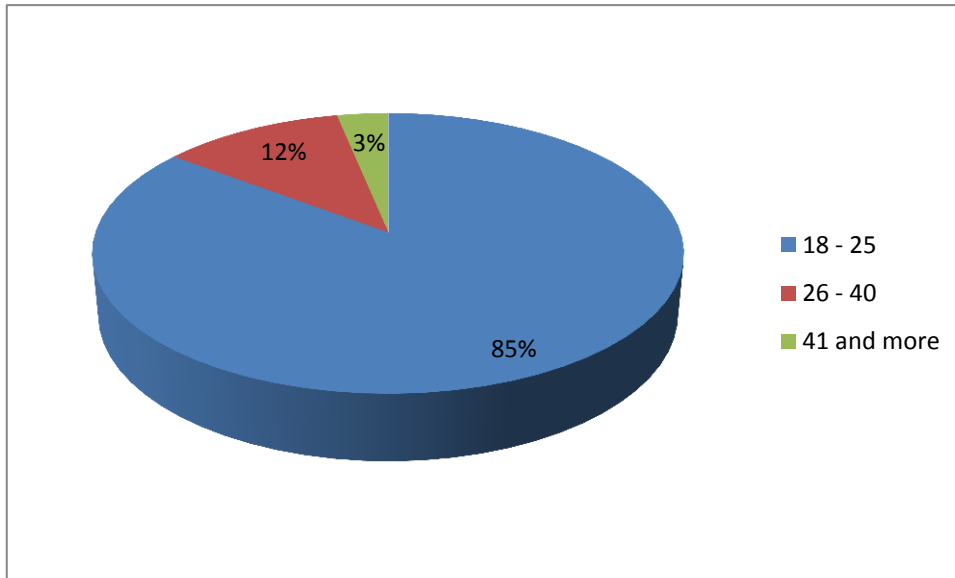


Source: own elaboration

Graph no. 13 shows the composition of respondents. 58 percent is covered by females, 42 percent were males. Talking about total frequencies, 196 females and 144 males participated in the survey.

Next question was related to age of respondents. Respondent filled his or her real age in. According to this information, there were finally created the age groups. They are represented on graph no. 14.

Graph 14 – Evaluation of question: What is your age?

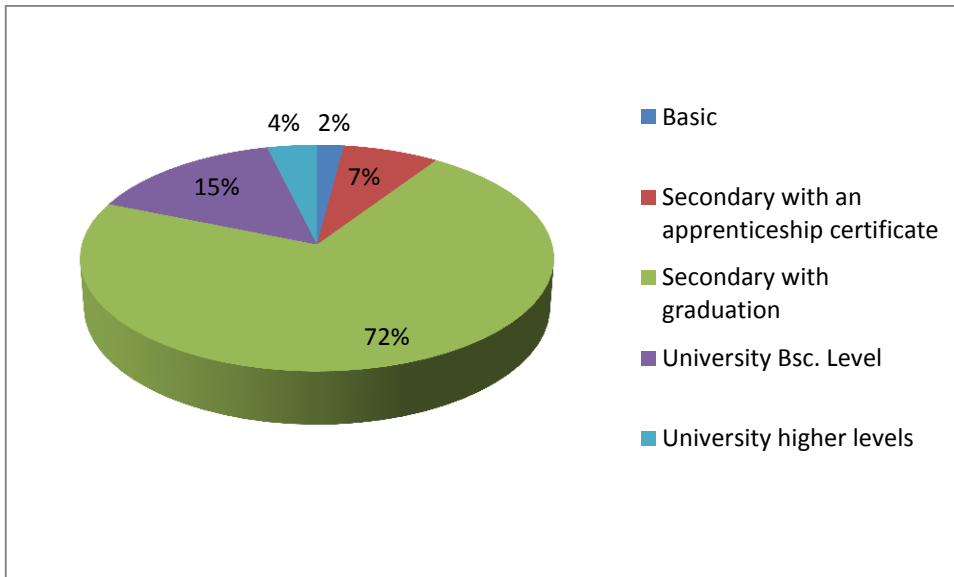


Source: own elaboration

As it is seen, the age groups were determined as following: 18 – 25 years old, 26 – 40 years old and 41 and more. The first group is represented by young people, many of them are still studying. The second group are young people, which take care about their career. Many of them also start a family. In the last group there are older people. A majority of respondents were young people with the age between 18 and 25 years. Lower limit of age was 18, because beer is an alcoholic beverage. The oldest respondent was 61.

The survey also included reached education of respondents. In this case, five options were available.

Graph 15 – Evaluation of question: What is your reached education?

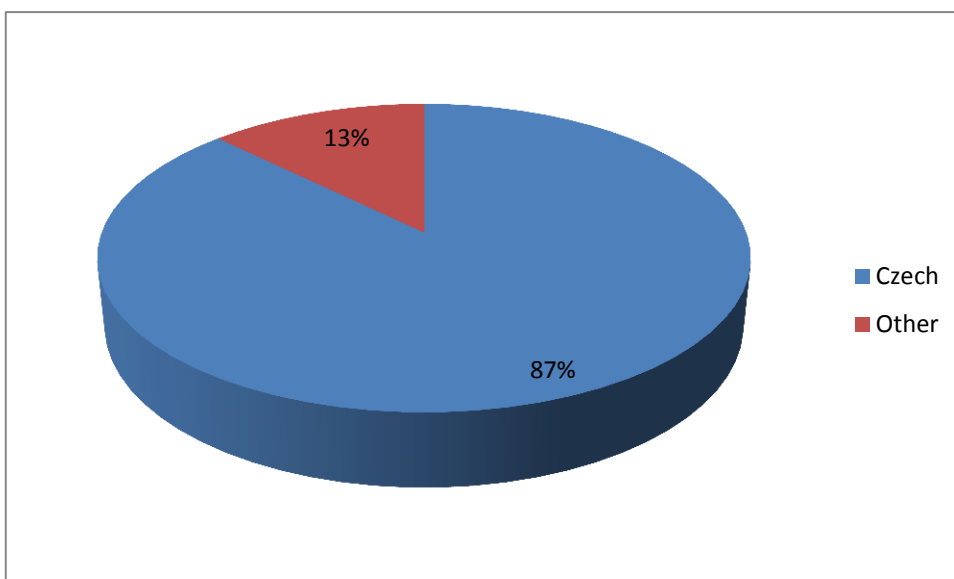


Source: own elaboration

It is obvious, that almost three fourths of respondents attained secondary education with graduation. Another strong group are “Bachelors” representing 15 % of respondents. Only 2 percent of respondents have basic education.

The last identification question is related to nationality of respondents. It can be a very significant factor while analysing beer consumption.

Graph 16 – Evaluation of question: What is your nationality?



Source: own elaboration

87 percent of respondents were Czechs. 43 respondents chose the answer “Other”. In this case, quite a big variance of answers can be seen. The most foreigners (5) came from Slovakia, Portugal and Russia. Other countries were for example Germany, France, Cyprus, Spain, Kazakhstan, Vietnam, Ghana or Mali.

4.3 Statistical hypothesis testing

Statistical hypotheses are listed here:

H₀: It is expected, that there is no dependency between age and beer consumption.

H₀: It is expected, that there is no dependency between gender and beer consumption.

H₀: It is expected, that there is no dependency between reached education and beer consumption.

H₀: It is expected, that there is no dependency between leisure activity and beer consumption.

H₀: It is expected, that there is no dependency between economic activity and beer consumption.

H₀: It is expected, that there is no dependency between sex and beer consumption of particular brand.

H₀: It is expected, that there is no dependency between sex and beer consumption of particular colour.

H₀: It is expected, that there is no dependency between change in income and beer consumption of particular degree.

H₀: It is expected, that there is no dependency between beer brand's country of origin and beer consumption.

H₀: It is expected, that there is no dependency between gender and pride of high beer consumption in the Czech Republic.

H₀: It is expected, that there is no dependency between nationality and beer consumption.

H₀: There is no statistically significant difference between a population proportion of males drinking beer and a random sample proportion of males drinking beer.

H₀: There is no statistically significant difference between a population proportion of females drinking beer and a random sample proportion of females drinking beer.

The hypotheses were tested using categorical data analysis. The level of significance was stated at $\alpha = 0.05$. In case of χ^2 test the conditions of good approximation had to be met. Results are elaborated in form of association or contingency tables. For this purpose statistical software SAS enterprise guide 4.2 was used.

4.3.1 Analysis of dependency between age and beer consumption

H_0 : It is expected, that there is no dependency between age and beer consumption.

H_1 : It is expected, that there is a dependency between age and beer consumption.

Table 8 – Contingency table: age group x beer consumption

		Beer consumption		Total
		Yes	No	
Age group				
18-25	Frequency	244	46	290
	Expected	248.21	41.794	
26-40	Frequency	37	2	39
	Expected	33.379	5.6206	
41 and more	Frequency	10	1	11
	Expected	9.4147	1.5853	
Total	Frequency	291	49	340

Source: SAS output, own elaboration

Table 9 – Statistics: age group x beer consumption

Statistic	DF	Value	p
Chi-Square	2	3.4720	0.1762
Phi Coefficient		0.1011	
Contingency Coefficient		0.1005	
Cramer's V		0.1011	

Source: SAS output, own elaboration

The conditions of good approximation are met, chi-square test can be used. For the decision of rejection (acceptation) of H_0 two approaches can be used. In first case the calculated value of test criterion is compared to critical value $\chi^2_{\alpha(DF)}$. If $\chi^2 > \chi^2_{\alpha(2)}$, the null hypothesis is rejected. Table value for $\alpha = 0.05$ and $DF = 2$ is 5.991. The calculated value is 3.4720. The second approach uses p-value and alpha. If $p\text{-value} < \alpha$, null hypothesis is rejected. P-value is 0.1762, which is greater than α . H_0 cannot be rejected. **There is no dependency between age and beer consumption.**

4.3.2 Analysis of dependency between gender and beer consumption

H_0 : It is expected, that there is no dependency between gender and beer consumption.

H_1 : It is expected, that there is a dependency between gender and beer consumption.

Table 10 –Association table: gender x beer consumption

		Beer consumption		Total
		Yes	No	
Gender				
Male	Frequency	139	5	144
	Expected	123.25	20.753	
Female	Frequency	152	44	196
	Expected	167.75	28.247	
Total	Frequency	291	49	340

Source: SAS output, own elaboration

Table 11 – Statistics: age group x beer consumption

Statistic	DF	Value	p
Chi-Square	1	24.2355	<.0001
Phi Coefficient		0.2670	
Contingency Coefficient		0.2579	
Cramer's V		0.2670	

Source: SAS output, own elaboration

From table no. 10 results, that only 5 males do not drink beer. The proportion of females is much higher. P-value is pretty close to 0, which means the level of significance α is greater. The null hypothesis is rejected, alternative hypothesis is valid. **There is a dependency between gender and beer consumption.** Looking at Cramer's V coefficient, the dependency can be classified as weak.

4.3.3 Analysis of dependency between reached education and beer consumption

H_0 : It is expected, that there is no dependency between reached education and beer consumption.

H_1 : It is expected, that there is a dependency between reached education and beer consumption.

Table 12 – Contingency table: reached education x beer consumption

		Beer consumption		Total
		Yes	No	
Reached education				
Secondary with graduation	Frequency	206	38	244
	Expected	208.84	35.165	
Secondary with an apprenticeship certificate	Frequency	23	2	25
	Expected	21.397	3.6029	
Basic	Frequency	7	0	7
	Expected	5.9912	1.0088	
University higher levels	Frequency	11	2	13
	Expected	11.126	1.8735	
University BSc. Level	Frequency	44	7	51
	Expected	43.65	7.35	
Total	Frequency	291	49	340

Source: SAS output, own elaboration

Table 13 – Statistics: reached education x beer consumption

Statistic	DF	Value	p
Chi-Square	4	2.3085	0.6792
Phi Coefficient		0.0824	
Contingency Coefficient		0.0821	
Cramer's V		0.0824	
WARNING: 30% of the cells have expected counts less than 5. Chi-Square may not be a valid test.			

Source: SAS output, own elaboration

The conditions of good approximation were not met. The reason is small amount of people with basic education and with higher level of University education. Chi-square test can be used only after synthesis into weak groups. This synthesis should be logical. It is shown at next table no. 14.

Table 14 – Association table after synthesis: reached education x beer

		Beer consumption		Total
		Yes	No	
Reached education				
Basic or secondary	Frequency	236	40	276
	Expected	236.22	39.776	
University	Frequency	55	9	64
	Expected	54.776	9.2235	
Total	Frequency	291	49	340

Source: SAS output, own elaboration

Table 15 – Statistics: reached education x beer consumption

Statistic	DF	Value	p
Chi-Square	1	0.0078	0.9296
Phi Coefficient		-0.0048	
Contingency Coefficient		0.0048	
Cramer's V		-0.0048	

Source: SAS output, own elaboration

At this moment, the conditions for using chi-square test are already met. Basic education was merged with both secondary with an apprenticeship certificate and secondary with graduation. Also University education was grouped together. Since p-value is very close to 1 and calculated value of chi-square test is very close to 0, the null hypothesis is accepted. **There is no dependency between reached education and beer consumption.**

4.3.4 Analysis of dependency between free time activity and beer consumption

H₀: It is expected, that there is no dependency between free time activity and beer consumption.

H₁: It is expected, that there is a dependency between free time activity and beer consumption.

Table 16 –Association table: free time activity x beer consumption

		Yes	No	
Free time activity				
Passively (for example reading)	Frequency	139	30	169
	Expected	144.64	24.356	
Actively (for example sport)	Frequency	152	19	171
	Expected	146.36	24.644	
Total	Frequency	291	49	340

Source: SAS output, own elaboration

Table 17 –Statistics: free time activity x beer consumption

Statistic	DF	Value	p
Chi-Square	1	3.0385	0.0813
Phi Coefficient		-0.0945	
Contingency Coefficient		0.0941	
Cramer's V		-0.0945	

Source: SAS output, own elaboration

As seen from table no. 16 , 139 beer consumers spend their free time passively and 152 actively. 30 people, who do not drink beer, spend their free time mostly passively. 19 people, who are not a beer drinkers, spent their time actively.

P-value is greater than alpha. It means the null hypothesis is accepted. **There is no dependency between free time activity and beer consumption.**

4.3.5 Analysis of dependency between economic activity and beer consumption

H₀: It is expected, that there is no dependency between economic activity and beer consumption.

H₁: It is expected, that there is a dependency between economic activity and beer consumption.

Table 18 –Association table: Economic activity x beer consumption

		Beer consumption		Total	
		Yes	No		
Employment	No	Frequency	152	26	178
		Expected	152.35	25.653	
Yes	Frequency	139	23	162	
	Expected	138.65	23.347		
Total	Frequency	291	49	340	

Source: SAS output, own elaboration

Table 19 –Statistics: Economic activity x beer consumption

Statistic	DF	Value	p
Chi-Square	1	0.0115	0.9145
Phi Coefficient		-0.0058	
Contingency Coefficient		0.0058	
Cramer's V		-0.0058	

Source: SAS output, own elaboration

As seen from table no. 18, number of drinking unemployed people is 152. There are 139 employed people, who drink beer. Table no. 19 shows p-value. It is pretty close to 1. Calculated value of chi-square test is very small. The null hypothesis cannot be rejected. **There is no dependency between economic activity and beer consumption.**

4.3.6 Analysis of dependency between gender and beer consumption of particular brand

H₀: It is expected, that there is no dependency between gender and beer consumption of particular brand.

H₁: It is expected, that there is a dependency between gender and beer consumption of particular brand.

Table 20 –Contingency table: gender x beer consumption of particular brand

		Preference of Czech brand of beer					Total	
		Braník	Velkopopovický Kozel	Pilsner Urquell	Staropramen	Other		Budweiser Budvar
Gender	Male							
	Female							
Male	Frequency	3	23	44	17	50	3	140
	Expected	2.3973	27.808	40.274	14.863	52.26	2.3973	
Female	Frequency	2	35	40	14	59	2	152
	Expected	2.6027	30.192	43.726	16.137	56.74	2.6027	
Total	Frequency	5	58	84	31	109	5	292
Frequency Missing = 48								

Source: SAS output, own elaboration

Table 21 –Statistics: gender x beer consumption of particular brand

Statistic	DF	Value	p
Chi-Square	5	3.6196	0.6054
Phi Coefficient		0.1113	
Contingency Coefficient		0.1107	
Cramer's V		0.1113	
WARNING: 33% of the cells have expected counts less than 5. Chi-Square may not be a valid test.			

Source: SAS output, own elaboration

At this moment, more than 20% of the cells have expected counts less than 5. The conditions for using chi-square are not met. Braník and Budweiser Budvar are not as preferred as it was expected. Logical synthesis into weak groups must be done.

Table 22 –Contingency table after synthesis: gender x beer consumption of particular brand

		Preference of Czech brand of beer						Total
		Other	Velkopopovický Kozel	Pilsner Urquell	Staropramen	Svijany	Ježek	
Gender								
Male	Frequency	38	23	44	17	9	9	140
	Expected	35.479	27.808	40.274	14.863	14.863	6.7123	
Female	Frequency	36	35	40	14	22	5	152
	Expected	38.521	30.192	43.726	16.137	16.137	7.2877	
Total	Frequency	74	58	84	31	31	14	292

Source: SAS output, own elaboration

Table 23 –Statistics after synthesis: gender x beer consumption of particular brand

Statistic	DF	Value	p
Chi-Square	5	9.1344	0.1038
Phi Coefficient		0.1769	
Contingency Coefficient		0.1742	
Cramer's V		0.1769	

Source: SAS output, own elaboration

The conditions of good approximations are already met. After detailed observation of data, Braník and Budweiser Budvar were moved to other brands. Svijany and Ježek, which seemed to be very popular, travelled the opposite direction. P-value is greater the alpha. It means the null hypothesis is accepted. **There is no dependency between gender and beer consumption of particular brand.**

4.3.7 Analysis of dependency between gender and beer consumption of particular type

H_0 : It is expected, that there is no dependency between gender and beer consumption of particular type.

H_0 : It is expected, that there is a dependency between gender and beer consumption of particular type.

Table 24 –Contingency table: gender x beer consumption of particular type

		Preference of type of beer			Total
		Light	Mixed	Black	
Gender					
Male	Frequency	123	9	8	140
	Expected	114.11	13.425	12.466	
Female	Frequency	115	19	18	152
	Expected	123.89	14.575	13.534	
Total	Frequency	238	28	26	292
Frequency Missing = 48					

Source: SAS output, own elaboration

Table 25 –Statistics: gender x beer consumption of particular type

Statistic	DF	Value	p
Chi-Square	2	7.2055	0.0272
Phi Coefficient		0.1571	
Contingency Coefficient		0.1552	
Cramer's V		0.1571	

Source: SAS output, own elaboration

Table no. 24 shows, that mixed and black beer is more preferred by females. P-value is lower than alpha. The null hypothesis is rejected, alternative one is valid. **There is a dependency between sex and beer consumption of particular colour.** According to available coefficients, the dependency can be specified as weak.

4.3.8 Analysis of dependency between change in income and beer consumption of particular degree

H_0 : It is expected, that there is no dependency between change in income and beer consumption of particular degree.

H_1 : It is expected, that there is a dependency between change in income and beer consumption of particular degree.

Table 26 –Contingency table: change in income x beer consumption of particular degree

		Mostly consumed degree of beer					Total
		10o beer	11o beer	12o beer	Higher than 12o beer	Less than 10o beer	
Income in the last two years:							
Has stayed at the same level	Frequency	54	48	41	5	3	151
	Expected	50.333	48.258	42.55	7.2646	2.5945	
Has increased	Frequency	36	38	33	7	2	116
	Expected	38.667	37.072	32.687	5.5808	1.9931	
Has decreased	Frequency	7	7	8	2	0	24
	Expected	8	7.6701	6.7629	1.1546	0.4124	
Total	Frequency	97	93	82	14	5	291
Frequency Missing = 49							

Source: SAS output, own elaboration

Table 27 –Statistics: change in income x beer consumption of particular degree

Statistic	DF	Value	p
Chi-Square	8	3.1065	0.9275
Phi Coefficient		0.1033	
Contingency Coefficient		0.1028	
Cramer's V		0.0731	
WARNING: 27% of the cells have expected counts less than 5. Chi-Square may not be a valid test.			

Source: SAS output, own elaboration

None of conditions for using chi-square test is met. More than 20 % of the cells have expected counts less than 5, 1 of the cells even equals to 0. Marginal groups represented by “less than 10° beer” and “higher than 12° beer” should be logically merged. Thy synthesis is described as Appendix no. 3.

Table 28 –Statistics after synthesis: change in income x beer consumption of particular degree

Statistic	DF	Value	p
Chi-Square	4	1.7258	0.7860
Phi Coefficient		0.0770	
Contingency Coefficient		0.0768	
Cramer's V		0.0545	

Source: SAS output

The conditions for using chi-square test are already met. Since p-value exceeds alpha, the null hypothesis is accepted. **There is no dependency between change in income and beer consumption of particular degree.**

4.3.9 Analysis of dependency between beer's country of origin and beer consumption

H₀: It is expected, that there is no dependency between beer brand's country of origin and beer consumption.

H₁: It is expected, that there is a dependency between beer brand's country of origin and beer consumption.

The Appendix no. 4 shows the needed calculations. The conditions of good approximation are met and chi-square test can be used at the level of significance $\alpha = 0.05$. 291 respondents drink Czech beer, but only 123 of them consume also foreign brand of beer. P-value is very close to 0. It is lower than alpha. The null hypothesis is rejected. Cramer's V coefficient equals to -0.3089. According to this coefficient, the dependency between observed characters can be classified as medium. **There is a dependency between beer brand's country of origin and beer consumption.**

4.3.10 Analysis of dependency between gender and pride of high beer consumption in the Czech Republic

According to CVVM (2012), high beer consumption in the Czech Republic is perceived variously. Most of males are proud on this. The proportion of proud females is much lower. Females rather feel ashamed. The following hypotheses should examine the perception of random sample.

H₀: It is expected, that there is no dependency between gender and pride of high beer consumption in the Czech Republic.

H₁: It is expected, that there is a dependency between gender and pride of high beer consumption in the Czech Republic.

For the purpose of analysis of these hypotheses, only Czechs were filtered. Appendix no. 6 shows the answers of respondents. A majority of males are proud on high consumption of beer, the opinion of females is not so unambiguous.

The null hypothesis is rejected. P-value equals to 0.0018, which is lower than the level of significance α . Since the chosen Cramer's V coefficient equals to 0.2247, the dependency is weak. **There is a dependency between gender and pride of high beer consumption in the Czech Republic.**

4.3.11 Analysis of dependency between nationality and beer consumption

H₀: It is expected, that there is no dependency between nationality and beer consumption.

H₁: It is expected, that there is a dependency between nationality and beer consumption.

Appendix no. 8 shows the proportion in the cells. The conditions of good approximation are met, chi-square test can be used. Appendix no. 9 includes the needed statistics. P-value is greater than alpha. The null hypothesis is accepted. Beer consumption of Czechs is not statistically different than the consumption of foreigners. It can be caused by the structure of sample. A majority of foreigners were students living here for a short-time period. They wanted to enjoy their study life. The price of beer is also much lower than in other countries. Finally, **there is no dependency between nationality and beer consumption.**

4.3.12 Comparison to other research

H₀: There is no statistically significant difference between a population proportion of males drinking beer and a random sample proportion of males drinking beer.

H₁: There is a statistically significant difference between a population proportion of males drinking beer and a random sample proportion of males drinking beer.

For the purpose of testing mentioned hypotheses, only males were filtered from the sample. The percentage of males drinking beer is 96.53. The population proportion is set on 88 percent. The analysis of CVVM (2012) is shown in Appendix no. 12.

In case of one sample test for proportion, Z- distribution is used. Appendix no. 10 describes the needed statistics. Z equals to 3.1491, which is greater than critical value. The null hypothesis is rejected. **There is a statistically significant difference between a population proportion of males drinking beer and a random sample proportion of males drinking beer.** The sample proportion of males drinking beer is significantly greater. Males consuming beer maybe found the participation in survey more interesting. The same approach was used in case of females. The null and alternative hypotheses are formulated in such a way:

H₀: There is no statistically significant difference between a population proportion of females drinking beer and a random sample proportion of females drinking beer.

H₁: There is statistically significant difference between a population proportion of females drinking beer and a random sample proportion of females drinking beer.

77.55 percent of females from sample drink beer, the population proportion is 62 percent. Z equals to 4.4854, critical value of Z is 1.96. Null hypothesis is rejected. **There is a statistically significant difference between a population proportion of females drinking beer and a random sample proportion of females drinking beer.** The sample proportion of females drinking beer is significantly greater.

5 Conclusion

Good knowledge of consumer can have a significant effect on the business run. Main aim of the thesis was to determine the factors, which may influence consumer behaviour when drinking beer. A questionnaire was the research tool.

Totally, 340 respondents participated in the survey. 58 percent of them were females, 42 percent were males. Majority (87 %) of respondents were Czechs. The basic assumption was to find out if these people drink beer. 78 percent of them state it is so. Other questions should have identified the factors, which have the impact on their beer consumption. The most favoured type of beer was the light beer, especially in its tap form. The most preferred brand was Pilsner Urquell. The most important criteria for the consumers were **taste, brand, and price** in this order.

Another very important part of the thesis was the testing of stated hypotheses. Totally, 13 hypotheses were tested and 6 of them were rejected. The accepted alternative hypotheses are:

- There is a dependency between gender and beer consumption.
- There is a dependency between sex and beer consumption of particular colour.
- There is a dependency between beer brand's country of origin and beer consumption.
- There is a dependency between gender and pride of high beer consumption in the Czech Republic.
- There is a statistically significant difference between a population proportion of males drinking beer and a random sample proportion of males drinking beer.
- There is a statistically significant difference between a population proportion of females drinking beer and a random sample proportion of females drinking beer.

According to results, gender is one of the most important factors affecting beer consumption. One of the possible suggestions is to focus on segments of consumers and distinguish between males and females. In the case of males, some loyalty card could be established in order to increase their consumption. It would be beneficial for both breweries and consumers. The breweries would realise what their customers are and consumers would get some discounts. But females also represent a substantial part of the market. The special way of serving could help to increase their consumption. Beer is

generally perceived as a beverage for males. But if it was served in elegant goblet, females would not have to hesitate to drink it.

The breweries can use the results of the thesis and implement them into their marketing strategy.

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7 Appendices

Appendix 1 – Questionnaire

Appendix 2 – Evaluation of question: Estimate your weekly beer consumption in liters

Appendix 3 – Contingency table after synthesis: change in income x mostly consumed degree of beer

Appendix 4 – Association table: beer consumption x beer consumption of foreign brand

Appendix 5 – Statistics: beer consumption x beer consumption of foreign brand

Appendix 6 – Contingency table: gender x pride of being the biggest consumer in the world

Appendix 7 – Statistics: gender x pride of being the biggest consumer in the world

Appendix 8 – Association table: nationality x beer consumption

Appendix 9 – Statistics: nationality x beer consumption

Appendix 10 – Statistics for males: one sample test for proportion

Appendix 11 – Statistics for females: one sample test for proportion

Appendix 12 – Percentage of people drinking beer in the Czech Republic

Appendix 1 - Questionnaire

1. Do you drink beer?
 - Yes (continue with question number 2)
 - No (continue with question number 20)
2. Which type of beer do you prefer?
 - Light
 - Black
 - Mixed
3. Which of the following packaging do you prefer?
 - Tap
 - Bottle
 - Tin
 - I do not care
4. Which degree of beer do you drink mostly?
 - Lower than 10° beer
 - 10° beer
 - 11° beer
 - 12° beer
 - Higher degree beer
5. Which Czech brand do you prefer?
 - Pilsner Urquell
 - Budweiser Budvar
 - Staropramen
 - Braník
 - Velkopopovický kozel
 - Other:
6. Do you drink beer of foreign brand?
 - Yes (continue with question number 7)
 - No (continue with question number 8)

7. Which foreign brand do you prefer?
- Stella Artois
 - Hoegaarden
 - Heineken
 - Other:
8. Estimate your weekly beer consumption in liters:
9. Your net income in the last two years:
- has increased
 - has decreased
 - has stayed at the same level
10. Would you think about reducing the beer consumption, if the price increased by 10%?
- Yes
 - Rather yes
 - Rather no
 - No
11. What is for you the important criterion when purchasing beer? (more options possible)
- Taste
 - Price
 - Brand
 - Country of origin
 - Type
 - Alcohol percentage
 - Other:
12. Are you influenced by advertisement when purchasing beer?
- Yes
 - Rather yes
 - Rather no
 - No
13. Where do buy beer most frequently?
- Retail

- Pub
- Directly from producer
- Other:

14. Where do you consume beer most frequently?

- Pubs
- At parties
- At home
- Other:

15. In which occasions do you drink beer most frequently? (more option possible)

- After sport activity, when you are thirsty
- Drinking in evenings with friends
- To get drunk
- Other:

16. Why do you prefer beer to other alcoholic beverages? (more options possible)

- I like it
- It is cheaper, than other alcoholic beverages
- Because other people drink it as well
- Other:

17. How your beer consumption has changed in last two years?

- It has increased (continue with question number 18)
- It has decreased (continue with question number 19)
- It has stayed at the same level (continue with question number 22)

18. What is the reason of this change? (more option possible)

- More free time
- Favourable price
- Better financial situation
- Change in preferences
- Reaching adulthood
- Other:

(continue with question number 22)

19. What is the reason of this change? (more options possible)

- Less free time

- Growing of beer price
- Worse financial situation
- Change in preferences
- Other:

(continue with question number 22)

20. Why do not you drink beer? (more options possible)

- I do not like it
- Abstainer
- Medical reason
- Other:

21. Which other alcoholic beverage do you drink? (more options possible)

- None
- Wine
- Cocktails (mixed beverages)
- Hard alcohol
- Other:

22. How do you mostly spend free time?

- Actively (for example sport)
- Passively (for example reading)

23. What is your gender?

- Female
- Male

24. What is your age?

25. What is your reached education?

- Basic
- Secondary with an apprenticeship certificate
- Secondary with graduation
- University BSc. Level
- University higher levels

26. Do you study on regular basis?

- Yes
- No

27. Do you work?

- Yes (continue with 28)
- No (continue with 29)

28. Do you work regularly?

- Yes, I work on full-time basis
- Yes, I work on part-time basis
- Yes, I work on brigades

29. What is the population in town you live?

- Village (less than 5,000 inhabitants)
- Town between 5,001 and 20,000 inhabitants
- Town between 20,001 and 100,000 inhabitants
- Town with more than 100,001 inhabitants

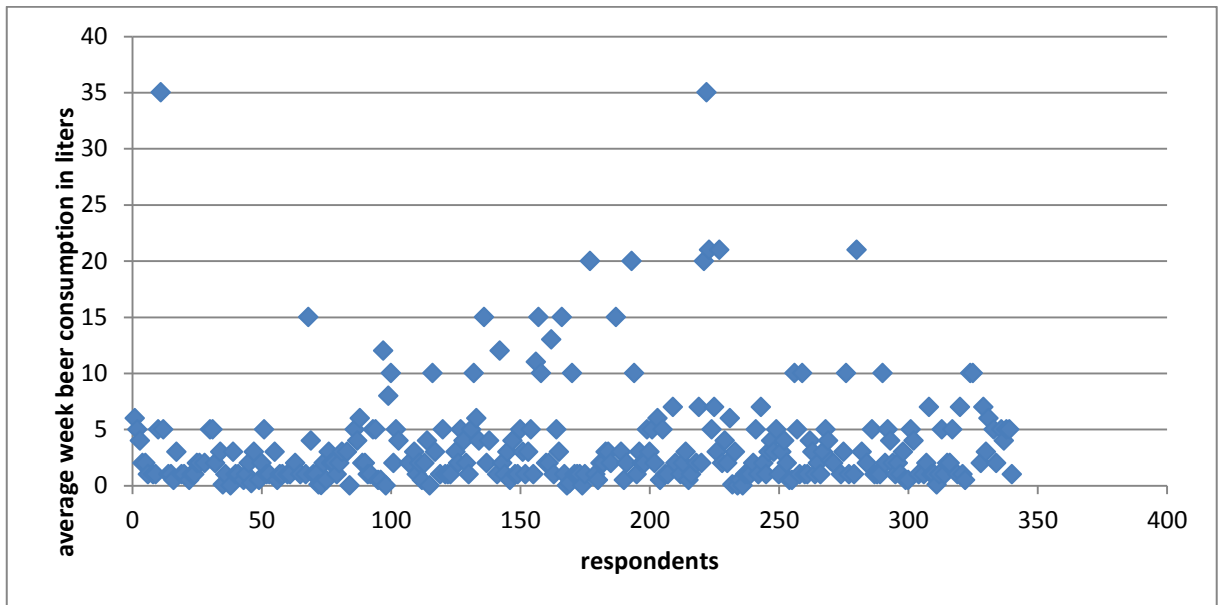
30. What is your nationality?

- Czech (continue with 31)
- Other:

31. Are you proud, that the Czech Republic is the biggest beer consumer in the world?

- Yes
- Rather yes
- Rather no
- No

Appendix 2 - Evaluation of question: Estimate your weekly beer consumption in liters



Source: own elaboration

Appendix 3 – Contingency table after synthesis: change in income x mostly consumed degree of beer

		Mostly consumed degree of beer			Total
		Less than 10° beer or 10° beer	11° beer	12° beer or higher	
Income in the last two years:					
Has stayed at the same level	Frequency	57	48	46	151
	Expected	52.928	48.258	49.814	
Has increased	Frequency	38	38	40	116
	Expected	40.66	37.072	38.268	
Has decreased	Frequency	7	7	10	24
	Expected	8.4124	7.6701	7.9175	
Total	Frequency	102	93	96	291
Frequency Missing = 49					

Source: SAS output, own elaboration

Appendix 4 – Association table: beer consumption x beer consumption of foreign brand

		Beer consumption		Total	
		Yes	No		
Consumption of foreign brand	No	Frequency	168	49	217
		Expected	185.73	31.274	
	Yes	Frequency	123	0	123
		Expected	105.27	17.726	
Total	Frequency	291	49	340	

Source: SAS output, own elaboration

Appendix 5 – Statistics: beer consumption x beer consumption of foreign brand

Statistic	DF	Value	p
Chi-Square	1	32.4509	<.0001
Phi Coefficient		-0.3089	
Contingency Coefficient		0.2952	
Cramer's V		-0.3089	

Source: SAS output, own elaboration

Appendix 6 – Contingency table: gender x pride of being the biggest consumer in the world

		Gender		Total
		Male	Female	
Pride of being the biggest consumer in the world	Yes	62	49	111
	Expected	47.091	63.909	
Rather yes	Frequency	38	59	97
	Expected	41.152	55.848	
No	Frequency	7	18	25
	Expected	10.606	14.394	
Rather no	Frequency	19	45	64
	Expected	27.152	36.848	
Total	Frequency	126	171	297
Frequency Missing = 43				

Source: SAS output, own elaboration

Appendix 7 – Statistics: gender x pride of being the biggest consumer in the

Statistic	DF	Value	Prob
Chi-Square	3	14.9975	0.0018
Phi Coefficient		0.2247	
Contingency Coefficient		0.2192	
Cramer's V		0.2247	

Source: SAS output, own elaboration

Appendix 8 – Association table: nationality x beer consumption

		Beer consumption		Total
		Yes	No	
Nationality	Czech	257	40	297
	Expected	254.2	42.803	
Other	Frequency	34	9	43
	Expected	36.803	6.1971	
Total	Frequency	291	49	340

Source: SAS output, own elaboration

Appendix 9 – Statistics: nationality x beer consumption

Statistic	DF	Value	p
Chi-Square	1	1.6957	0.1929
Phi Coefficient		0.0706	
Contingency Coefficient		0.0704	
Cramer's V		0.0706	

Source: SAS output, own elaboration

Appendix 10 – Statistics for males: one sample test for proportion

Test of H0: Proportion = 0.88	
ASE under H0	0.0271
Z	3.1491
One-sided Pr > Z	0.0008
Two-sided Pr > |Z|	0.0016

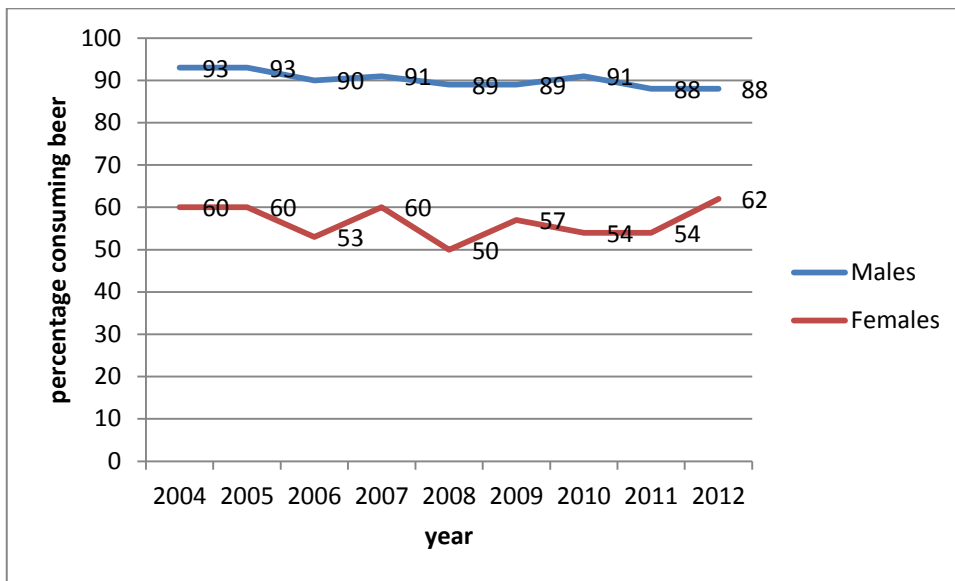
Source: SAS output, own elaboration

Appendix 11 – Statistics for females: one sample test for proportion

Test of H0: Proportion = 0.62	
ASE under H0	0.0347
Z	4.4854
One-sided Pr > Z	<.0001
Two-sided Pr > |Z|	<.0001

Source: SAS output, own elaboration

Appendix 12 – Percentage of people drinking beer in the Czech Republic



Source: CVVM SOÚ AV ČR, v.v.i.,2012, own elaboration