Well-being of students in the context of higher gas prices

By

Rens Vos

S3797260

Bachelor thesis

Spatial Planning and Design

Faculty of Spatial Sciences

University of Groningen

Under supervision from Dr. Sarah Mawhorter

January 27, 2023

Colophon

Bachelor thesis	Spatial Planning and Design
Title	Well-being of students affected by higher gas prices
Location	Groningen
Date	January 27, 2023
Version	Step 7, final version
Author	Rens Vos
	S3797260
Contact	R.j.vos.2@student.rug.nl
University	University of Groningen Faculty of Spatial Sciences Landleven 1 9747 AD Groningen
Supervisor	Dr. Sarah Mawhorter
Number of pages	28 (excluding references & appendices)
Word count	6456 (excluding references & appendices)

Abstract

Energy prices, particularly gas have increased tremendously over the past year. This has consequences for the well-being of low-income residents. Governmental help via energy allowance is created for these low-income residents. However, students are excluded from this allowance. This research aims to identify how the well-being of students is affected by higher gas prices, which led to the following research question: "How do higher gas prices affect the well-being of students, in terms of financial well-being, minimisation of gas usage and indoor comfort?" It is expected that the higher gas prices have a negative influence on students' well-being. In order to answer this question, a quantitative research approach was used, and an online survey collected data. This study discovered that higher gas prices negatively affect students' well-being. Students experience financial troubles due to higher energy costs. Furthermore, students feel less comfortable in their own houses due to the lower settings of the thermostat. Students also experience more stress, and finally, students change their behaviour regarding gas usage. Therefore, the government should consider students' different situations and redecide whether energy allowance should be granted. Possible further research could investigate how other low-income groups' well-being is affected by higher gas prices.

Contents

1. Introduction

1.1 Background

Societal relevance

Over the past year, energy prices have been increasing tremendously in Europe. The natural gas prices in November 2020 were 14 Euro per MWh, and a year later, in November 2021, these prices reached 80 Euro per MWh (Kröger et al., 2022). Since the war in Ukraine started, gas prices have risen even more, up to 135 Euros per MWh in March 2022 (Kröger et al., 2022). In the Netherlands, the household consumption of gas is twice as high as the average in the European Union (Mashhoodi, 2021). The Netherlands will thus have more consequences for higher gas prices than other countries in the European Union. The reason for the high dependency on natural gas in the Netherlands can be explained by going back to 1959. In 1959, a large gas field was discovered in Groningen, located in the northern part of the Netherlands. Due to this discovery and a competitive and liberalised energy market, there were relatively low gas prices in the Netherlands (Mashhoodi, 2021). Households with a low income are less likely to install solar panels and generate energy to minimise gas usage (Chapman & Okushima, 2019). Thus, low-income households depend more on gas and will be more vulnerable to rising gas prices.

Currently, there are already extreme situations where people decide to turn off their gas to succeed in paying energy bills (BNN VARA, 2022). The Dutch government created an allowance for rising gas prices, the so-called 'Energietoeslag', meaning a single payment of around 1300 Euros. However, students are excluded from this allowance, whether they are low-income residents or not (Rijksoverheid, 2022b). As stated previously, the Netherlands has a high dependency on gas. Due to the competition in the energy market and the gas field in Groningen, prices are relatively low. Now, gas prices are rising due to the phasing out of gas drilling in Groningen and geopolitical tensions (Rijksoverheid, 2022a). The article of Mashhoodi (2021) shows that the low-income groups are the most gas-dependent and, thus, most vulnerable to rising gas prices in this energy sector. Since students are excluded from the energy allowance, they have to deal with financial drawbacks (Rijksoverheid, 2022b). From this, the following question arises: how do students deal with rising gas prices, and how is their daily life affected?

Scientific relevance

Research has been conducted on gas prices in the past, specifically, which groups are the most vulnerable and dependent on gas in the Netherlands (Mashhoodi, 2021). Mulder et al. (2023) gives an overview of energy poverty in the Netherlands at the national and local level. However, in this study, students are taken out of the data since they have an exceptionally low income. Furthermore, research has been conducted regarding fuel poverty and the well-being of students. This research focused on seven European countries. However, the Netherlands was excluded from this research and was

conducted before the gas prices rose tremendously (Kousis et al., 2020). Anderson et al. (2012) investigated how low-income households in Great Britain cope with cold homes in the winter. Their study showed that the main strategy for low-income households was to economise on essentials, such as food and fuel, in order to meet their basic financial obligations (Anderson et al., 2012). Anderson et al. (2012) mentioned that there could be a distinction within the different low-income household groups for further studies. One of these groups is students in the Netherlands, and research has been conducted regarding their finances. However, this research was focused on student loans, not higher gas prices (van der Werf et al., 2022). In the study by van der Werf et al. (2022) no significant links were made between well-being and the students. This can be explained since students are young adults and, therefore, less affected by cold; older adults and young children are most affected by cold (Childs et al., 2020; Gabriel et al., 2021). This study will measure the effects on the well-being of students in the Netherlands due to higher gas prices. Therefore, a contribution towards resolving the research gap will be made.

1.2 Research problem

This research aims to investigate how the well-being of students is affected by high energy prices and has the following research question:

> *How do higher gas prices affect the well-being of students, in terms of financial well-being, minimisation of gas usage and indoor comfort?*

This research question will be answered by means of the following sub-questions based on the two pillars of affordability and sustainability:

- Which financial actions do students take as a reaction to higher gas prices?
- What are students doing in order to minimise the usage of gas?
- What are the changes regarding feeling comfortable in their own house?

2. Theoretical framework

The theoretical framework discusses the following concepts: energy poverty, energy adaptation, renting and housing conditions, thermal comfort, financial well-being and the conceptual model.

2.1 Energy poverty

The Sustainable Development Goals are a framework of guidelines for the development of societies all around the globe (UNDP, 2022). One of these goals is to provide access to affordable, clean and reliable forms of energy in 2030. In other words, by 2030, energy poverty has to be eliminated (Longa et al., 2021). Energy poverty is defined as the lack of affordability for basic energy services necessary for a decent standard of living (Pye et al., 2015). Energy poverty is a multi-dimensional problem that impacts the environment, urban development, health and housing (Stevens et al., 2022). Feenstra et al. (2021) stated that the affordability of energy bills could be measured with two complementary indicators, the so-called energy ratio and the payment risk. The energy ratio is the share of the spendable income of a household used for energy. Energy poverty is present at an energy ratio of 10 percent (Feenstra et al., 2021). A household is at payment risk when the remaining budget is insufficient to cover subsistence expenditures after paying the housing and energy costs (Feenstra et al., 2021). Currently, gas prices are rising, so more households are expected to enter the payment risk and the energy poverty zones. In the Netherlands, household gas consumption is double compared to the European Union (Mashhoodi, 2021). The most gas-dependent groups in the Netherlands are low-income households. These groups are hit hardest by rising energy prices (Mashhoodi, 2021).

2.2 Financial well-being

When the energy expenditures of people rise, their budget for social activities or savings will decrease (Anderson et al., 2012). The most common actions people take in order to cut back on expenditure are cutting back on non-essential spending, heating and food (Anderson et al., 2012). Watson et al. (2015) investigated the role of economising and financial strain on students in Australia. Both students in Australia and the United States often study full-time. Due to this full-time study, these students are forced to restrictive economising practices. The students that chose to work more hours per week experienced lower academic performance and achievements as a consequence than students who did not choose to work more hours per week (Watson et al., 2015). Moreover, Anderson et al. (2012) stated that people avoid loaning more money, despite financial difficulties. Over the past six years, Watson et al. (2015) noted a rise in the number of students needing financial aid from their parents/guardians to afford a student room and meet basic needs. Furthermore, adverse outcomes are associated with financial setbacks. To give an insight into the decisions that students make in order to deal with a smaller budget, students economise on several activities, such as food, social activities and personal care (Watson et al., 2015). When people have less money to spend, more depressed feelings are experienced, which leads to lesser well-being (Anderson et al., 2012). Section 2.1 and section 2.2

will lead to hypothesis H1: *Higher energy prices will lead to financial difficulties regarding the payment of bills, and students will have a lower level of well-being and spend less money on social activities in order to economise for the higher energy costs.*

2.3 Energy adaptation

With rising energy prices in mind, adaptations are essential to minimise energy usage. These adaptations could for example be purchasing more efficient appliances such as a new boiler, fridge or freezer, or adaptations within the household's behaviour, such as lowering the thermostat. Since low-income families mostly do not have the resources to invest in more efficient appliances, it is more likely that the behaviour within the household will change (Feenstra et al., 2021). Anderson et al. (2012) explored how low-income households in Great Britain are coping with cold homes. The primary strategy that low-income households chose to cope with financial constraints was minimising and reducing spending on essentials like food and fuel. This was needed in order to keep room for core financial commitments. The amount of money spent on energy is usually reduced by cutting consumption (Anderson et al., 2012). This will lead to hypothesis H2: *Students will change their energy behaviour in their student house to minimise gas usage.*.

2.4 Renting and housing conditions

There is a complex relationship between property owners and their tenants. The property owner is the decision maker regarding energy-efficiency renovations of the house. However, higher energy prices do not affect the property owner (Zwickl-Bernhard et al., 2022). On the other hand, the tenants have no say in the decision-making process regarding energy-efficiency renovations of the rental house. Nonetheless, the tenants are affected by rising energy prices, contrary to the property owners (Zwickl-Bernhard et al., 2022). According to a study by Sánchez-Torija et al. (2021) the total energy cost is between 5 and 62 percent of the total rental price of a house in Spain. So, this can be a huge part of the total renting costs for tenants. Tenants of homes with expansive energy bills will profit in case the landlord decides to start energy renovation (Sánchez-Torija et al., 2021). According to Sovacool et al. (2019), the difficulty regarding energy renovations is a lack of capital, which predominantly concerns tenants. Furthermore, tenants tend to be less energy efficient, which causes higher energy consumption. That in turn, leads to vulnerability to rising gas prices (Reames, 2016).

2.5 Thermal comfort

Since there is a shortage of student houses in the Netherlands, students tend to accept rooms of lower quality, which has a negative impact on thermal comfort (CBRE, 2015). When colder winters are present in the Netherlands, there will be a higher demand for energy (Kazmi et al., 2022). Peeters et al. (2009) investigated the most comfortable indoor temperature for residential buildings. This research concluded that the optimal indoor residential temperature is 20,4°C during the winter. Furthermore, the needs and preferences of men and women in terms of the environment differ (Mishra & Ramgopal,

2013). Women are more sensitive to ambient temperature than men, and women tend to be more likely to be dissatisfied, especially in cooler areas (Karjalainen, 2012). This is because women have less tolerance for deviations from the optimal thermal environment. Generally, women need more personal temperature control and adaptation measures than men (Karjalainen, 2012). Furthermore, when temperatures outside are dropping, it is preferred to have warmer temperatures indoors (Humpreys & Hancock, 2007). Anderson et al. (2012) stated strategies in their research that were used in order to keep warm, when it is cold inside. Some of these strategies include putting on extra outdoor clothing, and thermal underwear, and using blankets. Sections 2.4 and 2.5 lead to hypothesis H3*: Students will feel less comfortable in their own houses due to the lower settings of the thermostat. Therefore, students are more stressed and afraid of a cold winter*.

2.6 Conceptual model

The conceptual model is visualised in figure 1. The relationship between the independent variable, 'rising gas prices' and the dependent variable 'the well-being of students' is visualised; the well-being of students will be analysed on thermal comfort and financial well-being, compared to the height of their energy bills. Furthermore, the influence of home energy efficiency and energy minimisation is made visible in the conceptual model.

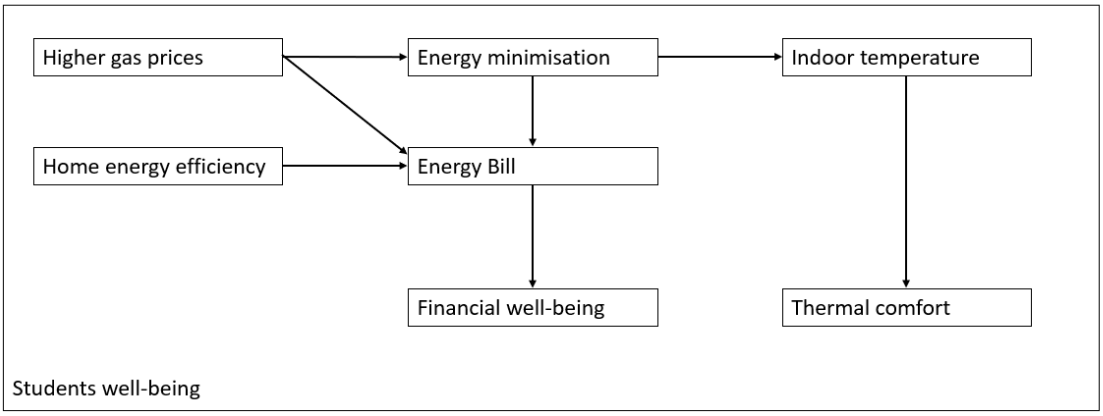


Figure 1: conceptual model.

2.7 Hypotheses overview

Below is a short overview of the above-stated hypotheses.

Hypothesis 1

Higher energy prices will lead to financial difficulties regarding the payment of bills, and students will have a lower level of well-being and spend less money on social activities in order to economise for the higher energy costs.

Hypothesis 2

Students will change their energy behaviour in their student house to minimise gas usage.

Hypothesis 3

Students will feel less comfortable in their own houses due to the lower settings of the thermostat. Therefore, students are more stressed and afraid of a cold winter.

3. Methodology

3.1 Research design

In order to investigate the well-being of students regarding higher gas prices and to answer the research questions, primary data needed to be collected among students throughout the Netherlands. Primary data was chosen over secondary data since primary data gives specific information in order to answer the research question. Secondary data gives no control over the way in which it is collected and whether this data had been collected for other purposes (Rahman, 2016). Data collection at this range was chosen because higher gas prices affect students throughout the Netherlands. A quantitative approach was used for this research, and the data was collected using an online survey. The quantitative approach for this study was chosen since it generates generalised knowledge (Rahman, 2016).

3.2 Data Collection

The survey was available online in November 2022. The survey distribution has been done through WhatsApp, Instagram and the personal network of the researcher. A convenience sampling method was chosen, which resulted in a snowball effect where people from within the researcher's network were asked to share the survey in their network. This method resulted in a total of 126 respondents and was collected with an online survey via Qualtrics. The survey consisted of 30 questions and was divided into four blocks with-multiple choice and 5-point Likert scale questions. In the first block, demographic questions about the respondents were asked; in the second block, questions about the housing conditions; in the third block, questions regarding the students' well-being; in the fourth block, financial questions. An overview of the survey can be found in appendix 1. Figure 2, shows which sub-question is answered using which bock of the survey.

Research sub-question:	Answered by
1. Which financial actions do students take as a reaction to rising gas prices?	Financial block of the questionnaire (4).
2. What are students doing in order to minimise the usage of gas?	Well-being block of the questionnaire (3).
3. What are the changes regarding feeling comfortable in your own house?	Housing block (2) of the questionnaire and well-being block of the questionnaire (3).

Figure 2: an overview of research methods to answer sub-questions.

3.3 Data analysis

The primary data from the survey will be exported from Qualtrics into a SPSS file. In order to create the charts, the data was exported to Excel. In Excel, the data was transformed into charts. In order to

make the charts easiest to understand, different charts were created, and the best understandable chart was chosen.

Firstly, descriptive and frequencies were run for each variable. The T-test was used in order to show the difference in the height of the energy bill in Euros, the difference in comfort concerning the indoor temperature and the difference in the height of the thermostat. Furthermore, correlations were performed to look for associations between variables in order to answer the sub-questions. A schematic overview of the data analysis can be found in figure 3.

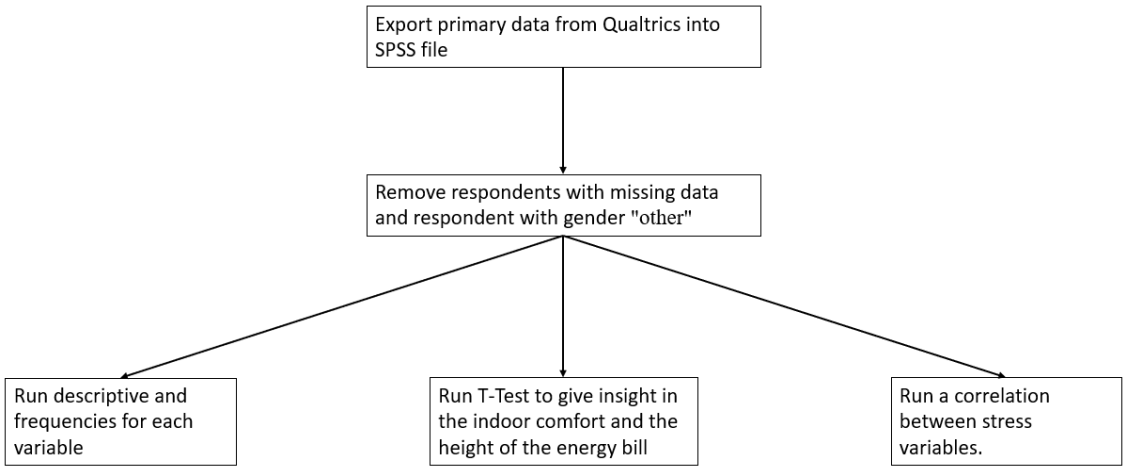


Figure 3: data analysis scheme.

3.4 Operationalisation of variables

Below, the most used variables are operationalised. When the terms 'last year' and 'this year' are discussed, 'last year' refers to 2021, and 'this year' refers to 2022.

Firstly, three variables measuring the characteristics of the respondents and the housing were measured. The variable 'energy label' had the following categories: A, B, C, D, E, F and G. The categories A, B and C were combined and recoded into the value 1. The outcomes D, E, F and G were recoded into the value 0, which led to the dummy variable 'energy label'. The variable 'age' ranged from 18 to 27, which was coded into a categorical variable: 18-20, 21-23 and 24-27. The variables 'monthly energy bill in Euros last year' and 'monthly energy bill in Euros this year' ranged from 0 to 500. These variables were recoded into categorical values with five categories: 0-99, 100-199, 200-299, 300-399 and 400-500.

The variables 'stress higher gas prices', 'stress possibilities of a cold winter', 'comfort related to the indoor temperature last year and this year' and 'stress regarding financial shortages at the end of the month' were measured on a 5-point Likert scale with 1 'very low', 2 'low', 3 'normal', 4 'high' and 5 'very high'.

The variables 'difficulty meeting monthly payments on the energy bill last year and this year' were measured on a 5-point Likert scale with 1 'not at all difficult', 2 'not very difficult', 3 'somewhat difficult', 4 'very difficult' and 5 'completely difficult'.

The variable 'level of isolation' was measured on a 5-point Likert scale with 1 'very poor', 2 'poor', 3 'normal', 4 'well' and 5 'very well'.

3.5 Validity and reliability

In order to ensure the validity of the research, the survey was based on the established theory presented in the theoretical framework. The questions in the survey were formulated carefully and precisely worded. Moreover, the population is clearly defined, and the convenience sampling method was used to ensure that the sample represents the population.

To ensure the reliability of this research, the survey was done in Qualtrics. At the beginning of the survey, it was made clear to the respondents what the purpose of the research was and what the research was about. Since the questions in the survey were carefully worded, there is a low probability that the same respondents would give different answers in the coming days, weeks or months. A low probability means there is still a slight possibility because the survey was based on gas prices. Since gas prices are subject to change, this could result in a change in the survey answers. E.g., if gas prices continue to rise, respondents might experience more stress.

3.6 Missing data

Originally the sample comprised 126 students. However, a missing value analysis was done to identify patterns of missing values across variables. This showed that some respondents did not give answers to key categorical questions. In total, 16 students did not give answers to questions regarding the key variables in the well-being and financial block of the survey. These cases were removed from the data. Furthermore, 1 respondent defined itself gender as other, and therefore this respondent was removed from the data. This resulted in a working data set of 109 students.

3.7 Ethical considerations

Within this methodology, ethical considerations need to be addressed. In this study, primary data is used in order to answer the research question. This primary data was collected through an online survey via Qualtrics. A password is needed to access the data within Qualtrics, which was only available to the researcher and the supervisor. At the beginning of the survey, an informed consent form was presented (see appendix 2). The respondents were informed about the study and that the results would eventually be published in the researcher's bachelor thesis. The data was collected anonymously; only general personal information was asked in this survey. Furthermore, it was made clear that participation in this research was entirely voluntary, and the respondents could stop the survey at any time.

The power relations within this research are highly hierarchical since the type of study is quantitative research, and the researcher collects both information and data. The researcher contributes to the thinking that goes into this project (Karnieli-Miller et al., 2009). Furthermore, the researcher of this study is an insider. The researcher is a student and is also confronted with higher gas prices. In order to ensure the objectivity of this research, it is important to be aware of this situation. Due to the quantitative approach, it is unlikely that this influenced on the interpretation of the results.

4. Results

In this chapter, the results of the data collection and the analysis of the data will be discussed. This will be done by analysing the primary data. The demographic data of the sample can be found in appendix 3, and the statistics tables in appendix 4.

4.1 Descriptive table

Below, in figures 4, 5 and 6, all the descriptive statistics from the survey are shown. These descriptive statistics are shown in different tables since some variables give no information when shown in descriptive. Therefore, frequencies are chosen with the mode displayed on the following two pages.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	108	18	27	22,52	1,672
Education	109	1	2	1,80	,403
Years of studying	109	1	8	4,38	1,660
Housing units	109	1	6	3,08	1,098
Roommates	107	0	10	5,13	3,464
Energy label	71	1	7	4,66	2,171
Level of isolation	98	1	5	2,01	1,126
Type of glass	109	1	2	1,51	,502
Stress higher gas prices	102	1	5	3,11	,964
Stress possibilities cold winter	103	1	5	2,83	1,097
Comfort related to the indoor temperature last year	107	1	5	3,08	1,074
Comfort related to the indoor temperature this year	105	1	5	2,63	,993
Stress regarding financial shortages	104	1	5	3,30	1,245
Indoor temperature in degrees Celsius last year	87	12	24	19,08	1,990
Indoor temperature in degrees Celsius this year	59	2	23	16,81	3,246
Monthly energy bill in euros last year	88	0	500	122,17	109,548
Monthly energy bill in euros this year	82	0	500	220,83	148,180
Difficulty paying the monthly energy bill last year	87	1	3	1,94	,721
Difficulty paying the monthly energy bill this year	88	1	5	2,80	1,019
Valid N (listwise)	21				

Figure 4: descriptive statistics table.

Statistics

		Gender	Type of building	Energy bill	Energy contract	Cancelling social activites	Economizing on daily costs	Financial support parents/guardians	Working and/or borrowing more money	Shorter and/or colder showers	Draft strips
N	Valid	109	109	108	108	98	99	99	99	109	109
	Missing	0	0	1	1	11	10	10	10	0	0
Mode		1	1	1	1	2	1	1	4	2	2

Figure 5: frequency table with mode displayed.

Cancelling social activites

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	31	28,4	31,6	31,6
	No	67	61,5	68,4	100,0
	Total	98	89,9	100,0	
Missing	System	11	10,1		
Total		109	100,0		

Economizing on daily costs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	69	63,3	69,7	69,7
	No	30	27,5	30,3	100,0
	Total	99	90,8	100,0	
Missing	System	10	9,2		
Total		109	100,0		

Financial support parents/guardians

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	63	57,8	63,6	63,6
	No	36	33,0	36,4	100,0
	Total	99	90,8	100,0	
Missing	System	10	9,2		
Total		109	100,0		

Working and/or borrowing more money

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes both	17	15,6	17,2	17,2
	Yes working	32	29,4	32,3	49,5
	Yes borrowing	12	11,0	12,1	61,6
	No	38	34,9	38,4	100,0
	Total	99	90,8	100,0	
Missing	System	10	9,2		
Total		109	100,0		

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	61	56,0	56,0	56,0
	Female	48	44,0	44,0	100,0
	Total	109	100,0	100,0	

Type of building

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Room in regular student house shared facilities	92	84,4	84,4	84,4
	Room in a student flat shared facilites	2	1,8	1,8	86,2
	Indepentent room/appartment with no shared facilites	13	11,9	11,9	98,2
	Independent room student flat with no shared facilites	2	1,8	1,8	100,0
	Total	109	100,0	100,0	

Energy bill

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Inclusive	59	54,1	54,6	54,6
	Exclusive	48	44,0	44,4	99,1
	Do not know	1	,9	,9	100,0
	Total	108	99,1	100,0	
Missing	System	1	,9		
Total		109	100,0		

Energy contract

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Variable	54	49,5	50,0	50,0
	Fixed	25	22,9	23,1	73,1
	Do not know	29	26,6	26,9	100,0
	Total	108	99,1	100,0	
Missing	System	1	,9		
Total		109	100,0		

Shorter and/or colder showers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes both	20	18,3	18,3	18,3
	Yes shorter showers	50	45,9	45,9	64,2
	Yes colder showers	2	1,8	1,8	66,1
	No	37	33,9	33,9	100,0
	Total	109	100,0	100,0	

Draft strips

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	15	13,8	13,8	13,8
	No	94	86,2	86,2	100,0
	Total	109	100,0	100,0	

Figure 6: frequencies.

4.2 Financial consequences

In the following section, the first and following sub-question will be discussed:

Which financial actions do students take as a consequence of the higher gas prices?

A paired samples t-test compares the means of two variables for a single group. The statistics of a paired samples t-test between the difference in the monthly energy bill in 2021 and 2022 are presented. First, it needs to be visualised that there are indeed higher gas prices in 2022 in comparison to 2021

A paired samples t-test was conducted to compare the monthly energy bill in Euros in 2021 and in 2022. There was a significant difference in the scores for 2021 ($M=131.11$, $SD=108.18$) and 2022 ($M=220.83$, $SD=148.18$) conditions; $t(81)=-8.26$, $p < .001$. These results show that the monthly energy bill in 2021 was, on average, 131,11 Euros, and in 2022, 220,83 Euros. This is an average increase of 89,72 Euros in the monthly energy bill. Below, in figure 7, the rise in monthly energy bills is visualised.

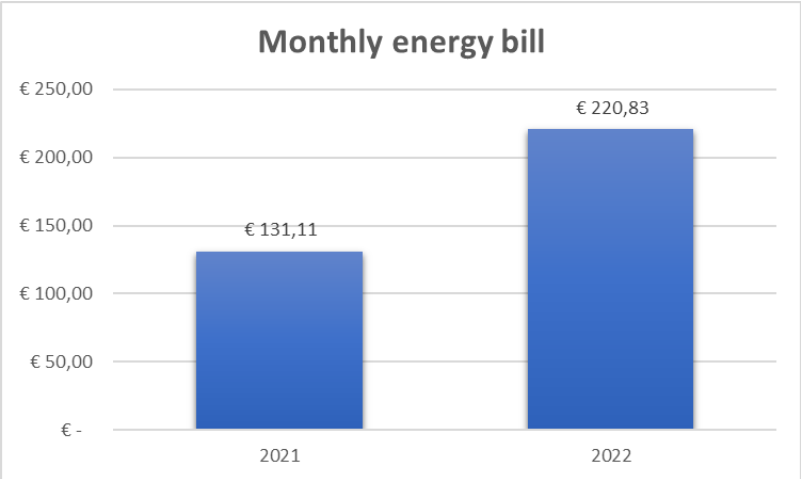


Figure 7: bar chart of the monthly energy bill from 2021 and 2022.

As discussed and shown in figure 7, students' average monthly energy bill rises to 220,83 Euros. This has consequences for the financial situation of students. Below, figures 8 and 9 visualise which financial actions students take to deal with the higher energy bill due to higher gas prices. Considering figure 8, it becomes clear that students take financial actions to compensate for higher gas prices. Students prefer to economise on daily costs like groceries (70%) instead of cancelling social activities (32%). Furthermore, it becomes clear that 64 percent of students get financial support from their parents/guardians. In figure 9, the stacked bar chart shows which financial actions students take in order to have a higher monthly income. This is possible due to borrowing more money or working more weekly hours. 17 percent of the students borrows more money and started working more hours, in order go have a higher monthly income; 39 percent did not borrow more money or started working more hours; 12 percent borrowed more money; 32 percent worked more hours.

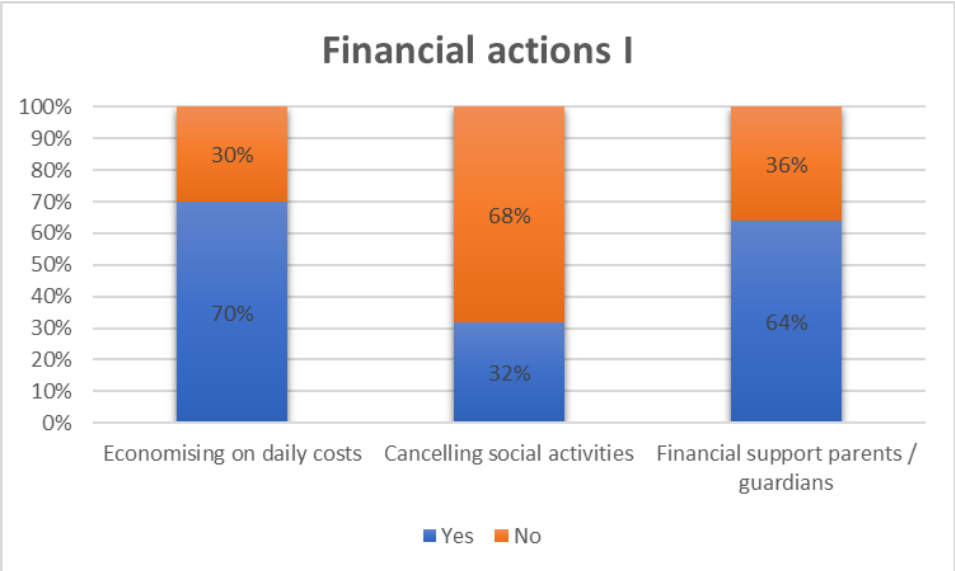


Figure 8: stacked bar chart of financial actions I.

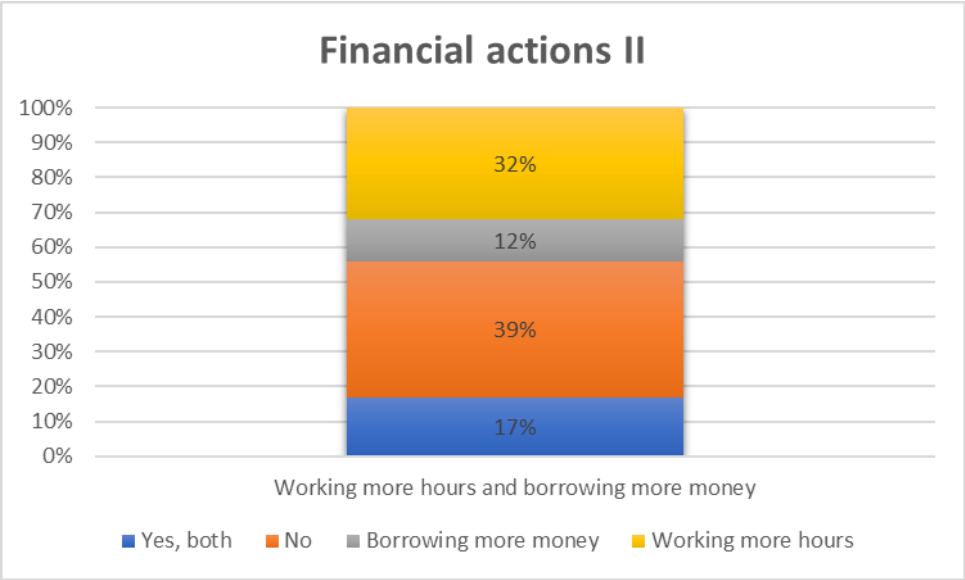


Figure 9: stacked bar chart of financial actions II.

Figures 10 and 11 show the relationship between the difficulty in paying the energy bill and the height of the energy bill in 2021 and 2022. Five different groups were made for the height of the monthly energy bill. Considering figures 10 and 11, it becomes clear that the centre of gravity of the monthly energy bill shifts to the right in 2022 compared to 2021. In other words, more respondents experienced higher energy bills. This is not the only phenomenon that is visible in both figures. Also, the difficulty regarding the payment is higher in 2022, respondents generally experience a more difficult task in paying their monthly energy bills in 2022 compared to 2021. In 2021, none of the respondents experienced it 'very difficult' or 'completely difficult' to pay their monthly energy bills. When looking at the year 2022, 17 out of the 76 respondents experienced it 'very difficult' or 'completely difficult' to pay their monthly energy bills.

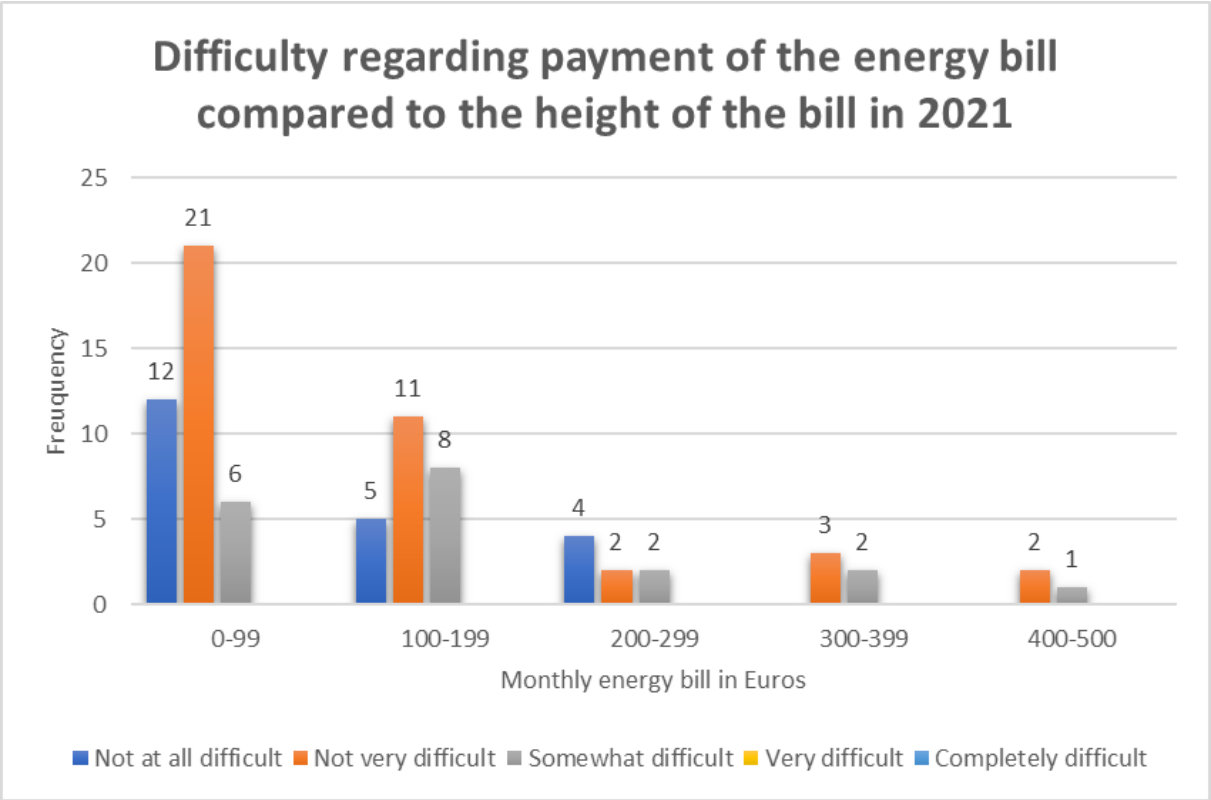


Figure 10: difficulty regarding the payment of the energy bill compared to the height of the energy bill in 2021.

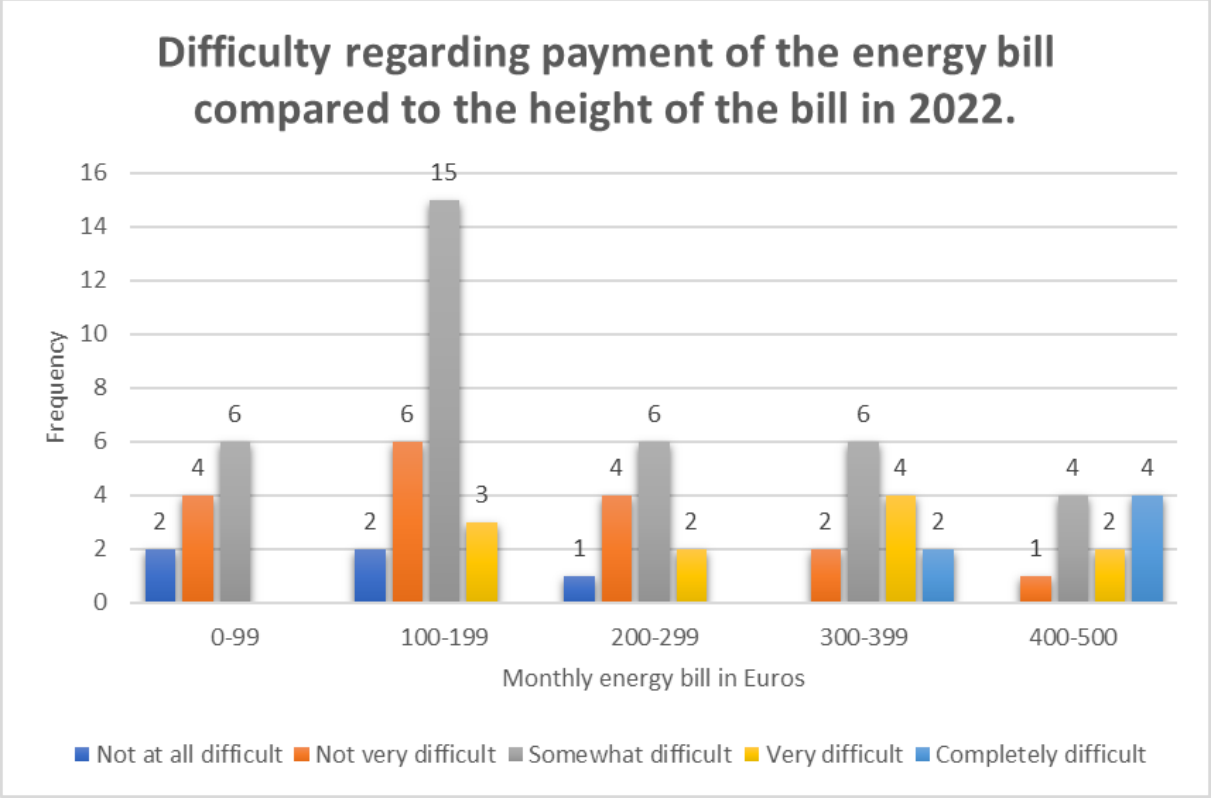


Figure 11: difficult regarding the payment of the energy bill compared to the height of the energy bill in 2022.

4.3 Minimisation of gas usage

In the following section, the second sub-question will be discussed:

What are students doing in order to minimise the usage of gas?

A paired samples t-test was conducted to compare the indoor temperature on the thermostat in degrees Celsius in 2021 and in 2022. There was a significant difference in the scores for the indoor temperature in degrees Celsius in 2021 (M=19.07, SD=2.19) and 2022 (M=16.82, SD=3.27) conditions; $t(56)=5.99$, $p < .001$. These results suggest that the thermostat's average indoor temperature declined to 2.25 degrees Celsius, which is visualised in figure 12. This is due to the fact that students set their thermostats lower in order to minimise the usage of gas.

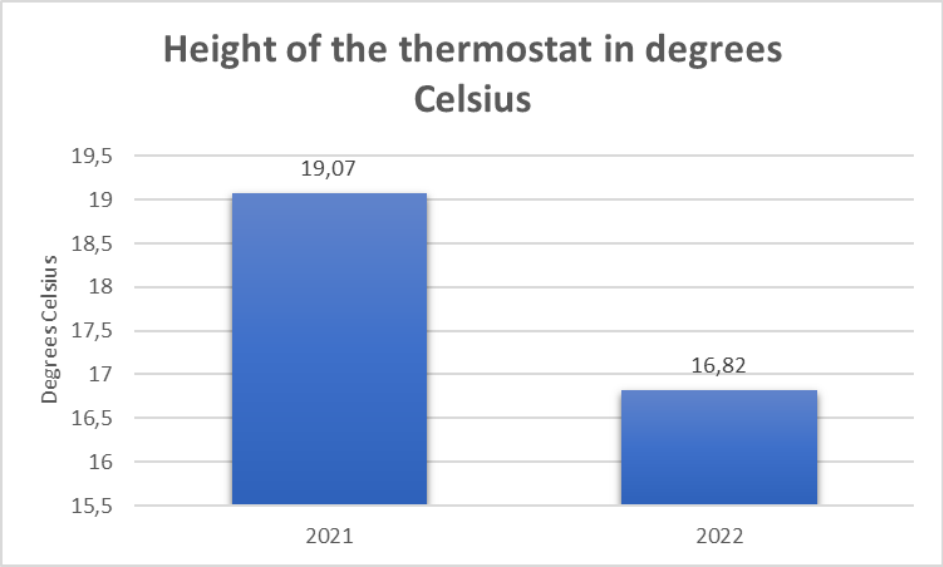


Figure 12: height of the thermostat in degrees Celsius in 2021 and 2022.

Furthermore, as visualised in figure 13, students changed their behaviour regarding showering. From the respondents, 18 percent started taking colder and shorter showers due to higher gas prices, 2 percent only lowered the temperature of the water, 46 percent did take shorter showers, and 34 percent did not change their behaviour regarding showering. When students shower colder or shorter, less gas is needed. Thus, students are minimising their gas usage regarding showering.

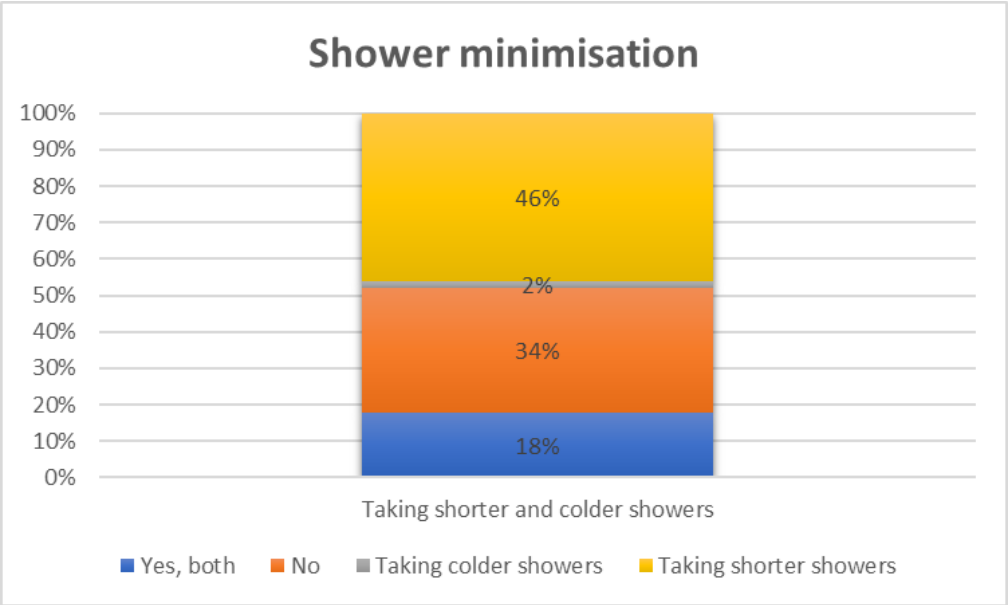


Figure 13: change in shower behaviour.

4.4 Indoor comfort

In the section below, the following sub-question will be discussed:

What are the changes regarding feeling comfortable in their own house?

A paired samples t-test was conducted to compare the level of comfort related to indoor temperature in 2021 and 2022. In this t-test, the mean of pair 1 is a value between 1 and 5, with the values 1 'very low' and value 5 'very high'. There was a significant difference in the scores in 2021 (M=3.08, SD=1.08) and 2022 (M=2.63, SD=.99) conditions; $t(104)=4.38$, $p < .001$. These results show a significant difference in comfort in relation to indoor temperature in 2021 and 2022. The value of last year, 3.08, shows that there was a normal level of comfort, which dropped in 2022 to 2.63, which shifted towards a lower level of comfort in relation to the indoor temperature.

As stated in section 4.3 students' indoor temperature declined in 2022 compared to 2021. Figure 14 visualises the decline in comfort regarding indoor temperature. As can be seen, the 'very low' level did not change from 2021 to 2022. However, the number of selected 'low' respondents rose tremendously from 23 percent to 47 percent. Furthermore, the number of respondents that answered 'high' or 'very high' also declined.

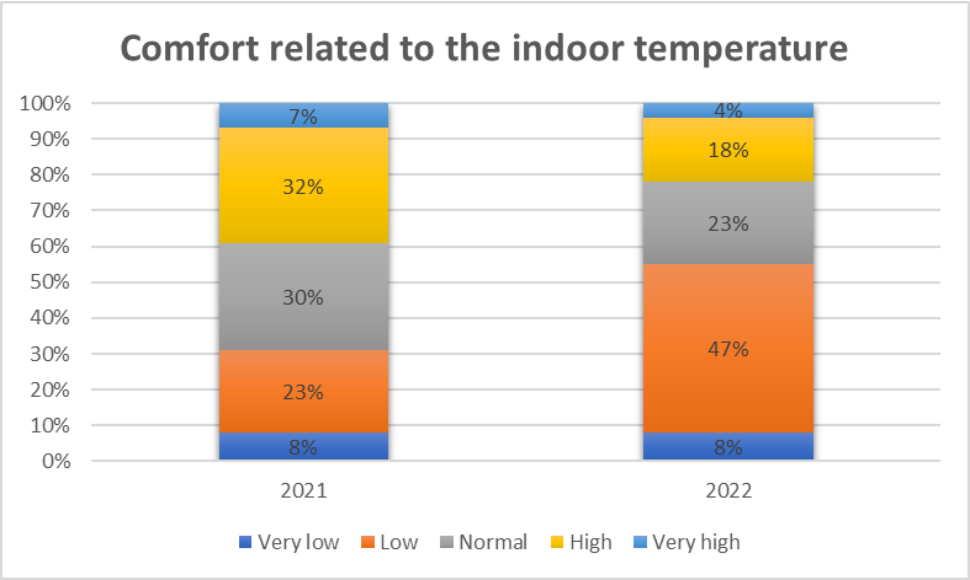


Figure 14: comfort related to the indoor temperature in 2021 and 2022.

As stated in section 2.5, women experience temperature differently than men. Therefore, a distinction is made between the comfort experience related to the indoor temperature by gender, which is visualised in figure 15. In this figure, it becomes visible that women and men experience temperature differently. Last year, a slightly higher percentage of male respondents experienced their comfort related to the higher temperature 'very low', than female respondents. However, females experienced last year more often a 'low' level of comfort related to the indoor temperature than males relatively. When comparing this year, it is also visible that females experience temperature differently than males. Relatively, females selected both 'very low' and 'low' more often than males.

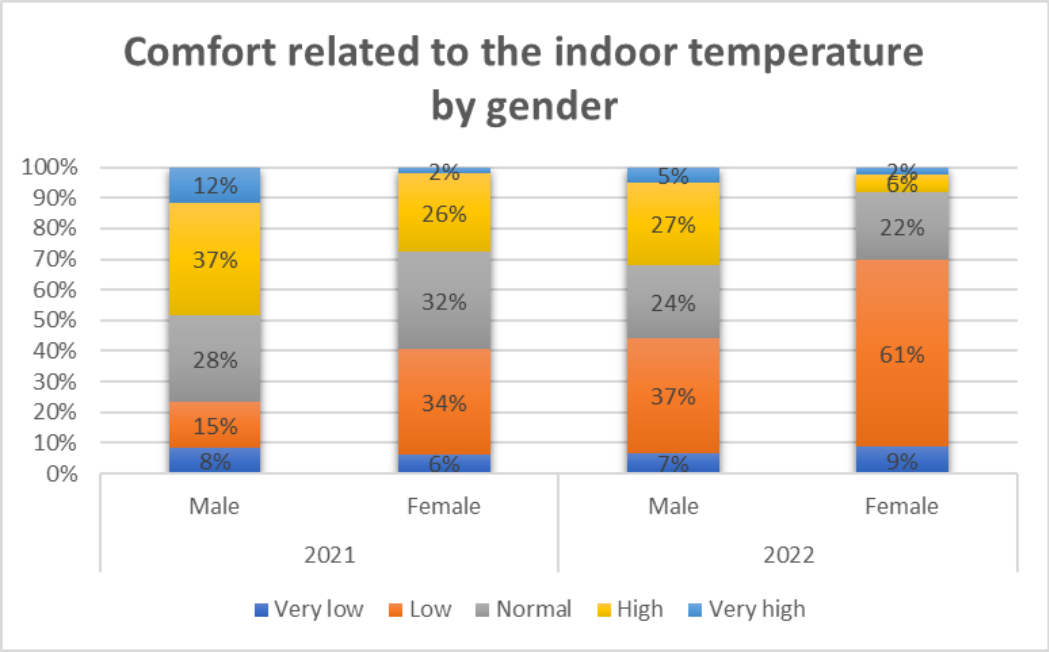


Figure 15: comfort related to the indoor temperature by gender.

Figure 16 below shows the stress level on the possibilities of a cold winter and higher gas prices. As can be seen, some students are worried about the possibility of a cold winter. However, the percentage of students that is worried are 10 percent lower than that of students that are not worried about the possibility of a cold winter. When looking at the stress level of students regarding higher gas prices, it is clear that students are more stressed about higher gas prices. The total percentage of students that are high or very highly stressed regarding higher gas prices is higher than the percentage of students that have a low or very low stress level regarding higher gas prices. However, more than one-third of the students do not necessarily feel stressed regarding higher gas prices.

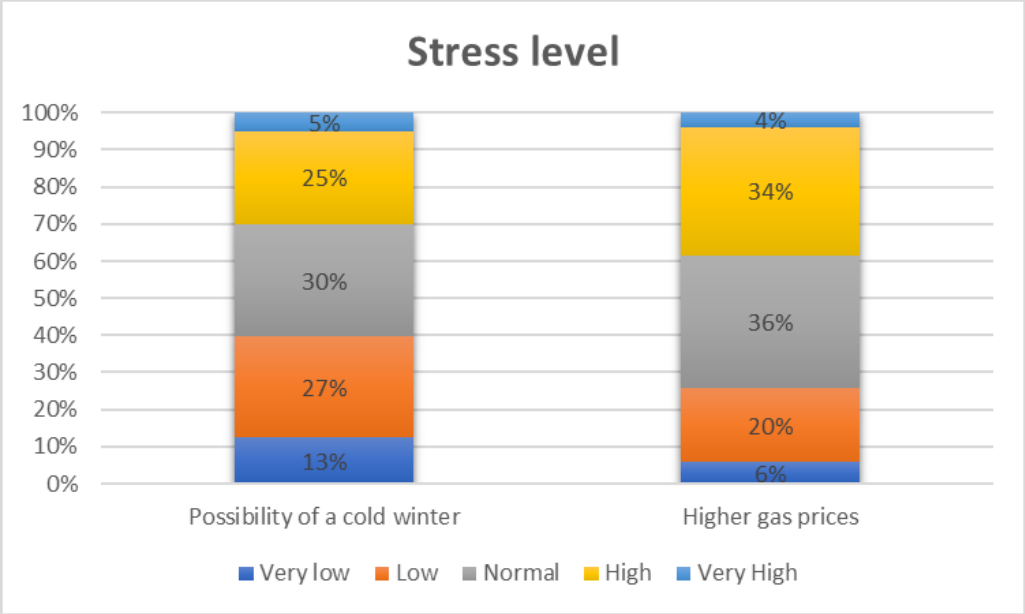


Figure 16: stress level regarding the possibility of a cold winter and higher gas prices.

Since males and females had different outcomes on comfort related to the indoor temperature, a distinction is also made on gender regarding the stress level. This is visualised in figure 17. Considering figure 17, it becomes clear that females have a higher stress level regarding the possibility of a cold winter than males. In total, 42 percent of female respondents had a 'high' or 'very high' stress level regarding the possibility of a cold winter. Only 21 percent of the males experienced this likewise. The same trend is visible when looking at the stress level of higher gas prices. Females experienced, in 48 percent of the cases, a 'high' or a 'very high' stress level regarding higher gas prices. Not a single male respondent had a 'very high' stress level regarding higher gas prices, and 31 percent experienced a 'high' stress level.

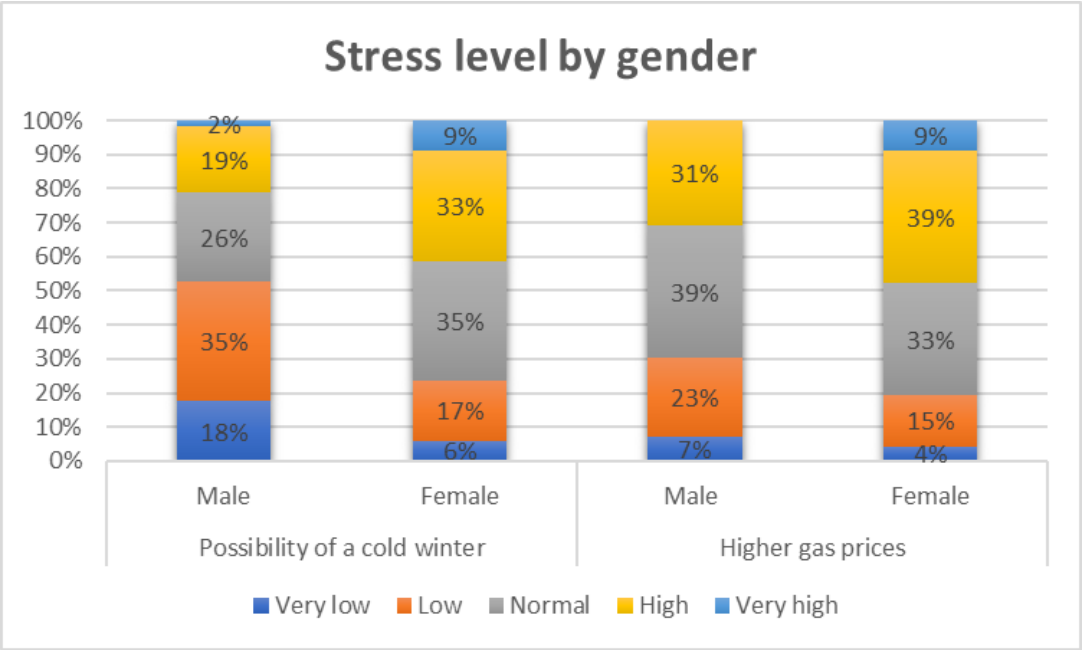


Figure 17: stress level regarding the possibility of a cold winter and higher gas prices by gender.

A Spearman's rho correlation coefficient was computed to assess the linear relationship between the stress regarding the higher gas prices and the stress regarding the possibility of a cold winter. A Spearman's rho correlation measures whether there is a relationship between two variables. There was a positive correlation between the two variables, $r(97) = .61$, $p < .001$. Overall, there was a strong positive correlation between stress regarding higher gas prices and stress regarding the possibility of a cold winter. Increases in stress regarding higher gas prices were correlated with increases in stress regarding the possibility of a cold winter.

5. Discussion

This research aimed to investigate the well-being of students and how this is affected by higher gas prices. The sub-questions will be answered in the following sections.

5.1 Which financial actions do students take as a reaction to higher gas prices?

Considering section 4.2, it can thus be concluded that students feel financial consequences of higher gas prices. According to Mashhoodi (2021), low-income households could become at risk since gas prices will hit this group hardest. These groups will experience difficulties regarding the payment of their energy bill. This is visible in the higher monthly energy bill, which increased by 89,72 Euros per month. Because of this, students often experience difficulties in paying their monthly energy bills, which corresponds with the literature of Mashhoodi (2021). In order to deal with higher energy costs, students economise on several activities, like food, social activities and personal care (Watson et al., 2015). As stated in section 4.2, students cut their budget by economising on daily costs but prefer not to cancel social activities. This contradicts the research done by Watson et al. (2015), which stated that students prefer not to economise on social activities.

5.2 What are students doing in order to minimise the usage of gas?

Low-income households, such as students, are likely to change their energy usage behaviour in order to minimise it (Feenstra et al., 2021). This corresponds with the theoretical framework considering section 4.3. Students changed their behaviour by lowering the height of the thermostat by more than two degrees Celsius. Furthermore, students contributed to minimisation by taking shorter and colder showers in order to contain gas usage.

5.3 What are the changes regarding feeling comfortable in their own house?

The comfort in relation to indoor temperature declined in 2022 in comparison to 2021. Women experience this decline even greater than men. This was expected since Karjalainen (2012) stated that women are more likely to be dissatisfied with temperature in colder areas than men. Mishra and Ramgopal (2013), stated that the optimal indoor temperature is 20,4°C. Since the indoor temperature on the thermostat in 2022 dropped to 16,8 °C, the comfort level declined. Thus, it can be said that students feel less comfortable indoors. Furthermore, it is not necessarily clear that students are stressed about the possibility of a cold winter. However, women are more stressed regarding a cold winter than men. Students tend to feel more stressed regarding higher gas prices, which is also experienced as more stressful by women than men. Finally, there is a strong positive correlation between the stress regarding higher gas prices and the stress regarding the possibility of a cold winter.

6. Conclusions

6.1 Higher gas prices and the well-being of students

The main research question was as the following:

> *How do higher gas prices affect the well-being of students, in terms of financial well-being, minimisation of gas usage and indoor comfort?*

This research question has been formulated since higher gas prices are recent developments, and students are excluded from the governmental allowance. However, the scientific literature is scarce regarding the topic.

Based on a quantitative analysis, it can be concluded that student well-being has declined. This well-being can be divided into three components: financial, comfort and minimisation of gas usage. Students will experience financial troubles and need to economise on their expenditures. Furthermore, students minimise gas usage by lowering the thermostat and changing their shower behaviour. Finally, students will experience more stress and feel less comfortable in their own houses regarding the indoor temperature. These findings, taken together, lead to the conclusion that students' well-being is affected on a financial level, the level of comfort regarding the indoor temperature and their stress level.

6.2 Limitations

Several limitations are present in this research. Since this study is about students throughout the Netherlands, an evenly distributed sample size from all the different student cities is preferred. However, Groningen is overrepresented in this study, and not every student city in the Netherlands is represented. Furthermore, not every question in the survey is used in this research. Due to these unnecessary questions, the survey took longer to finish, and respondents stopped during the survey leading to the missing data. Within the survey question regarding the temperature, there was an option to select 'thermostat turned off'. This influenced the data since this could not be measured within the average temperature of the thermostat. Unfortunately, whether students selected this option or did not fill in this question could not be found. Due to the lack of respondents, it was not possible to have a significant simple linear regression with control variables. In order to tackle this problem, outcomes were taken together as bigger categories with the help of recoding. Unfortunately, this did not impact the outcomes of the regression positive enough. With more respondents, a higher statistical power could be present for multivariate regressions.

6.3 Recommendation for future research

This study focussed on students. However, more low-income groups face challenges regarding higher gas prices. Further research could be conducted in order to investigate how other low-income groups' well-being is affected by higher gas prices. This could be, for example, low-income households. Furthermore, this research could also be conducted on a larger scale and evenly distributed sample

through the student cities in the Netherlands. This leads to more statistical power, and differences within the municipalities can be detected. Furthermore, it could be interesting to study whether the years that someone is studying have different influences on their well-being or the actions that students take due to higher gas prices.

6.4 Policy recommendations

The results show that students' well-being is affected by higher gas prices. At the moment, students are in advance excluded from the allowance for the higher energy bill which the government implements. This was decided because the government thought that the situation with students would be too complex and that every student's situation differs. Therefore, I suggest the government stop excluding every student in advance. The government should consider students' different situations and make a new decision about whether energy allowance should be granted to students or not.

References

Anderson, W., White, V. and Finney, A. (2012) 'Coping with low incomes and cold homes', *Energy Policy*, 49, pp. 40–52. Available at: https://doi.org/10.1016/j.enpol.2012.01.002.

BNNVARA (2022) *Energiearmoede: Wilma (61) laat huis noodgedwongen afsluiten van gasleiding - Joop - BNNVARA, Joop*. Available at: https://www.bnnvara.nl/joop/artikelen/energierarmoede-wilma-61-laat-huis-noodgedwongen-afsluiten-van-gasleiding (Accessed: 25 September 2022).

CBRE (2015) *Student Housing: Investing in a better living, Student Housing: Investing in a better living*. Available at: http://bit.ly/1J2cQkF (Accessed: 21 November 2022).

Chapman, A. and Okushima, S. (2019) 'Engendering an inclusive low-carbon energy transition in Japan: Considering the perspectives and awareness of the energy poor', *Energy Policy*, 135, p. 111017. Available at: https://doi.org/10.1016/j.enpol.2019.111017.

Childs, C., Elliot, J., Khatab, K., Hampshaw, S., Fowler-Davis, S., Willmot, J. and Ali, A. (2020) 'Thermal Sensation in Older People with and without Dementia Living in Residential Care: New Assessment Approaches to Thermal Comfort Using Infrared Thermography', *International Journal of Environmental Research and Public Health*, 17(18), p. 6932. Available at: https://doi.org/10.3390/ijerph17186932.

Dalla Longa, F., Sweerts, B. and van der Zwaan, B. (2021) 'Exploring the complex origins of energy poverty in The Netherlands with machine learning', *Energy Policy*, 156, p. 112373. Available at: https://doi.org/10.1016/j.enpol.2021.112373.

Feenstra, M., Middlemis, L., Hesselman, M., Straver, K. and Herrero, S. (2021) 'Humanising the Energy Transition: Towards a National Policy on Energy Poverty in the Netherlands', *Frontiers in Sustainable Cities*, 3. Available at: https://doi.org/10.3389/frsc.2021.645624.

Fonseca Gabriel, M. Paciência, I., Felgueiras, F., Cavaleiro Rufo, J., Castro Mendes, F., Farraia, M., Mourão, Z., Moreira, A. and Oliveria Fernandes, E. (2021) 'Environmental quality in primary schools and related health effects in children. An overview of assessments conducted in the Northern Portugal', *Energy and Buildings*, 250, p. 111305. Available at: https://doi.org/10.1016/j.enbuild.2021.111305.

Gallego Sánchez-Torija, J., Fernández Nieto, M.A. and Gómez Serrano, P.J. (2021) 'The merits of making energy costs visible: The sustainability benefits of monetizing energy efficiency certificates in Spanish rental homes', *Energy Research & Social Science*, 79, p. 102169. Available at: https://doi.org/10.1016/j.erss.2021.102169.

Humphreys, M.A. and Hancock, M. (2007) 'Do people like to feel "neutral"?: Exploring the variation of the desired thermal sensation on the ASHRAE scale', *Energy and Buildings*, 39(7), pp. 867–874. Available at: https://doi.org/10.1016/j.enbuild.2007.02.014.

Karjalainen, S. (2012) 'Thermal comfort and gender: a literature review', *Indoor Air*, 22(2), pp. 96–109. Available at: https://doi.org/10.1111/j.1600-0668.2011.00747.x.

Karnieli-Miller, O., Strier, R. and Pessach, L. (2009) 'Power relations in qualitative research', *Qualitative Health Research*, 19(2), pp. 279–289. Available at: https://doi.org/10.1177/1049732308329306.

Kazmi, H., Keijsers, M., Mehmood, F. and Miller, C. (2022) 'Energy balances, thermal performance, and heat stress: Disentangling occupant behaviour and weather influences in a Dutch net-zero energy

neighborhood', *Energy and Buildings*, 263, p. 112020. Available at: https://doi.org/10.1016/j.enbuild.2022.112020.

Kousis, I., Laskari, M., Ntouros, V., Assimakopoulos, M. and Romanowicz, J. (2020) 'An analysis of the determining factors of fuel poverty among students living in the private-rented sector in Europe and its impact on their well-being', *Energy Sources, Part B: Economics, Planning, and Policy*, 15(2), pp. 113–135. Available at: https://doi.org/10.1080/15567249.2020.1773579

Kröger, M., Longmuir, M., Neuhoff, K. and Schütze, F. (2022) *DIW Berlin: The Costs of Natural Gas Dependency : Price Shocks, Inequality, and Public Policy*. DIW Berlin. Available at: https://www.diw.de/de/diw_01.c.847880.de/publikationen/diskussionspapiere/2022_2010/the_costs_of_natural_gas_dependency__price_shocks__inequality__and_public_policy.html (Accessed: 25 September 2022).

Mashhoodi, B. (2021) 'Who is more dependent on gas consumption? Income, gender, age, and urbanity impacts', *Applied Geography*, 137, p. 102602. Available at: https://doi.org/10.1016/j.apgeog.2021.102602.

Mishra, A.K. and Ramgopal, M. (2013) 'Field studies on human thermal comfort — An overview', *Building and Environment*, 64, pp. 94–106. Available at: https://doi.org/10.1016/j.buildenv.2013.02.015.

Mulder, P., Dalla Longa, F. and Straver, K. (2023) 'Energy poverty in the Netherlands at the national and local level: A multi-dimensional spatial analysis', *Energy Research & Social Science*, 96, p. 102892. Available at: https://doi.org/10.1016/j.erss.2022.102892.

Peeters, L., Dear, R., Hensen, J. and D'haeseleer, W. (2009) 'Thermal comfort in residential buildings: Comfort values and scales for building energy simulation', *Applied Energy*, 86(5), pp. 772–780. Available at: https://doi.org/10.1016/j.apenergy.2008.07.011.

Pye, S., Dobbins, A., Baffert, C. and Brajkovic, J. (2015) *Energy poverty and vulnerable consumers in the energy sector across the EU: analysis of policies and measures*.

Rahman, M.S. (2016) 'The Advantages and Disadvantages of Using Qualitative and Quantitative Approaches and Methods in Language "Testing and Assessment" Research: A Literature Review', *Journal of Education and Learning*, 6(1), p. p102. Available at: https://doi.org/10.5539/jel.v6n1p102.

Reames, T.G. (2016) 'Targeting energy justice: Exploring spatial, racial/ethnic and socioeconomic disparities in urban residential heating energy efficiency', *Energy Policy*, 97, pp. 549–558. Available at: https://doi.org/10.1016/j.enpol.2016.07.048.

Rijksoverheid (2022a) *Afbouw gaswinning Groningen*. Ministerie van Algemene Zaken. Available at: https://www.rijksoverheid.nl/onderwerpen/gaswinning-in-groningen/afbouw-gaswinning-groningen#:~:text=De%20gaskraan%20in%20Groningen%20gaat,een%20wat%20temperatuur%20bereft%20… (Accessed: 18 september 2022).

Rijksoverheid (2022b) *Hoe vraag ik de energietoeslag 2022 aan van ongeveer € 1.300? - Koopkracht - Rijksoverheid.nl*. Ministerie van Algemene Zaken. Available at: https://www.rijksoverheid.nl/onderwerpen/koopkracht/hoe-vraag-ik-de-energietoeslag-aan (Accessed: 25 September 2022).

Sovacool, B.K., Lipson, M.M. and Chard, R. (2019) 'Temporality, vulnerability, and energy justice in household low carbon innovations', *Energy Policy*, 128, pp. 495–504. Available at: https://doi.org/10.1016/j.enpol.2019.01.010.

Stevens, M., Raat, H., Ferrando, M., Vallina, B., Lucas, R., Middlemis, L., Rédon, J., Rocher, E. and van Grieken, A. (2022) 'A comprehensive urban programme to reduce energy poverty and its effects on health and wellbeing of citizens in six European countries: study protocol of a controlled trial', *BMC Public Health*, 22(1), pp. 1–10. Available at: https://doi.org/10.1186/s12889-022-13968-2.

UNDP (2022) *Sustainable Development Goals | United Nations Development Programme*, *UNDP*. Available at: https://www.undp.org/sustainable-development-goals (Accessed: 27 October 2022).

Watson, S.J., Barber, B.L. and Dziurawiec, S. (2015) 'The Role of Economizing and Financial Strain in Australian University Students' Psychological Well-Being', *Journal of Family and Economic Issues*, 36(3), pp. 421–433. Available at: https://doi.org/10.1007/s10834-014-9404-5.

van der Werf, M.M.B., van Dijk, W.W., Schonewille, G.A., van der Steeg, M.W. and van Dillen, L.F. (2022) 'Encouraging recalibration of student loans in the Netherlands: The impact of information about future costs and the ease of adjustment', *Journal of Behavioral and Experimental Finance*, 34. Available at: https://doi.org/10.1016/j.jbef.2022.100637.

Zwickl-Bernhard, S., Auer, H. and Golab, A. (2022) 'Equitable decarbonization of heat supply in residential multi-apartment rental buildings: Optimal subsidy allocation between the property owner and tenants', *Energy and Buildings*, 262, p. 112013. Available at: https://doi.org/10.1016/j.enbuild.2022.112013.

Appendix 1: Questionnaire design

Question	Measurement level	Answer options	Aim of the question
1. Questions about the demographics of the sample.			
1A What is your age?	Ratio	0-99	To get a demographic insight of the sample.
1B What is your Gender	Nominal	Male, female, other.	To get a demographic insight of the sample, and to find out what the differences on the well-being are with the different genders in mind.
1C In which city do you live?	Nominal	Open answers possible.	To get a demographic insight of the sample.
1D Which university (of applied science) do you study at?	Nominal	Open answers possible.	To get a demographic insight of the sample.
1E Which study year are you currently in?	Ratio	0-10.	To find out for how many years the sample studies. This is in order to distinguish whether "fresh" students are more/less worried than

			"older" students.
1F What type of building do you live in?	Nominal	A room in a regular student house with shared facilities, a room in a student flat with shared facilities, an independent studio/apartment with no shared facilities, and independent room in a student flat with no shared facilities.	To get insight into the living conditions of the sample.
1G How many housing units are in your building?	Ordinal	1, 2-4, 5-9, 10-19, 20-49, 50+.	To get insight into how many housing units are within the student's building.
1G How many roommates do you have? (if more than 10, please select 10)	Ratio	0-10, I live with my parents.	To get insight into the living conditions of the sample.
2. Questions about the housing conditions of the sample.			
2A Does your monthly rent payment to your landlord include the energy bills, or do you pay this separately?	Nominal	Includes, pay separately.	To find out whether students that pay inclusive have other behaviour regarding energy savings and also have a higher level of well-being.

2B Do you have a variable or a fixed energy contract?	Nominal	Variable, fixed, don't know.	In order to find out which type of contract a student has. This since the fixed contract pays a lower price for energy.
2C What is the energy label of your house? https://www.energielabel.nl/woningen/zoek-je-energielabel/	Ordinal	A, B, C, D, E, F, G.	To find out how well isolated the homes of students are, and whether this influences the well-being.
2D How well would you define the isolation of your house?	Ordinal	1-5	This in order to find out how well the home is isolated.
2E What type of glass do you have in your home	Ordinal	Single, double, triple.	This in order to figure out how well the home is isolated.
2F Do you have draft strips in your house?	Nominal (binary)	Yes, no.	This in order to figure out how well the home is isolated.
3. Questions about the well-being of the sample.			
3A How would you define your level of stress regarding the higher gas prices?	Ordinal	1-5	To find out what the level of stress is regarding higher gas prices.

3B How would you define your level of stress on the possibilities of a cold winter?	Ordinal	1-5.	To find out how the sample thinks about their level of stress regarding a possible cold winter.
3C How would you define your level of comfort related to the temperature in your own house last year?	Ordinal	1-5.	To find out how comfortable the sample feels in their own house in relation to the indoor temperature last year.
3D How would you define your level of comfort related to the temperature in your own house this year?	ordinal	1-5.	To find out how comfortable the sample feels in their own house in relation to the indoor temperature this year.
3E How would you define your level of stress regarding financial shortages at the end of the month?	Ordinal	1-5.	What the stress level of the sample is regarding financial shortages at the end of the month.
3F What was the average temperature of your thermostat when you were at home and awake last year?	Scale	0-30 degrees celsius	To find out if, or how many degrees the sample set the thermostat lower or higher

3G What was the average temperature of your thermostat when you were at home and awake this year?	Scale	0-30 degrees celsius	To find out if, or how many degrees the sample set the thermostat lower or higher.
3D Did you start taking colder and/or shorter showers?	Nominal	Yes both, yes colder, yes shorter, no.	To find out whether there is a change in behaviour in showering.
4. Questions about the financial status of the sample.			
4A What was your monthly energy bill last year?	Ratio	0-500	To find out how much the monthly costs were rising in comparison with the previous year.
4B What is your monthly energy bill this year?	Ratio	0-500	To find out how much the monthly costs were rising in comparison with the previous year.
4C How difficult was it for you to meet monthly payments on your energy bills last year?	Ordinal	1-5.	To find out the difficulty regarding the monthly energy bills and compare this year and last year.
4D How difficult was it for you to meet monthly payments on your energy bills this year?	Ordinal	1-5.	To find out the difficulty regarding the monthly energy bills

			and compare this year and last year.
4E Do you cancel social activities that cost money due to the higher gas prices (Terrace, pub, day trips)?	Nominal (binary)	Yes, no.	To find out whether the sample cancels social activities.
4F Do you economise on daily costs like groceries?	Nominal (binary)	Yes, no.	To find out whether the sample economises on daily costs like the groceries.
4G Are you obtaining financial support from your parents/guardians?	Nominal (binary)	Yes, no.	To find out whether the sample has a higher level of well-being when financial support is given.
4H Did you start working more hours, loaning more money due to the higher gas prices?	Nominal	Yes both, yes more work, yes higher monthly loan, no.	To find out whether the sample finds resources for more monthly money.

Appendix 2: Informed consent form

How do higher energy prices affect students' well-being?

Dear respondent,

You are invited to participate in a study investigating how higher energy prices affect students' well-being. My name is Rens Vos. By filling out this questionnaire you will help me conduct this research as part of my bachelor thesis in the Society, Sustainability, and Planning program at the University of Groningen, under the supervision of Dr. Sarah Mawhorter.

This survey is intended for students who have moved out of their parents' homes and now live independently, on their own or with roommates.

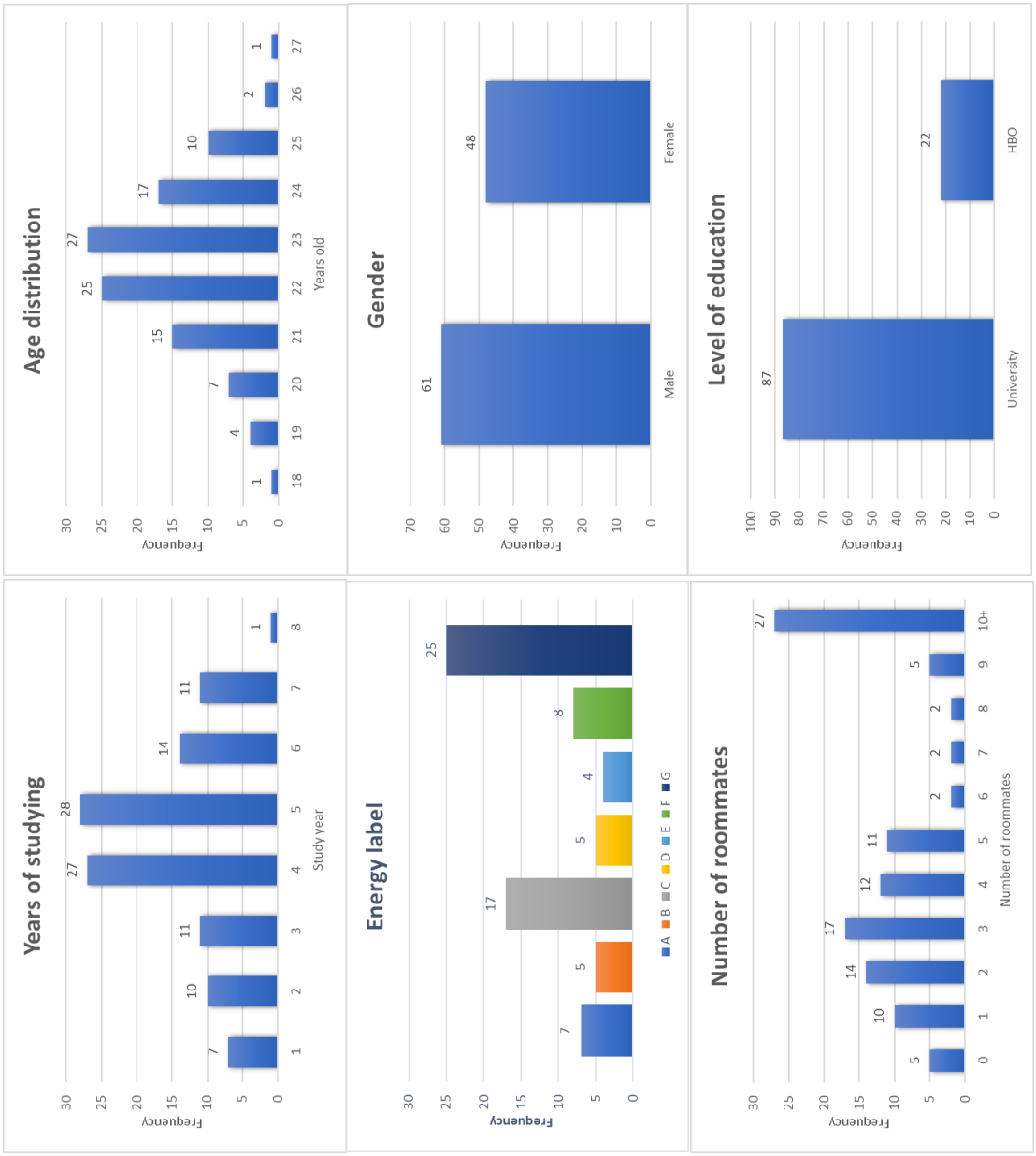
The survey will take around 5 minutes. Participation in this survey is voluntary, and you may withdraw at any time. In order to assure your privacy, responses are collected anonymously; the survey only asks for general personal information and no personally identifying information is collected. The data is encrypted and only the researcher and supervisor will have access to this data via a password.

By filling out this questionnaire you give me permission to use your answers for my research. The aggregated results of my research will be published in my bachelor thesis, and also may be published in articles or book chapters.

Thank you in advance for taking the time to share your thoughts and experiences!

- Rens Vos
- R.j.vos.2@student.rug.nl

Appendix 3: Demographic data of the sample



Appendix 4: Statistical tests

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Monthly energy bill in euros last year	131,11	82	108,181	11,947
	Monthly energy bill in euros this year	220,83	82	148,180	16,364

Paired Samples Test

		Paired Differences					t	df	Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			One-Sided p	Two-Sided p
Pair 1	Monthly energy bill in euros last year - Monthly energy bill in euros this year	-89,720	98,318	10,857	-111,322	-68,117	-8,263	81	<,001	<,001

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Indoor temperature in degrees Celsius last year	19,07	57	2,186	,290
	Indoor temperature in degrees Celsius this year	16,82	57	3,268	,433

Paired Samples Test

		Paired Differences					t	df	Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			One-Sided p	Two-Sided p
Pair 1	Indoor temperature in degrees Celsius last year - Indoor temperature in degrees Celsius this year	2,246	2,830	,375	1,495	2,997	5,990	56	<,001	<,001

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Comfort related to the indoor temperature last year	3,08	105	1,080	,105
	Comfort related to the indoor temperature this year	2,63	105	,993	,097

Paired Samples Test

		Paired Differences					t	df	Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			One-Sided p	Two-Sided p
Pair 1	Comfort related to the indoor temperature last year - Comfort related to the indoor temperature this year	,448	1,047	,102	,245	,650	4,382	104	<,001	<,001

Correlations

			Stress higher gas prices	Stress possibilities cold winter
Spearman's rho	Stress higher gas prices	Correlation Coefficient	--	
		Sig. (2-tailed)	.	
		N	102	
	Stress possibilities cold winter	Correlation Coefficient	,609**	--
		Sig. (2-tailed)	<,001	.
		N	99	103

**. Correlation is significant at the 0.01 level (2-tailed).