UNIVERSITY OF
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Forced Sustainability

- a stated preferences study investigating expected compliance with an externally imposed diet restriction

Abstract

The municipality of Gothenburg aims to drastically reduce greenhouse gas emissions stemming from meals served within the public sector, partially by substituting meat with plant-based alternatives within the schooling system (Göteborgs Stad, 2014). The emission target is set at a 40 percent reduction, and if this is to be met solely through change of diet, three out of five school lunches would have to be vegetarian. Through a stated preferences survey, this paper investigates whether such a forced restriction would be accepted by the students of upper secondary schools in Gothenburg. If the students would rebel against the implementation, the policy is not plausible to result in its intended effects. The findings of the study show that the students, to date, are willing to comply with an average of two vegetarian lunches a week. The results also show that an implemented restriction on non-vegetarian meals has a negative effect on the attitudes towards an even stricter policy, but that exposure to vegetarianism in one's private life has the opposite effect. In total, the results indicate that a vegetarian oriented policy could be successful in reducing emissions – given careful design and implementation.

Keywords: **Diet change | School lunches | Consumer behaviour | GHG emissions | Sustainability | Forced choice | Compliance |**

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Contents

1 Introduction

With a global population relentlessly growing towards somewhere between 9.5 and 13.3 billion people in 2100 (United Nations, 2015), the importance of diet choices and the various impact these may have on the environment are questions often up for debate. Existing literature on the topic is rather extensive, and the levels prescribed to the entire agricultural sector are commonly reported at around one third of the total global greenhouse gas (GHG) emissions (e.g. Pretty et al., 2010; IPCC, 2014; FAO, 2012). However, estimated emission levels vary vastly, especially regarding the most GHG intensive sub-sector, the meat industry. For example, the United Nation's (UN) Food and Agriculture Organization (FAO) reported in 2006 that livestock and their byproducts alone could be held accountable for 18 percent of the total global GHG emissions (Steinfeld et al., 2006), whereas World Watch three years later raised that number to 51 percent (Goodland & Anhang, 2009).

However large the emissions from livestock are, the diet choices we make have a great impact on the climate, a view shared by the municipality of Gothenburg. Gothenburg's strategy for mitigating the effect on climate change states that emissions originating from meals served within the public sector in the city should be reduced by 40 percent by 2030 compared to 2010 (Göteborg Stad, 2014). This objective will henceforth be referred to as *the 40 percent target*. One of the strategies to reach the target is to partially substitute meat with vegetarian alternatives[1]. In the assumption that food served in the public schooling system has the same mitigation target as the entire public sector, three out of five school lunches would have to be vegetarian if the target should be met only through this strategy (this point will be elaborated on further in this paper). According to U. Lundgren (investigator at the Environmental Administration in Gothenburg, e-mail conversation 2016-03-22)[2], the work on substitution is already well on the way as a weekly vegetarian day[3] started to be implemented within the public schooling system in 2014.

Whether a vegetarian oriented policy is to be successful or not, however, depends on how well those affected by the policy accept the changes. Without compliance there is an obvious risk for leakage. For instance, the students may choose to buy a non-vegetarian lunch outside of school. Thus, gaining knowledge about factors that affect attitudes towards a vegetarian policy is crucial for attaining goal fulfillment. Empirical research on the outcomes of this specific kind of forced choice restriction is, however, lacking. To date, the most thoroughly conducted evaluation

[1] Vegetarian is defined as lacto-ovo vegetarian, i.e. dairy products may be included in a vegetarian meal.
[2] Available on request
[3] A vegetarian day is defined as a school day when the only lunch alternative available is vegetarian.

is made by Lombardini & Lankoski (2013) who find that compliance differs with age and over time. However, their study regards compulsory school pupils in Helsinki. In consideration of vegetarian days starting to be implemented in Swedish upper secondary schools it is important to widen the knowledge about possible outcomes locally.

The purpose of this study is to create an understanding of how upper secondary students in Gothenburg are expected to act when faced with a policy partially restricting the school lunch to a vegetarian alternative. To our best knowledge, no such study has yet been made. In addition, the study aims to evaluate how the students' attitudes towards a vegetarian diet may be affected by already implemented policies. In other words, how and to what extent are the attitudes affected by exposure to a weekly vegetarian day in school? The students' attitudes will also be put in relation to exposure to private relations, such as friends and family. The underlining research questions of the paper are as follows:

- If the 40 percent target was to be reached only through change of diet, i.e. three vegetarian days a week, would the strategy be coherent with the wishes of the upper secondary students in Gothenburg?
- Does the maximum acceptable amount of vegetarian days per week (MAAVD) and the compliance[4] stated by the students change when they are exposed to vegetarianism?

As mentioned above, there is a substantial gap in the literature regarding forced vegetarian days in the educational environment. Since the study of Lombardini and Lankoski (2013) is the single leading article on the topic, also research on choice restriction regarding sugar-sweetened beverages and snacks has been used when analyzing the mechanisms behind the outcomes of the present study. However, the findings in this field vary, ranging from positive spillover effects and a consumption reduction of the restricted food (Cullen et al., 2008; Schwartz et al., 2009 & Johnsson et al., 2009) to negative spillover effects and compensatory behavior in unrestricted food environments (Whatley Blum et al., 2008).

[4] In the present paper, compliance denotes behavior in the restricted environment only.

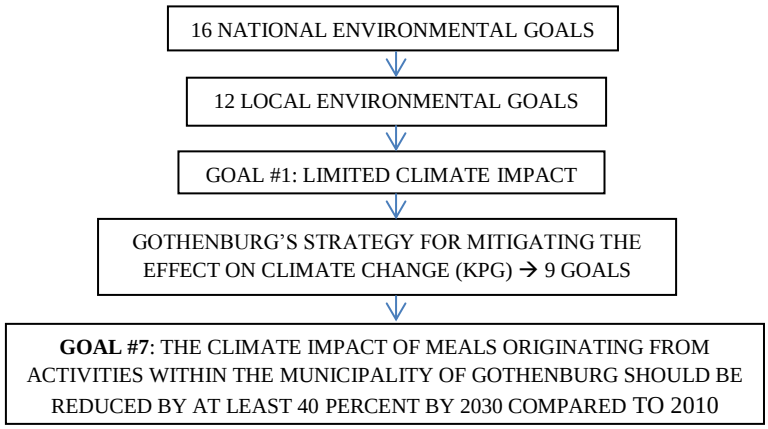
2 Background

The following section provides an overview of the strategies and goals associated with the climate impact arising from the municipality of Gothenburg. It also describes the current climate impact of the food industry, as well as the potential emission mitigation of reduced meat consumption.

2.1 Structuring the Environmental Goals

Figure 1 depicts a schematic overview of how the environmental work is organized in Gothenburg. In the top are the sixteen national environmental goals that were adopted in 1999. Based on the sixteen national goals, the municipality of Gothenburg adopted twelve local environmental goals in 2006. One of the twelve adopted goals is *Limited Climate Impact*[5]. A target within *Limited Climate Impact* is that Gothenburg should reach a fair and sustainable level of GHG emissions in 2050, which is defined as 1.9 tonnes CO_2e annually per capita. This level is borrowed from the UN's two-degree target, which both the European Union (EU) and Gothenburg have adopted (Bryngelsson et al., 2016). Today, the average annual level of emissions in Gothenburg is 8-10 tonnes per capita (Göteborgs Stad, 2014). In addition, *Gothenburg's Strategy for Mitigating the Effect on Climate Change*[6], was formed within the goal *Limited Climate Impact* in 2014 (Göteborgs Stad, 2014). This mitigation strategy will henceforth be referred to as KPG. KPG contains nine concretized goals out of which one is directly related to the 40 percent target, namely goal number seven: *The climate impact of meals originating from activities within the municipality of Gothenburg should be reduced by at least 40 percent by 2030 compared to 2010.*

Figure 1. Schematic overview of the climate work in Gothenburg



In the top are the 16 national goals, out of which twelve local goals are adopted for Gothenburg. Within one of these goals, Limited Climate Impact, KPG is formed. KPG contains nine goals, out of which one applies to the 40 percent target (Göteborgs Stad, 2014).

[5] Author's translation (Begränsad Klimatpåverkan)
[6] Author's translation (Klimatstrategiskt Program för Göteborg)

KPG founds its arguments and conclusions regarding the 40 percent target on *Klimatomställning Göteborg, Tekniska möjligheter och livsstilsförändringar 2.0* (Bolin & Larsson, 2014). This paper, in turn, bases its estimations regarding GHG emissions related to private food consumption on *Scenarier för klimatpåverkan från matkonsumtionen 2050* (Bryngelsson et al., 2013) and the emissions related to public food consumption on *Greenhouse gas emissions from public consumption in Gothenburg* (Sinclair, 2013). The findings of Sinclair show that almost ten percent of the municipality of Gothenburg's total emissions can be ascribed to public food consumption. Reaching the 40 percent target would thus reduce the total emissions from the public sector in Gothenburg with approximately four percent.

2.2 Gothenburg's Mitigation Strategies and School Food System

The more practical part of KPG is explained in 24 strategies, of which one is to *reduce the climate impact from food served in municipal activities.* For the strategy to work, it should be performed by education, dialog, consciously choosing menus at events and conferences and by gradually replacing GHG intensive foods such as meat and dairy products with plant-based substitutes (Göteborgs Stad, 2014). For example, the efforts put on reducing GHG emissions from meals served within the municipality's own activities has resulted in the *Enviromeal,*[7] where aspects such as ecologically grown products and seasonal adjustment are included. A pamphlet of 24 enviromeal recipes has also been put together to help guide the transition. In addition, the standard procedure regarding municipal procurements has been changed so that all purchased meat must be organic, starting in 2014. However, specific numbers on how much of the meat that should be replaced, or how large the organically grown share should be in order to reach the 40 percent target, are lacking in KPG. Estimations regarding the magnitude of the substitution needed have thus been calculated, and are presented in *Impact of Food*.

The 40 percent target is directed to all meals served within the public sector in the municipality of Gothenburg, which equals 19,000,000 meals per year (Göteborgs Stad, 2016). According to E. Hallberg (planner at the Educational Department in Gothenburg, email-conversation 2016-05-09[8]) there are a total of 21,401 upper secondary students in Gothenburg, of which 11,106 are registered in public schools and 10,295 registered in the private school sector. Each school year consists of a minimum of 178 days (SFS, 2010:2039), and in assumption of all students taking advantage of the free lunch every day of the school year, the number of meals served in public upper secondary schools is 1,976,868 annually. This equals approximately 10

[7] Author's translation (Miljömåltiden)
[8] Available on request

percent of the total meals served in the public sector. In total, 3,809,378 meals are served annually at all upper secondary schools in Gothenburg. Although upper secondary school, as opposed to compulsory school, are not legally bound to serve free lunch, meals are provided in the majority of Swedish upper secondary schools (Lundmark, 2002), and is also prevailing at all schools participating in this study. However, the 40 percent target is only directed at municipal activities and does not apply to private schools (Göteborgs Stad, 2014). The data of this study would hence ideally be based on public school students alone, something that was ultimately not achieved. However, since 1992, public and private upper secondary schools have received equal amounts of governmental subsidy per student, which enabled students to choose a school without having to consider school related expenditures (Prop. 1991/92:95). In addition, according to Broo & Lagerqvist (2008) the two top preferences when applying for upper secondary school are what program the school offer and the location of the school, both of which will be argued to be controlled for in this study. More than half of the respondents stated these two attributes as the main reason for their choice of school. The distinction between public and private was not even ascribed as a reason, and less than three percent of the students had stated the quality of the lunch as an indicator (Broo & Lagerqvist, 2008). Whether a school is public or private will hence be argued to be irrelevant in relation to selection bias, and the sample of this study is thus argued to be representative for both public and private students in Gothenburg.

2.3 The Impact of Food

It is no secret that the global agricultural system is a major player in climate change (e.g. NVV, 2008; NVV, 2011; FAO, 2012; IPCC, 2014; Åström et al., 2013). There is, however, an ongoing debate regarding what emissions to measure and how to measure them, and one should keep in mind that numbers therefore vary. One issue being discussed concerns emissions arising from land use change, which has a potential to drastically alter the emissions from meat production (e.g. Sinclair, 2013; NVV, 2011). However, since this study aims to value the effects that might emerge when implementing a certain strategy - and not to question the scientific calculations supporting this strategy - the numbers presented in the papers supporting KPG have also been used here. That said, if counted differently, the result from this study would probably vary, especially regarding the numbers of vegetarian days needed in order to reach the 40 percent target.

The municipality of Gothenburg has chosen to use estimations from Bryngelsson et al. (2013) and Sinclair (2013) when deciding on the climate impact from food consumption within the city. Bryngelsson et al. (2013) base their calculations on consumption data. The reason is that

emissions counted from the consumer perspective are argued to take more aspects into account than emissions estimated from the producer perspective. Emissions based on consumption data can hence be argued to give a more accurate depiction of reality. The data that Bryngelsson et al. use originates from the Swedish Board of Agriculture where the trend of Swedish food consumption from 1960 until 2006 is outlined (Eidstedt et al., 2009). The numbers from 2006 are therefore set as the baseline year. Bryngelsson et al. (2013) proceed by presenting nine different scenarios of the annual level of emissions that Swedish food consumption could amount to in 2050. The scenarios range from 0.9 to 1.9 CO_2e per capita depending on which diet choices and technological advancements will be made[9]. Reaching the least emission intensive scenario will demand what many people would regard as quite forceful changes in behavior, shifting diet to a completely plant-based one. However, according to Bryngelsson et al. (2016) diet choices have to be somewhat altered even if the UN's two-degree target is "only" to be attained.

Sinclair (2013) used a report from SIK (Sund & Florén, 2011) when calculating the emissions from public food consumption within Gothenburg. Sund & Florén (2011) present emissions from eight standardized meals served in schools, by which Sinclair (2013) estimates a mean amount of emissions that a vegetarian as well as a non-vegetarian meal causes (0.52 CO_2e and 1.62 CO_2e respectively). The two mean values are the ones used in the present paper when estimating how many school lunches per week that would have to be vegetarian in order to reach the 40 percent target.

As previously mentioned, a weekly vegetarian day was implemented within the Gothenburg's schooling system in 2014 (U. Lundgren, investigator at the Environmental Administration in Gothenburg, e-mail conversation 2016-03-22)[10]. Although this goal was applicable to all public schools, it seems to have been only partially fulfilled[11]. Additionally, since the 40 percent target is to be compared to the emission levels of 2010, the assumption was made that the reduction is to be based on zero vegetarian days, and the consumption baseline was hence set to five non-vegetarian meals per week for each student[12]. Accordingly, using the numbers of Sinclair (2013) gives that each student's lunch consumption equals 8.1 kg CO_2e per

[9] Bryngelsson et al. (2013) have set the current trend as the baseline, i.e. 0.9-1.9 CO_2e per capita is not maximum reduction from today's consumption levels, but absolute emissions assuming meat consumption growth to be as it has been previous years. Since 1990 meat consumption (pork, beef and chicken) has grown 50 percent per capita in Sweden (NVV, 2011).

[10] Available on request

[11] A large proportion of the (public and private) upper secondary schools contacted in this study denied that such a policy had yet been implemented.

[12] This assumption is made since a very small proportion, 6 percent, of the Swedish population is vegetarian and an even smaller share, 4 percent, is vegan (Djurens rätt/Demoskop, 2014) and the effect of vegetarians and vegans is thus argued to be marginal.

week. To reduce the amount of emissions by 40 percent, this number would have to drop to 4.86 kg CO_2e per week. The new level of weekly allowed emissions would equal two non-vegetarian and three vegetarian meals per week. For further elaboration on this, see *Dietary Calculations*. In assumption of the emissions from the standardized non-vegetarian meal and full participation in the free lunch, CO_2e emissions stemming from meals served at public upper secondary schools in Gothenburg equal approximately 3,202 tonnes annually in the baseline scenario. Meeting the 40 percent target would reduce the annual CO_2e emissions by 1,281 tonnes.

The present paper is focused on CO_2e emissions only, whereas other environmental issues originating from the agricultural sector, e.g. eutrophication, water depletion, antibiotic resistance et cetera are left out of the discussion.

3 Theoretical Framework

This section starts by providing an overview of different policy instruments that could possibly affect private food choices in Sweden. Since forced choice is the policy instrument in question of the present study, the following section goes into the theory of forced choice restriction and its possible outcomes.

3.1 Instruments Towards Sustainable Choices

Decision makers and experts are more or less unanimous about the need of reducing meat consumption, however, there are almost no policies implemented in Sweden to target this issue (NVV, 2011). The Swedish Environmental Protection Agency finds that informative instruments are the ones mostly evaluated for Swedish purposes, and that they have contributed to both the national and local goal *Limited Climate Impact* (Hennlock et al., 2015). Surveys supporting these findings show that, for example, labelling on eco-friendly food items can increase the sales by seven percentage points. Hennlock et al. (2015) admit that this is much lower than results retrieved from consumers' self-reported behavior, however, the results are in line with other studies examining actual market behavior.

Even though Hennlock et al. (2015) find that Sweden's main strategy has been to implement informative instruments with the distinct purpose of steering behavior towards more sustainable consumption, there are many other options available. Taxes to make the price reflect the social cost of climate intensive food, such as meat, could be another option (Cash et al., 2005; Vinnari & Tapio, 2012; Wirsenius et al., 2011). There is also a growing interest for the so called nudges, e.g. modifying food environments such as school lunch cafeterias in a way that helps the consumer make "the better choice" without actually restricting the number of choices (Sunstein

& Thaler 2008). However, since isolating the effect of such interventions is difficult and uncertainties still surround the method (Mont et al., 2014), the Swedish Environmental Protection Agency rather see nudges as a complement to more established instruments. Another major umbrella of policy instruments is administrative ones, in which the kind of forced choice that this study aims to investigate is to be found.

3.2 Forced Choice Restriction

Choice restrictions can, as in the words of Botti et al. (2008, p 185), be defined as *"...any internally or externally imposed boundary that limits and/or confines choices"*. A restriction could therefore come in various forms, for example as internal beliefs about oneself and social norms, or as external boundaries such as laws. A ban, where the policy maker restricts the choice set, is an external restriction. To have fully vegetarian days, as proposed in KPG, would be a clear example of a direct and external choice restriction. This kind of paternalistic choice approach is thus at the focus of this study.

A direct and external food restriction could be very effective since it restricts the choice set for everyone regardless of their budget constraint. On the other hand, upper secondary school students in Sweden are allowed to leave the school ground during lunch break and thus are free to buy lunch outside of school. Hence, to impose a restriction on the school lunch would not restrict the entire food environment. To know if an external lunch choice restriction is to be successful, it is crucial to gain knowledge about the students' expected compliance.

Following the reasoning of Botti et al. (2008), individuals may react to forced choice restriction on a continuum from compliance to rebellion. Along this scale, the reactions might create different spillover effects, both positive and negative. Spillover effects are said to occur when the adoption of a certain behavior changes the motivation for the individual to increase or decrease other related behaviors (Thøgersen & Crompton, 2009).

Cho & Salmon (2007) present eleven major dimensions of unintended effects of forced choices, one of them being non-compliance. If a vegetarian day was to be received with a lot of non-compliance, it might result in negative spillover effects. For example, assume that a student disregards the forced vegetarian choice in school. Now what could that lead to? To begin with, the student would not eat the lunch served. If the student did not eat anything at all, the policy could still be said to be successful, given that reduced meat consumption and GHG emissions is the only objective. However, it is not likely that the student would not eat anything the entire day. One could bring food from home, buy something elsewhere or eat compensatory amounts for dinner. If the substituted food is not vegetarian it is reasonable to assume that the GHG mitigation

is less than it would have been if the student had eaten the vegetarian school lunch[13]. Supported by Byrne & Hart (2009), a restriction can lead to psychological reactance, meaning that people start to value the restricted behavior even more than they did prior to the change. The restriction might also, even if in reality it is not, be perceived as a threat to individual freedom. In order to maintain the same level of freedom a reverse behavior can be ignited, resulting in negative spillover effects. Meaning in this case: eating more meat. A policy restricting school lunch choices would thus increase GHG emissions instead of reducing them.

On the other hand, positive spillover effects may also occur. In the case of vegetarian days in school, the share of vegetarian meals could increase not only when the choice set is restricted but also when it is not, i.e. during the unrestricted school lunches, at home or in other food consuming situations. It could also manifest itself through indirect effects, for example if the person shifts to a less GHG intensive behavior also in other situations, such as taking the bus instead of the car. Following Thøgersen & Crompton's (2009) discussion on the topic, positive spillover effects can be due to the mere fact that the individual has been forced to broaden her horizon regarding food preferences: leaving meat and fish out of the plate might in itself, for example, foster thinking about one's climate impact. Theories that explain this are, amongst others, the *self-perception theory* and *cognitive dissonance*.

According to the self-perception theory, behavior might change for two reasons (Thögersen & Crompton, 2009). First, to be forced to, for example, eat vegetarian food might lead the individual to internalize the behavior and thus change their preferences about vegetarianism (Holland et al., 2002). Secondly, eating vegetarian food could change a person's self-perception (Cornelissen et al., 2008); maybe I actually am a person who cares about the climate, and accordingly I will act on reducing GHG emissions also in other situations?

Cognitive dissonance describes the uncomfortable feeling that might emerge when one behaves differently in varying situations. For example, if one eats vegetarian food in order to reduce emissions, but at the same time chooses to take the car instead of the bus even at times when it could have been avoided. The ambivalence emerging from the two behaviors is eased by changing one of them, a change that could go either way. Cognitive dissonance resulting in more environmentally friendly behavior is thus not to be taken for granted. Additionally, the theory also comes with some restrictions. For instance, Thøgersen & Crompton (2009) stress that it is important that the different behaviors are self-chosen for cognitive dissonance to emerge and that it is crucial whether the behaviors are salient with one's own beliefs. An external restriction might

[13] Since 90 percent of the Swedish population defines themselves as meat eaters (Djurens rätt/Demoskop, 2014), the assumption is made that meals containing meat is the ones most frequently consumed.

not fulfill either of these requirements. Furthermore, Cho & Salmon (2007) explain that cognitive dissonance might even emerge amongst those most motivated to act, since they are the ones realizing how much that can be done, but at the same time experiencing large obstacles to get there. This reasoning is in line with the findings of Ajzen (1991), who states that motivation is not the only determinant of behavior. In order to predict performance of behavior, Ajzen explains, motivation has to be matched with a corresponding grade of perceived control.

To date, the majority of the studies investigating the effectiveness of school based interventions to promote healthy meals to children and adolescents are conducted in the US, and only a few of them concern adolescents in Europe (Van Cauwenberghe et al., 2010). Empirical findings on forced restrictions in school environment is hence even smaller and has, in addition, mostly targeted sugar-sweetened beverages (SSB) and snacks (Lombardini & Lankoski 2013). Whether a policy restricting such food choices renders its intended or unintended effects is, according to Schwartz et al. (2009), more of a theoretical discussion, taking the lack of empirical research into account. Theoretically, Schwartz et al. (2009) explain, the outcome depends on how the individual is being influenced, internally or externally. The external approach means that one is choosing out of availability, and restricting the choices should thus lead to reduced consumption of the restricted alternative. The internal position states that one's choices rather are driven by desire, and if, for example, SSB are restricted the students will go elsewhere to buy it, possibly resulting in compensatory behavior and no goal fulfillment. However, empirical findings supporting the latter are partially based on the behavior of restrictive mothers and their daughters (Schwartz et al., 2009). Taking into account the disparities existing between the school lunch environment and the one just described, one should be careful when extrapolating these results.

Having both the elaboration on possible cognitive reactions, as well as the external and internal stand in mind, it comes as no surprise that the empirical findings in the area are somewhat contradictory. For instance, Cullen et al. (2008) find significant reductions in consumed amount of chips, SSB and snacks when investigating the effects of the Texas public school nutrition policy. Cullen et al. (2008) used a difference-in-difference methodology, and no compensatory effects were to be seen. Furthermore, their results show that the outcome depends on to what extent the food environment can be restricted. Similar in both methodology and sample age is a study of Schwartz et al. (2009) who also find a decline in SSB and snack consumption when restricting the choice set, but in Connecticut middle schools. Additionally, Johnsson et al. (2009) find significant effects for a reduction on the consumption of SSB under an external choice restriction when analyzing the effects of different policies between 64 middle schools in 28 districts in the US. It must be said, however, that the nationwide lunch food

program in the US to a large extent differs from the Swedish. For example, it is quite common to have access to both the free lunch, an a la carte menu and vending machines in school in the US (Johnsson et al., 2009), when in Sweden it is most common to only have the free lunch, sometimes complemented with a café. To restrict the entire school food environment is hence more easily done in Sweden, and as proven by Cullen et al. (2008), this factor is of great importance for the outcome of a forced choice restriction.

While Cullen et al. (2008), Schwartz et al. (2009) and Johnsson et al. (2009) find significant reductions in unhealthy foods under a choice restriction, even when taking compensatory behavior into account, Whatley Blum et al. (2008) report the opposite. Their findings show that the restriction, although lowering the consumption in school, generates compensatory behavior that evens out the effect. In the end, no significant change in overall consumption was found. However, these studies target different age groups. Both Cullen et al. (2008), Schwartz et al. (2009) and Johnsson et al. (2009) target middle school pupils, while Whatley Blum et al. (2008) investigate the behavioral effects of upper secondary school students. Although Taber et al. (2012) find that compensatory behavior equals out the effect from the choice restriction in the restricted area also for middle school pupils, the notion that age might matter is worth recognizing. Amongst other determinants, Fernandes (2008) finds significant disparities between age groups. He attributes these findings to the variation in freedom and supervision between the different school levels. In younger years, pupils might not even be allowed to leave the school ground which is why a restriction in the school environment can be very effective. Upper secondary school students on the other hand are free to go as they wish, opening up the possibility to substitute the vegetarian lunch if dismissed.

The single leading article on vegetarian food restriction was conducted by Lombardini & Lankoski (2013) who investigated the effects of the Helsinki School District weekly vegetarian day. Although restricting different kinds of food, the results are coherent with the ones regarding SSB and snacks. For example, the external stand stating that people choose out of availability is supported since the findings of Lombardini & Lankoski (2013) show higher compliance with younger ages. They also found that, for example, even though non-compliance was high shortly after the implementation of the Helsinki vegetarian day, it seemed to diminish over time. This might indicate that the psychological reactions fostering negative spillover effects are prevalent in the beginning, but that over time they change. However, neither the studies regarding SSB and snacks, nor the one regarding the Helsinki vegetarian day was able to analyze long term effects of the restrictions.

Concerning vegetarian food preferences in general, distaste seems to be one of the most prevalent reasons for avoidance. Koivisto & Sjödén (1996) find that among Swedish adolescents in the age 12 to 20, distaste accounted for 48-81 percent of the reasons for not liking a specific food item. The second largest explanation was texture. Additionally, their findings show that parental influences, habits and exposure to certain foods also were important factors. These findings go in line with the ones of Krölner et al. (2011), even though their studies were mostly conducted in the US.

Conclusively, certain findings are likely to emerge in the present study. Since the study of Lombardini & Lankoski (2013), to date, is the only one that has investigated the effects of a forced vegetarian day in school, findings somewhat in line with theirs are argued to be plausible. However, the age disparity may, as discussed, have a large impact, why the outcomes might deviate towards non-compliance. Considering the small share of the Swedish population being vegetarian (Djurens rätt/Demoskop, 2014), it is not seen as plausible that the findings of this study will reveal that the students wishes are coherent with the changes necessary to reach the 40 percent target. This expectation can also be founded in the emotional arousal that forced restrictions in general, and vegetarian ones in particular, often evokes (Wetterborg, 2014, 29 January; Dalén, 2012, 14 August). As for the second research question, it is argued that a positive correlation between exposure to vegetarianism in one's private life and positive attitudes to the proposed policy is likely to be found, based on the findings of Koivisto & Sjödén (1996). The effects of being exposed to a vegetarian oriented policy are, however, harder to predict, taking the contradictory findings discussed into account.

4 Methodology

This section provides information about how the sample was chosen and which aspects that have been considered when conducting the survey. It also gives an overview of descriptive statistics of the sample and the prevalence of certain main variables.

4.1 The Sample

Policies altering school lunch menus to be less climate intensive was, for the most part, not yet in place at the time of this study. Hence, a hypothetical approach with the method of stated preferences (SP) was chosen (Bateman et al., 2002, pp 20-22). According to Bateman et al. (2002, p 89) *"the target population consists of those who receive the benefits or the costs of the non-market effect in question"* Since the present study is focused on compliance and change of attitude from exposure to vegetarianism, the population of interest comes down to all students in

Gothenburg affected by a policy concerning vegetarian school lunches. More specifically, this study was narrowed down to focus on upper secondary school students. One could argue that the pupils of compulsory school would be the sub-population most affected by such a policy, and thus the ones to be observed, given the higher levels of supervision and thus lower possibilities to leave school during lunch break. However, this subpopulation comes with other difficulties. Firstly, the pupils in the younger classes most often lack a specific budget constraint (Nordea, 2016; Statistiska Centralbyrån, 2005). They are still, in general, dependent on their parents and their respective income. It is therefore not plausible to think that they have a good perception of the cost of a lunch out, which is why such self-reported estimates would not be very valid. This also creates problems since it is of great importance to make the respondent keep their respective budget restriction in mind when eliciting willingness to pay (WTP) answers (Bateman et al., 2002, p 143). Even though this study's aim is not to estimate the WTP for an unchanged menu, the structure of the corresponding question was posed in a similar way. Secondly, it is no secret that the methods of both SP and WTP are highly debated (Hausman, 2012; Kling et al., 2012). It can thus be argued that both of these concepts are hard to grasp even for adults, and that the cognitive ability of compulsory school pupils would not be enough. At least not in the context of relating their food consumption to climate change and expected change of behavior, which is the motive of this study.

As a Swedish citizen, your guardian is entitled to a bursary of 1050 SEK per month from the year you turn 16 (CSN, 2016), and it is mostly the case that this is directly passed on to the student (Statistiska Centralbyrån, 2005). In addition to the bursary, it is also much more plausible that upper secondary school students have an income from working. Older students are also eating lunch out more frequently, and thus have an easier time relating to a possible change in behavior if a policy concerning vegetarian lunches was to be implemented. In total, it can be argued that older students have a larger capability of understanding the notion of the survey in this study, and upper secondary school students are thus considered to be the better choice of subpopulation.

A file of all public and private upper secondary schools in Gothenburg was compiled, a total of 46 schools. An email was then sent to each principal of the schools in question, asking to be allowed to hand out the survey to the students of the respective school, two classes of each year[14]. A week after the email was sent, the principals who had not replied were contacted via

[14] Since the majority of the respondents at the time were under the age of 18, it was considered appropriate to have the principals (and not solely the teachers) of each school to agree to the involvement in the study. This was done

telephone. Altogether, 15 schools did never respond, which implies a non-response rate of approximately 30 percent. A total number of twelve schools agreed to participate in the study, out of which one was chosen as the pilot study group, resulting in a participation rate at approximately 26 percent. The students of the pilot study school were handed the survey a week prior to the students of the other schools. Based on both their answers and comments, adjustments with the aim of reducing misunderstandings were made for the final version. Out of the eleven schools constituting the sample, there were two public and nine private ones. Two schools had already implemented a policy regarding one vegetarian day per week. The data was collected during a two week period in April 2016.

4.2 The Survey

To avoid low response rates from the students, the procedure of an intercept survey was chosen (Bateman et al., 2002, pp 101-107). Hence, the students were asked to respond in school during class, and not via email or telephone. The design of the survey is also in line with the design of a *Contingent Valuation* study (CV) (Bateman et al., 2002, pp 112-157). The reasons for this were that both the change being valued and the elicitation models best fitted resembled the ones found in CV studies. That is, even though the survey did not contain a monetary valuation, the same procedures in formulating and receiving true answers as when designing a CV study were used.

The survey began with a few neutral questions regarding age, gender and residential area. The students were then reminded of their budget constraint in relation to the monthly bursary previously mentioned. This was put as a combination of a closed- and open ended double bounded question (Bateman et al., 2002, pp 112-157). More precisely they were asked if they received the exact amount of 1050 SEK per month, and if they replied either *more* or *less* they were asked to specify their total income. The survey then continued with three different sections.

In section one the students got to answer a mixture of dichotomous choice (yes/no) and scale questions. These kinds of structured questions generally facilitate the answering process for the respondents (Bateman et al., 2002, pp 112-157), and considering the fairly low age of the subpopulation of interest combined with the rather stressful environment in school, easing the cognitive effort asked for was considered appropriate. Bateman et al. (2002, pp 112-157) further state that scale questions are commonly used when it comes to estimating attitudes, which constituted a significant part of the survey. Amongst others, questions were asked about how

even though the survey was completely anonymous and there was no way to trace a specific student to a specific survey.

often the students pay for lunch outside of school instead of eating the free lunch meals, as well as how much they on average spend in those situations. Although all questions in a survey should generally be of importance for the analysis, certain questions can be included with the intention of disguising the real purpose of the study (Bateman et al., 2002, pp 112-157). Since the subject, vegetarian food, generally comes with a lot of preconceptions, a few of these disguising questions were included.

According to Bateman et al. (2002, pp 112-157), one of the main distinguishing features of a CV study is to thoroughly describe the policy change and its implications before the respondents are asked to evaluate it. Accordingly, this introduces the third section of the survey. However, other sample specific aspects were also considered important to be taken into account. In consideration of the age of the respondents ranging from 16 to 19, the decision was made to make the description short and easy to read[15]. Words with academic weight were thus substituted for easier words, and explanations of, for example, the IPCC[16] and the significance of their results were left out. It would usually have been of great importance to include such information in order to create validity and the belief among the respondents that the policy is plausible to be implemented. The notion of the municipality of Gothenburg as executor of the policy is, however, argued to fulfill this purpose. Accordingly, the scenario was constituted of a short description of the impact that food and meat production has on climate change, and a short paragraph on the municipality of Gothenburg's 40 percent target. Thus, following Bateman et al. (2002, pp 112-157) this is not standard procedure for a CV study, but the risk of receiving a large number of dropouts was otherwise regarded too present. Further, the notion from Mitchell and Carson (1989, p 120) gives a good indication of how to prioritize when designing a CV study: *"The principle challenge facing the designer of a CV study is to make the scenario sufficiently understandable, plausible and meaningful to respondents."*

Since upper secondary school students are (almost) always served free lunch, the school lunch might be argued to resemble a true common good seen from the students' perspective. When investigating changes to such goods in CV studies, monetary valuation is the prevailing measure (Bateman et al., 2002, p 14). However, the policy would not alter the accessibility, amount or nutritional content of the good, only its composition. In addition, considering the quote

[15] This decision was formed from discussions with mainly Åsa Löfgren, associate professor at the School of business, economics and law, the university of Gothenburg, and Jonas Franzén, youth leader with many years' experience from work with youths and their motivations.

[16] IPCC is the United Nations Intergovernmental Panel on Climate Change and is said to be objective and to represent the majority of the world's environmental researchers. The findings of IPCC support the UN's two-degree target.

from Mitchell & Carson above, a standard monetary valuation (WTP) of the policy change was not considered appropriate in this specific situation. The procedure surrounding the design of a CV study in general, and WTP-questions in particular, were however still regarded as well suited for the specific group of respondents. Thus, instead of stating a WTP for not changing the menus, the students were asked if they would comply with the proposed policy, as well as how many school lunches per week they would at most be willing to substitute with vegetarian ones. Since prior questions were asked about if they had, to date, tried the vegetarian meal as well as how often they on average buy lunch outside of school, the students had been reminded of their current behavior. This goes in line with the procedure of reminding WTP respondents of their budget constraint, in order to not overstate the WTP (Bateman et al., 2002, p 143). The questions on compliance and MAAVD are also to a greater degree based on everyday actions, and are thus argued to be simpler to answer. In total, to state a forthcoming behavior is, in this case, argued to give a truer valuation than to state a WTP.

The question on compliance was posed as a double bounded closed ended discrete choice question (Bateman et al., 2002, pp 112-157). As previously mentioned, to reach the 40 percent target solely through changed diets, three out of the five lunches per week would have to be vegetarian. However, to avoid getting responses biased with the bid of three vegetarian days, the students were randomly presented with two, three or four vegetarian days per week as the new policy proposal. The respondents were then asked if they would comply with the new policy or not. If no, the students got to answer an extra question on how many of the proposed number of vegetarian days that they would rather pay for lunch outside school. This question was posed in order to get a measure on possible negative spillover effects from the policy. The whole sample was then asked for the maximum amount of weekly vegetarian school lunches (0-5) they would accept (MAAVD).

In the fourth and last section followed a few general socioeconomic inquiries. The students were asked questions such as if their parents had an academic background and where they would place themselves on a political left-right scale. The reason for waiting with these kinds of questions until the very end of the survey is supported by Bateman et al. (2002, pp 148-151), where they argue that placing such sensitive questions early on can initiate mistrust and thus decrease participation.

The data obtained from this kind of sampling is known as cross-section data. This implies that each individual is observed only once, and that all observations are collected within the same time period. Following is that the variation within the subpopulation only goes across individuals, i.e. spatial variation, and not over time (Black et al., 2012).

4.3 Descriptive Statistics and Presentation of Main Variables

This section provides general descriptive statistics and estimates of the prevalence of certain characteristics within the sample. The total number of respondents amounted to 981 students. Since the aim of this study was to analyze the sub-population that would be subject to a behavioral change in relation to the policy, all vegetarians (72) and vegans (16) were excluded from the sample. The exclusion made the number of observations drop to 893.

4.3.1 Socioeconomic Aspects

Table 1 presents certain socioeconomic aspects of the sample. The aspects are dummy variables, except for age and income which were posed as ordinal scale question.

Table 1. Descriptive statistic: Socioeconomic aspects
Descriptive statistics of the control variables age, gender, income, parents university education, housing and political orientation.

	Mean	Standard Deviation	Min	Max	Observations
Age	17.21	.91	16	19	851
Female	.43	.49	0	1	819
Monthly income (SEK)*	1,668.29	1,299.58	0	15,000	802
Parents university education	.79	.41	0	1	769
Living with parents	.98	.15	0	1	878
Right-wing political orientation	.55	.49	0	1	771

*The median equals 1050 SEK (339 observations).

The mean age of the respondents was 17.21 years and 43 percent were females. The average monthly income was estimated at 1,668.29 SEK per student, however, the median (with 339 observations) of the monthly income equaled the exact amount of the monthly bursary previously mentioned, i.e. 1050 SEK. As much as 79 percent replied that their parents had a university education (defined as three years or more), and almost the whole sample, 98 percent, reported living with their parents. Around half, 55 percent, of the students stated a right-wing censored political orientation.

4.3.2 Main Independent Variables and General Attitudes

Table 2 provides an overview of general attitudes towards the environment and vegetarianism as well as behavior in relation to school lunches. The two main independent variables of interest concerns being exposed to vegetarianism either in one's private life or in school.

Table 2. Descriptive statistic: General attitudes

Descriptive statistics of certain attitudes in the sample: the share of respondent being environmentally aware, the share of respondents holding a negative attitude towards vegetarian food, the share of respondents exposed to vegetarian food in their private life, the share of respondents having a vegetarian day in school, mean vegetarian dinners per week, mean lunches bought outside school and average money spent.

	Mean	Standard Deviation	Min	Max	Observations
Exposure to vegetarianism in private life	.83	.37	0	1	892
One vegetarian day per week in school	.17	.38	0	1	893
Environmental awareness	.83	.37	0	1	891
Negative attitude towards vegetarian food	.70	.46	0	1	892
Number of vegetarian dinners per week	1.36	1.28	0	5	886
Lunches bought outside of school per week	1.17	1.24	0	5	886
Money spent per lunch (SEK)	72.60	26.76	0	300	742

Whether privately exposed or not is here defined as at least fulfilling one of the following: if the student has a close friend who is a vegetarian (dummy variable), a parent who is a vegetarian (dummy variable) or reported eating a vegetarian dinner at least once a week (discrete values between 0-≥5). As much as 83 percent of the sample turned out to be privately exposed to vegetarian food. For the second main independent variable, 17 percent of the respondents reported going to a school that had already implemented a vegetarian day per week.

The share of the respondents that were considered environmentally aware was estimated as 83 percent of the sample. This characteristic was bundled together by three other variables: is the student worried about future climate change; does the student think of the environment as an important issue and; is the student a member of any environmentally focused organization. The first two were scale questions (1=disagree, 6=agree), where the three lowest values were regarded as the student not being substantially environmentally aware, and vice versa for the three highest values. Whether the student was a member of any environmental organization was a dummy variable to begin with. If the student replied yes to at least one of the three, they were defined as environmentally aware.

The variable regarding a negative attitude towards vegetarian food was constructed in a similar way as the previous one. Three scale questions (1=disagree, 6=agree) were redesigned into dummy variables (4-6=negative attitude). The three questions regarded vegetarian food being gross, not getting full from a vegetarian meal and vegetarian food being more expensive

than non-vegetarian food. About 70 percent of the sample was considered having a negative attitude towards vegetarian food (keep in mind that vegetarians and vegans were excluded).

On average, the students reported eating 1.36 vegetarian dinners per week. They also on average replied buying lunch outside of school 1.17 days per week, and spending on average 72.60 SEK on such a meal.

4.3.3 Dependent Variables of Interest

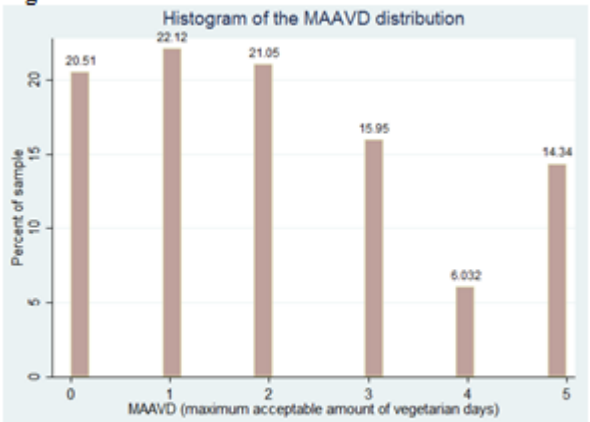
The two dependent variables concerns whether the students would comply with the proposed policy and what their maximum acceptable amount of vegetarian days per week (MAAVD) equals. Compliance was set up as a dummy variable, and the MAAVD as a scale question with six discrete values (0-5). Table 3 provides descriptive statistics of these two variables.

Table 3. Descriptive statistic: Dependent variables
Mean-, min- and max values as well as standard deviation and number of observations for Compliance and MAAVD are presented.

	Mean	Standard Deviation	Min	Max	Observations
Compliance	.53	.50	0	1	868
MAAVD	2.08	1.65	0	5	746

Out of the 868 respondents to the first question, 53 percent stated that they would comply with the proposed policy, and 47 percent thus replied that they would not. The average MAAVD of the respondents equaled 2.08 days, with a standard deviation of 1.65 days and 746 respondents. Since Compliance is a dummy variable, the distribution simply reflects the mean value previously mentioned, with 53 percent at *yes* and 47 percent at *no*. Figure 2 illustrates the distribution of the variable MAAVD.

Figure 2. Distribution of MAAVD



Histogram of the distribution of the variable MAAVD, which illustrates how large shares of the sample that would accept different levels of vegetarian school lunches per week.

The distribution of the MAAVD can take six different values, where 20.51 percent of the sample stated no willingness to reduce the current share of meat, i.e. zero vegetarian days. The remaining values were distributed as follows; 22.12 percent at one day, 21.05 percent at two days, 15.95 percent at three days, 6.03 percent at four days and 14.34 percent at five days.

4.4 Hypotheses

To statistically frame the two research questions of this paper, a hypothesis was formulated for each of them. When retrieving and analyzing the results in the coming parts, the aim is accordingly to test these hypotheses. To answer the first research question, i.e. if upper secondary school students in Gothenburg would accept a vegetarian policy tackling the 40 percent target, a t-test was conducted to test the hypothesis below.

$$H_0: MAAVD = 3$$
$$H_a: MAAVD \neq 3$$

For the second research question, a probit regression was used when analyzing the answers to the question *would you comply with the [hypothetical] policy or not?* The dependent variable is, as discussed, binary. An OLS regression was then used when analyzing the answers to *what is your maximum acceptable amount of vegetarian days per week in school?* The dependent variable MAAVD can, as also discussed, take six different discrete values, ranging from 0 to 5. Both the probit and the OLS regressions answer to the hypothesis below, where *exposure* denotes both public and private exposure to vegetarianism.

$$H_o: \beta_{exposure} > 0$$
$$H_a: \beta_{exposure} \leq 0$$

5 Result

This section provides the findings of the study, presented separately for each research question. Only the variables of interest for the research questions are shown. Worth mentioning is that in both of the regressions, a substantial drop in the number of observations can be noticed. This is argued to depend mainly on the inclusion the variable concerning the students' political orientation, which a rather large share of the respondents chose not to answer. However, excluding this variable does not alter the sign nor the significance level of the estimates. To not forfeit any explanatory power, this variable was thus included. For a more extensive presentation of included control variables and how they change with regards to robust and clustered standard errors, see *Appendix, Probit regressions* and *OLS regressions*.

5.1 Is the 40 Percent Target Coherent with the Students' Wishes?

As mentioned above, the mean of MAAVD was estimated at 2.08 meals per week, with a standard deviation of 1.65 days. To test the hypothesis regarding this research question, i.e. H_0:mean=3, a t-test was conducted at the 95 percent significance level. Following the definition of the Central Limit Theoreme (Cortinas & Black, 2012, p 247), a t-test was applicable to the data set since n>30 (746 observations). Using the numbers presented above, the observed t-value for the mean of MAAVD was calculated as -15.22. As can be seen in Table 4, if the null hypothesis were true, the probability of observing a mean value not equal to three is 0.00. The null hypothesis is thus rejected, which indicates that the mean of MAAVD is significantly different from three. Furthermore, if the null hypothesis were true, the probability of observing a t-value greater than the observed value is 1.00.

Table 4. t-tests
Outcome of the t-test, one-sided and two-sided

H_0: mean =3	H_a: mean <3	H_a: mean ≠3	H_a: >3
	P(|T|<|t|) = 0.00	P(|T|=|t|)=0.00	P(|T|>|t|)=1.00

Conclusively, the mean of MAAVD can be argued to be significantly different from three or more. Accordingly, the wishes of the students can be interpreted as not meeting the changes necessary to meet the 40 percent target.

5.2 Does Public and/or Private Exposure to Vegetarianism Alter Attitudes Towards the Proposed Policy?

Table 5 illustrates the magnitude of the effects from the main variables *Policy exposure* and *Private exposure* regarding whether or not the students would choose to comply with the proposed policy. The effects from the randomly assigned bid that were proposed to the students are also presented. For the effects of remaining control variables such as age, income and gender, see *Appendix, Probit Regressions*. Remember that Compliance is a binary variable which takes the value one if the student would comply with the policy, and zero otherwise.

Table 5. Marginal effects of probit regression
The outcomes of the variables Policy exposure, Private exposure, Bid 3 and Bid 4 predicting Compliance.

Compliance	Estimates	Robust standard error	95 % confidence interval
Policy exposure	-.14***	.02	-.18 -.11
Private exposure	.25***	.06	.13 .37
Bid 3	-.09*	.05	-.19 .01
Bid 4	-.18***	.03	-.25 -.11
Observations	554		
Pseudo R-squared	.36		
Robust	Y		
Clustered (school)	Y		

Controlled for: age, female, environmental awareness, negative attitude towards vegetarianism, parents university education, right-wing political orientation, monthly income, school, program (see Table II in Appendix for full output, reg (5)).

*** p<0.01, ** p<0.05, * p<0.1

As shown in table 5, being exposed to a vegetarian day in school has a significant negative effect on Compliance. If the student goes to a school that has a vegetarian policy, the likelihood of complying with the proposed new policy decreases by on average 14 percentage points compared to going to a school without a policy, which is significant at the 1 percent level. Private exposure, however, has a significant positive effect. If you eat at least one vegetarian dinner per week and/or have a parent or friend who is a vegetarian, you are 25 percentage points more likely to state that you would comply with the policy, also significant at the 1 percent level. The higher the bid the students were presented to, the less likely they were to comply. Both the bid of three vegetarian days and four vegetarian days per week has a significantly negative effect compared to the baseline of two vegetarian days per week, 9 and 18 percentage points respectively. Bid 3 is significant at the 10 percent level and Bid 4 at the 1 percent level.

Table 6 shows the output for the OLS regression were MAAVD is the dependent variable, and *Policy exposure* and *Private exposure* are the main independent variables. Again, for the effects of other control variables such as age, gender and income, see *Appendix*, *OLS Regressions*.

Table 6. OLS regression
The outcomes of the two main independent variables, Policy exposure and Private exposure, predicting MAAVD.

MAAVD	Estimates	Robust standard error	95 % confidence interval
Policy exposure	-.35***	.11	-.56 -.06
Private exposure	.71***	.10	.51 .95
Observations	483		
Adjusted R-squared	.39		
Robust	Y		
Clustered (school)	Y		

Controlled for: bids, age, female, environmental awareness, negative attitude towards vegetarianism, parents university education, right-wing political orientation, monthly income, school, program (see Table III in Appendix for full output, reg (5)).

*** p<0.01, ** p<0.05, * p<0.1

As can be seen in the output, *Policy exposure* and *Private exposure* are both statistically significant at the 1 percent level. If exposed to a vegetarian policy, the students on average stated a MAAVD 0.35 days less than if they were not exposed, ceteris paribus. Private exposure on the other hand, i.e. if the respondent eats at least one vegetarian dinner a week or has at least one parent or friend who is a vegetarian, has a larger magnitude and is positive. If privately exposed to vegetarian food, the students on average stated a MAAVD 0.73 days higher than if they were not privately exposed, ceteris paribus.

6 Sensitivity Analysis

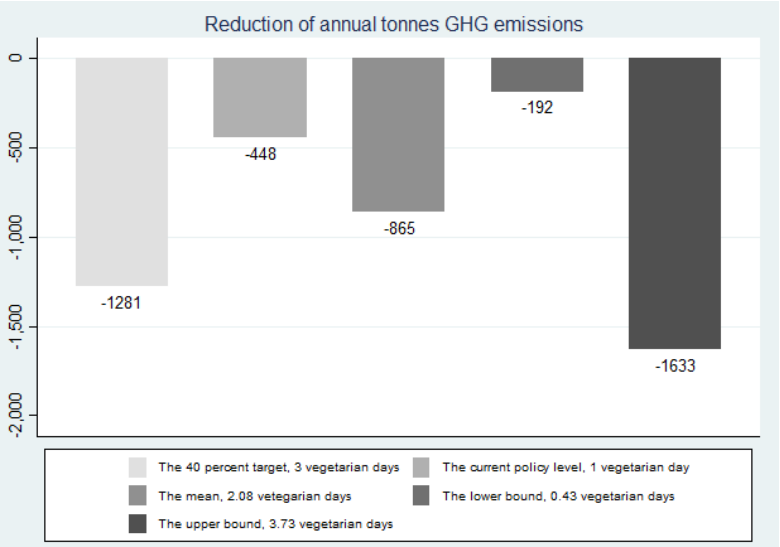
In the following section, uncertainties surrounding the estimate of MAAVD have been investigated. In order to address how the 40 percent target is affected when adjusting this estimate, a sensitivity analysis has been conducted.

The results show a mean value of 2.08 for the students' maximum acceptable amount of vegetarian days per week, an amount beyond the demands of the current policy level, i.e. one vegetarian day per week. However, the standard deviation is relatively large (1.65) meaning that 68 percent of the sample has stated .43<MAAVD<3.73. When applying the lower bound, not even the current policy demand is met. This indicates that the question contains vast disparities, with many students both willing and not willing to comply with a vegetarian oriented policy. There would thus be both winners and losers if two vegetarian days were implemented. The utility of those who stated a MAAVD less than two would be affected negatively, and vice versa for the "overstaters" (Kolstad, 2000, pp 33-41). This study has not been able to disentangle the

different subgroups and their respective motivations and reactions, but in order to successfully implement the policy, such questions must be addressed. The mean value is only an indication to what possibly could be reached, if compensation was undertaken. For instance, the lunch menu could be designed to on an aggregated level equal two vegetarian days a week, but simultaneously be differentiated according to the various acceptance levels among the students. If compensation is not feasible, the diet change could be said to merely fulfill the Kaldor Hicks Compensation Criteria, which states that a hypothetical possibility for compensation is enough for the change to be socially desirable (Kolstad, 2000, pp 37-38). If, however, compensation was accomplished, a pareto improvement would occur. Although this solution could solve the 40 percent target, issues regarding the fairness of the allocation of responsibility might arise. However, even though this issue is fairly complex, a common conclusion is that the most eligible allocation is to prescribe a larger share of the responsibility to the ones most capable to accept it, both physically and mentally. The complexity of this issue is worth recognition, however, it is not at the focus of this study. For further discussion on the topic see e.g. Caney (2005) and Moellendorf (2015).

To further illustrate how the baseline of emissions (3,202 tonnes CO2e annually, see *Impact of Food*) is affected when altering the level of policy enforcement, five different scenarios were calculated: reaching the 40 percent target, the current policy level of one vegetarian day per week, the mean value of MAAVD, the mean value of MAAVD minus one standard deviation and the mean value of MAAVD plus one standard deviation. The results are presented in Figure 4.

Figure 4. Adjusted reduction levels



Using the emissions stemming from five non-vegetarian days per week (the baseline), the graph shows the emission reduction in annual absolute numbers for the 40 percent target, the current policy level (one day per week), the mean value of MAAVD, the mean value of MAAVD minus one standard deviation and the mean value of MAAVD plus one standard deviation.

7 Discussion and Conclusions

The topic regarding forced choices is highly controversial, nevertheless simultaneously stressed as a possible measure towards reducing public GHG emissions. In Sweden, several municipalities all over the country are in the progress of implementing such restrictions (Östersund kommun, 2016; Naturskyddsföreningen, 2016). This paper investigates plausible reactions to a vegetarian policy at upper secondary schools in Gothenburg that, if implemented, would solve the 40 percent target. The findings show that such a policy would probably not render full compliance in the restricted environment, as well as that the effect of being publicly versus privately exposed to vegetarianism differs.

7.1 Discussion of Key Findings

As assumed, the estimated mean of MAAVD was less than three. The wishes of the students are hence not coherent with a vegetarian oriented policy tackling the 40 percent target. The mean value of MAAVD was, however, twice as large as what the current policy demands. This is worth mentioning since the current policy level, i.e. one vegetarian day per week, has not yet been fully implemented. The results clearly indicate that the failure is not due to lack of compliance from the students, and that the change could thus possibly come faster. A possible explanation for the unsuccessful implementation may instead be found with the ones in charge of the actual implementation, or in the inherent inertness in the process of change itself. In light of the vegetarian policy said to be implemented as recently as in 2014, many factors might still be in the process of changing. One example could be the attitudes and knowledge of principals, chefs and others in charge of the process of change at the schools.

In relation to an increase in the number of weekly vegetarian days it is, however, worth mentioning that leakage possibly may increase since the mean value does not cover different effects within the sample. For example, when further analyzed, the data showed that the mean number of days that the students went for lunch outside of school was estimated at 1.17 per week. In addition, the students who replied that they would not accept the proposed policy also stated that they would increase the number of lunches bought outside of school per week if the policy was implemented. This finding suggests that the leakage might increase with a stricter policy.

The results discussed above are all retrieved from stated preferences *as perceived today*. The 40 percent target, however, is set for 2030, and implications may change when taking time into account. Private exposure is found to have a significant positive effect on the attitudes towards a vegetarian policy, while the effect from policy exposure is negative. These results could possibly find its explanation in previous findings, and might be due to distinct disparities

between the two exposure environments, where time is one of them. As the results by, for example, Lombardini & Lankoski (2013) show, non-compliance diminishes over time. Hence, the amount of time you have been exposed does matter. Compared to the time that private exposure may have been in progress, the exposure in the school environment is quite new. One of the two schools in the sample that had a vegetarian oriented policy implemented had only had it for a few months. Exposure from a parent or a friend could, on the other hand, possibly have been in progress for one's entire life. Time also enables hedonic factors, such as texture, habituation and taste preferences to change, and hedonic factors has been shown to be very important when liking or disliking certain food (Koivisto & Sjödén, 1996; Krölner et al, 2011). Hardly surprising, the results show that taste and preconceptions are predictive on stated behavior towards the proposed policy. As described in *Theoretical Framework,* such factors could alter in both negative and positive ways, attributing different results to the outcome of choice restriction, depending on how the restriction is designed.

Another possible cause behind the different effects can be ascribed to the fact that the vegetarian policy in school is, in contradiction to private exposure, a forced choice restriction. As discussed in *Theoretical Framework*, forced choices might render effects opposite to the ones intended (Whatley Blum et al., 2008; Taber et al., 2012). There may be many factors contributing to the negative outcome of the policy exposure to the upper secondary school students. As discussed by Lombardini & Lankoski (2013) and also supported by, e.g., Schwartz et al. (2009) and Cullen et al. (2008), the different level of supervision and potential to restrict the entire lunch choice environment is most likely a contributing factor. All students in the sample of this study are free to go as they wish during lunch break. The possibility to restrict the entire lunch choice environment is thus very low. Another possible interpretation is that the students of upper secondary school are attributed to psychological reactance under forced choice restriction. As described by Byrne & Hart (2009), this could in extension make the restricted product (in this case meat) seem even more valuable than before the change. Thus, the feeling of reduced freedom of choice may potentially be strong with the students of upper secondary school, an interpretation in line with the findings of Whatley Blum et al. (2008). A forced vegetarian choice can be compared to having, for example, a friend who is a vegetarian. In this setting, one's personal freedom of choice is not reduced, but one is still influenced by vegetarian oriented choices and thoughts.

Most possibly, all the above discussed interpretations contribute to the negative results of policy exposure. However, to further disentangle the different effects, further studies must be made.

7.2 Limitations and Suggestions for Further Research

There are many reasons for why inaccuracies in responses, referred to as measurement errors, may occur when doing this kind of study. For one, issues regarding failure in the randomization process can take form as self-selections bias, i.e. that the majority of the respondents already have a particular interest in the chosen topic (Bateman et al., 2002, pp 298-300). Measures have been taken to avoid this issue, though to the cost of a lower total number of respondents than could otherwise have been achieved. In addition to the eleven involved schools, a few more initially agreed to participate in the study, but only with the condition that the survey be handed out in the school lunch cafeteria during lunch break. To minimize the risk of self-selection bias the idea of collecting respondents during lunch break was rejected, and accordingly those schools were as well. Lecture time was instead set aside for the survey and all students who attended class were asked to respond. Self-selection bias might however occur also in this setting, but is argued to be less present.

Another issue in relation to selection bias regards the respondent's relationship with the interviewer. If the respondent would feel sympathy for the interviewer and hence respond in order to please the interviewer, this would create interviewer bias (Bateman et al., 2002, pp 298-300). To avoid this issue, the introduction beforehand was kept as short as possible and all the information needed to respond was printed on the survey. Another issue is that respondents were seated right next to each other, and it must be seen as likely that they were influenced by each other's answers.

The somewhat strict assumption that all students take advantage of the free school lunch every day of the school year is also worth recognition. If an absence adjustment factor had been applied, the baseline of GHG emissions, and hence also the magnitude of the proposed policy, would probably have been lower. Given that the students had still stated the same mean MAAVD, the estimate would have been closer to the changes needed to reach the 40 percent target.

As discussed earlier in the paper, the municipality of Gothenburg can only affect the public schools to change their menus (U. Lundgren, investigator at the Environmental Administration Göteborg, e-mail conversation 2016-03-22[17]), and the sample would thus ideally have consisted of solely public school students. However, since the principal of each school had the option to choose if their school was to participate or not, this was not fulfilled. One reason for why more private schools agreed to participate could simply be assigned to the larger share of

[17] Available on request

private upper secondary schools in the city, namely 32 out of the total 46. Following the findings of Broo & Lagerqvist (2008) regarding the top preferences when applying for upper secondary school, the distinction between public and private schools was, as discussed, regarded as irrelevant for this study. One should nevertheless be aware of this assumption when extrapolating the results of this study to account for all upper secondary school students in Gothenburg.

Moreover, generalizing the results of this study to account for the attitudes toward vegetarian school lunches of students in other regions may be problematic. As for one, Gothenburg is the second largest city in the country with about 550 000 inhabitants, and general attitudes towards environmental issues are known to differ between urban and rural areas (Tuncer et al., 2004; Berenguer et al., 2005). Hence these findings might not hold for students in more rural regions. Secondly, it can be argued that it would not be plausible to let these findings account for students in other countries. Due to Sweden being one of the more progressive countries when it comes to fighting climate change (Hsu et al., 2014; Burck et al., 2014), inhabitants attitudes may to some extent have been influenced.

Gothenburg is also a city struggling with socioeconomic segregation (Andersson et al., 2009). Ideally the schools that participated would have been evenly allocated among the different socioeconomic regions of the city, but since little control was had over picking the specific schools represented in the sample, this was not fully attained.

Two schools in the sample, one public and one private, had already implemented one vegetarian day per week. However, no authority is keeping track of how many schools that have implemented weekly vegetarian days. Because of this, combined with the fact that 30 percent of the schools never replied to the emails and phone calls, no evaluation of the total number of Gothenburg's upper secondary schools with a vegetarian day could be estimated.

Due to national tests[18] being conducted in April and May combined with the spring overall being a heavy survey period[19], there might have been higher affirmative response rates from the principals if the study had been conducted during the fall.

It is also worth mentioning that the present study bases its result on self-reported expected behavior. To verify the results and to test whether the policy could achieve its intended effects, actual behavior must be investigated. For example, further research could use consumption data to investigate the long-term effects since much is still unknown in the area. Further, this study has not accounted for if there is a difference in how the policies are framed and implemented in the

[18] Standardized tests in core subjects such as Math, Swedish and English being conducted in all upper secondary schools in the whole country during roughly the same time period.
[19] The majority of the schools reported a heavy load of surveys being conducted towards the end of each school year.

schools. Moreover, the present paper focuses on exposure as the explanatory variable. However, the results show that gender has almost as big an explanatory power as private exposure. Since gender may be underpinned by many latent variables, this should be further investigated, possibly rendering findings that could help address the change to a more sustainable way of eating.

7.3 Policy Implications

The results from the present study are generally coherent with earlier work within the field of forced restrictions. Some of the findings could possibly help in designing successful restrictive food policies. First of all, it is important to recognize that the reactions - and hence the outcome of the entire policy - probably will vary, both over time and between different subgroups. It is therefore crucial to gain knowledge about specific obstacles and preconceptions before implementation. The findings of the present study stress the importance of recognizing hedonic factors. As shown, attitudes towards vegetarian food can be altered positively when one is privately exposed to vegetarianism. If a policy could be framed with similar characteristics, the effects of policy exposure might change. However, to mimic the settings from private relations into the school lunch environment might be easier said than done. In addition, considering that an average of 70 percent of the sample has a somewhat negative conception of vegetarian food, many obstacles are still to be overcome for a restrictive policy to work as intended. Since it is crucial to internalize an idea in order to act in line with it, one way to make the school lunch restriction seem less forced could be to create a strong dialogue on the reasons and objectives of the policy. Accordingly, this could potentially help change the attitudes towards vegetarian food. Considering that taste is the most important factor when it comes to liking food (Koivisto & Sjödén, 1996), removing preconceptions about the taste of vegetarian food could also be effective. A potential strategy could be to frame menus, in both wording and presentation, to allow the students to experience solely the taste instead of stigmatized expressions, such as *vegetarian* or *vegan.*

One of the main findings of this study shows that the students, on average, are willing to comply with twice as strict a policy as the current policy demands. This indicates that, if thoroughly designed, policy makers could possibly increase their demands, allowing for upper secondary schools to ultimately meet their share of the 40 percent target by 2030 only through a change of diet.

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Appendix: Supporting Material

Probit Regressions - Compliance

Table I. Probit regressions

Table I presents the outcome of a probit regression with Compliance as the dependent variable. First, only the variables of main interest are tested. Second, socioeconomic control variables are added. Finally all the control variables are included as well as compared when controlling for robust standard errors and clustered effects (school). Due to the large drop in observations when including all the control variables the data was further analyzed, and there were many missing observations in the right-wing political orientation variable. Thus, in (6), this variable was excluded to make sure the signs nor significance levels of the other estimates changed drastically, which did not occur. The marginal effects of the estimates of regression number (5) are the ones presented in the paper (Table 5).

Compliance	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Policy exposure	.15(.12)	-.27(.16)*	-.58(.24)**	-.58(.22)***	-.58(.08)***	-.45(.14)***
Private exposure	1.33(.14)**	1.04)***	1.01(.22)***	1.00(.21)***	1.01(.29)***	.79(.15)***
Bid 3	-.22(.11)**	-.40(.15)***	-.37(.16)**	-.37(.16)**	-.37(.22)*	-.12(.25)
Bid 4	-.37(.12)***	-.67(.16)***	-.72(.17)***	-.72(.16)***	-.72(.15)***	.13(.23)
Age						
17		.26(.16)*	.16(.18)	.16(.17)	.16(.22)	.16(.26)
18		.59(.18)***	.46(.21)**	.46(.19)**	.46(.24)*	-.05(.34)
19		.51(.27)*	.41(.29)	.41(.28)	.41(.20)**	.08(.40)
Female		.68(.13)***	.66(.15)***	.66(.14)***	.66(.07)***	.68(.18)***
Environmental awareness		.67(.19)***	.60(.20)***	.60(.20)***	.60(.26)**	.84(.16)***
Negative attitude towards vegetarianism		-.1.00(.14)***	-1.00(.15)***	-1.00(.15)***	-1.00(.09)***	-1.10(.26)***
Parents university education		-.01(.16)	-.06(.16)	-.06(.17)	-.06(.13)	.01(.16)
Right wing political orientation		-.32(.13)*	-.36(.15)**	-.36(.14)**	-.36(.13)***	
Monthly income*		-.08(.05)***	-.09(.05)***	-.09(.06)***	-.09(.05)***	-.06(.02)***
School						
2			-.63(.52)	-.63(.58)	-.63(.10)***	-1.07(.29)***
3			.54(.31)*	.54(.30)*	.54(.06)***	.42(.14)***
4			-.02(.26)	-.02(.24)	-.02(.10)	-.23(.09)**
5			-.83(.50)*	-.83(.36)**	-.83(.18)***	-.87(.12)***
6			1.34(.46)***	1.34(.44)***	1.34(.06)***	1.31(.09)***
7			.09(.26)	.09(.25)	.09(.07)	.11(.07)
8			-.18(.71)	-.18(.66)	-.18(.14)	-.30(.15)**
9			-1.08(.57)*	-1.08(.56)*	-1.08(.12)***	-.80(.12)***
10			-.71(.37)*	-.71(.37)*	-.71(.07)***	-.76(.11)***
11			omitted	omitted	omitted	omitted
Program						
Economy			-.25(.40)	-.25(.43)	-.25(.08)***	-.07(.53)
Arts			1.10(.56)**	1.10(.45)**	1.10(.17)***	.60(.22)***
Industrial technology			-.37(.45)	-.37(.49)	-.37(.08)***	-.33(.16)*
Science			.24(.21)	.24(.19)	.24(.06)***	.03(.12)
Social science			omitted	omitted	omitted	omitted
Technology			omitted	omitted	omitted	omitted
Constant	-.89(.14)***	-.36(.33)	-.17(.45)	-.17(.40)	-.17(.42)	.72(.35)*
Observations	868	554	554	554	554	631
Pseudo R-squared	.10	.29	.36	.36	.36	.32
Robust	Y	Y	N	Y	Y	Y
Clustered (school)	-	-	N	N	Y	Y

*With regards to the very small magnitude of the estimates of the monthly income, they are presented as (SEK*1000).

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table II. Margins of probit regressions

Table II presents the marginal effects from a probit regression with Compliance as the dependent variable. First, only the variables of main interest are tested. Second, socioeconomic control variables are added. In (3), (4) and (5) all the control variables are included as well as compared when controlling for robust standard errors and clustered effects (school). Due to the large drop in observations when including all the control variables the data was further analyzed and there were many missing observations in the right-wing political orientation variable. Thus, in (6), this variable was excluded to make sure the signs nor significance levels of the other estimates changed drastically, which did not occur. The estimates of regression number (5) are the ones presented in the paper (Table 5).

Compliance	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Policy exposure	.05(.04)	-.07(.04)*	-.14(.06)**	-.14(.05)***	-.14(.02)***	-.13(.01)***
Private exposure	.47(.04)***	.29(.05)***	.25(.05)***	.25(.05)***	.25(.06)***	.27(.05)***
Bid 3	-.08(.04)**	-.11(.04)***	-.09(.04)**	-.09(.04)**	-.09(.05)*	-.06(.07)
Bid 4	-.13(.04)***	-.18(.04)***	-.18(.04)***	-.18(.04)***	-.18(.03)***	-.16(.04)***
Age						
17		.07(.04)*	-.04(.05)	.04(.04)	.04(.06)	.02(.04)
18		.16(.05)***	.11(.05)**	.11(.05)**	.11(.06)*	.09(.05)
19		.14(.07)*	.10(.07)	.10(.07)	.10(.05)**	.10(.05)**
Female		.19(.03)***	.16(.04)***	.16(.03)***	.16(.02)***	.17(.02)***
Environmental awareness		.18(.05)***	.15(.05)***	.15(.05)***	.15(.06)**	.12(.07)*
Negative attitude towards vegetarianism		-.28(.03)***	-.25(.03)***	-.25(.03)***	-.25(.02)***	-.27(.02)***
Parents university education		-.00(.04)	-.01(.04)	-.01(.04)	-.01(03)	.00(.03)
Right wing political orientation		-.09(.04)**	-.09(.04)**	-.09(.04)**	-.09(.03)***	
Monthly income*		-.03(.02)***	-.02(.01)***	-.02(.02)***	-.02(.01)***	-.02(.01)***
School			Not	Not	Not	Not
2			estimable	estimable	estimable	estimable
3			.	.	.	.
4			.	.	.	.
5			.	.	.	.
6			.	.	.	.
7			.	.	.	.
8			.	.	.	.
9			.	.	.	.
10			.	.	.	.
11			.	.	.	.
Program						.
Economy			.	.	.	.
Arts			.	.	.	.
Industrial technology			.	.	.	.
Science			.	.	.	.
Social science			.	.	.	.
Technology			.	.	.	.
Observations	868	554	554	554	554	631
Pseudo R-squared	.10	.29	.36	.36	.36	.32
Robust	Y	Y	N	Y	Y	Y
Clustered (school)	-	-	N	N	Y	Y

*With regards to the very small magnitude of the estimates of the monthly income, they are presented as (SEK*1000).

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

OLS Regressions - MAAVD

Table III. OLS regressions

Table III presents the outcome of an OLS regression with MAAVD as the dependent variable. First, only the variables of main interest are tested. Second, socioeconomic control variables are added. Finally all the control variables are included as well as compared when controlling for robust standard errors and clustered effects (school). Due to the large drop in observations when including all the control variables the data was further analyzed and there were many missing observations in the right-wing political orientation variable. Thus, in (6), this variable was excluded to make sure the signs nor significance levels of the other estimates changed drastically, which did not occur. The estimates of regression number (5) are the ones presented in the paper (Table 6).

MAAVD	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Policy exposure	.39(.15)***	-.04(.16)	-.35(.22)	-.35(.22)	-.35(.11)***	-.16(.04)***
Private exposure	1.38(.13)***	.83(.17)***	.71(.18)***	.71(.17)***	.71(.09)***	.82(.07)***
Bid 3	-.12(.14)	-.24(.15)	-.17(.15)	-.17(.14)	-.17(.17)	-.10(.21)
Bid 4	.23(.16)*	.12(.15)	.16(.15)	.15(.15)	.16(.11)	.22(.10)*
Age						
17		.22(.17)	.12(.17)	.12(.15)	.12(.14)	.10(.14)
18		.56(.18)***	.39(.19)*	.39(.19)*	.39(.12)***	.26(.16)*
19		.23(.27)	.16(.26)	.16(.26)	.16(.29)	.10(.29)
Female		.67(.13)***	.66(.14)***	.66(.14)***	.65(.12)***	.75(.14)***
Environmental awareness		.76(.17)***	.66(.17)***	.66(.16)***	.66(.14)***	.60(.16)***
Negative attitude towards vegetarianism		-1.02(.14)***	-.96(.14)***	-.96(.14)***	-.96(.09)***	-1.06(.09)***
Parents university education		.12(.15)	.08(.15)	.08(.15)	.08(.17)	.14(.16)
Right wing political orientation		-.32(.13)**	-.33(.14)*	-.33(.13)**	-.34(.20)	
Monthly income*		-.05(.06)	-.04(.05)	-.04(.07)	-.04(.06)	.00(.04)
School						
2			-.29(.46)	-.30(.55)	-.30(.20)	.05(.13)
3			.54(.29)*	.54(.29)*	.54(.17)***	.57(.19)*
4			-.08(.24)	-.08(.24)	-.08(.16)	.03(.09)
5			-.46(.42)	-.46(.38)	-.46(.16)**	-.07(.17)
6			1.17(.34)***	1.17(.35)***	1.17(.12)***	1.15(.13)***
7			.06(.24)	.06(.24)	.06(.16)	.00(.18)
8			-.04(.60)	-.14(.58)	-.04(25)	.51(.23)*
9			-.60.35)	-.60(.31)*	-.60(.13)***	-.14(.19)
10			-.50(.32)	-.50(.27)*	-.50(.16)**	-.41(.20)*
11			omitted	omitted	omitted	omitted
Program						
Economy			-.30(.38)	-.30(.35)	-.30(.34)	-.53(.31)
Arts			.62(.47)	.62(.48)	.62(.12)***	.38(.09)***
Industrial technology			-.18(.49)	-.18(.52)	-.18(.10)*	-.10(.07)
Science			.19(.19)	.19(.20)	.19(.26)	.20(.25)
Social science			omitted	omitted	omitted	omitted
Technology			omitted	omitted	omitted	omitted
Constant	.84(.16)***	1.18(.31)***	1.41(.39)***	1.41(.38)***	1.41(.34)***	.98(.34)*
Observations	746	746	483	483	483	548
Adjusted R-square	.12	.12	.35	.39	.39	.37
Robust	Y	Y	N	Y	Y	Y
Clustered (school)	-	-	N	N	Y	Y

*With regards to the very small magnitude of the estimates of the monthly income, they are presented as (SEK*1000).

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Descriptive Statistics – All Variables

Table IV. Descriptive statistics of all variables

Table IV shows descriptive statistics of all variables in the survey. The mean, standard deviation, minimum value, maximum value and number of observations are presented.

	Mean	Standard Deviation	Min	Max	Observations
Compliance	.53	.50	0	1	868
MAAVD	2.08	1.65	0	5	746
Bid 2	.35	.48	0	1	893
Bid 3	.34	.47	0	1	893
Bid4	.32	.47	0	1	893
Age	17.21	.91	16	19	851
Female	.43	.49	0	1	819
Monthly income (SEK)*	1668.29	1299.58	0	15000	802
Parents university education	.79	.41	0	1	769
Living with parents	.98	.15	0	1	878
Right-wing political orientation	.55	.49	0	1	771
Environmental awareness	.83	.37	0	1	891
Negative attitude towards vegetarian food	.70	.46	0	1	892
Exposure to vegetarianism in private life	.83	.37	0	1	892
One vegetarian day per week in school	.17	.38	0	1	893
Number of vegetarian dinners per week	1.36	1.28	0	5	886
Lunches bought outside of school per week	1.17	1.24	0	5	886
Money spent per lunch (SEK)	72.60	26.76	0	300	742
Lunches bought outside of school per week if policy implemented	1.99	1.16	0	4	408
I am a member of environmental organization	.05	.21	0	1	892
I have a parent who is a vegetarian or vegan	.06	.23	0	1	892
I have a close friend who is a vegetarian or vegan	.59	.49	0	1	891
Statements, 1= disagree 6=agree					
I am satisfied with the school lunch	3.63	1.57	1	6	888
Taste is an important factor for me to eat the school lunch	4.70	1.23	1	6	890
Vegetarian food is gross	3.15	1.78	1	6	887
Vegetarian food is more expensive than non-vegetarian food	3.34	1.52	1	6	860
There is always a school lunch alternative that I can eat	3.99	1.75	1	6	887
There is always school lunch alternative for everyone regardless of preferences	3.90	1.63	1	6	877
I am worried about future climate changes	4.19	1.57	1	6	886
I think of the environment is an important issue	4.57	1.47	1	6	883
I have enough money to spend per month	4.44	1.61	1	6	886
I often buy clothes	3.12	1.40	1	6	891
When I buy clothes I buy them secondhand	1.57	1.09	1	6	887
I think it is a good idea to serve less meat in school	3.07	1.91	1	6	884
If it tastes as good I'm indifferent to the change	4.09	1.94	1	6	878
I would not get full from a vegetarian meal	2.96	1.84	1	6	869

Key Terms

CO_2e: carbon dioxide equivalents
CV: contingent valuation
GHG: greenhouse gas
MAAVD: maximum acceptable amount of vegetarian days
KPG: Klimatstrategiskt Program för Göteborg; Gothenburg's Strategy for Mitigating the Effect on Climate Change
The 40 percent target: goal number seven in KPG; The climate impact of meals originating from activities within the municipality of Gothenburg should be reduced by at least 40 percent by 2030 compared to 2010.

Dietary Calculations

The table below describes the eight standardized non-vegetarian meals and the four standardized vegetarian meals that Sinclair (2013) estimated using data from Sund & Florén (2011). The average level of CO_2e emissions stemming from one serving of a non-vegetarian meal is 1.62 kg, and 0.52 kg for a vegetarian serving.

Table I. Emissions per serving
Table I shows CO2e emissions stemming from standard meals served within the public sector in Gothenburg.

Standard meals	**kg CO_2-eq per serving**
Spaghetti and minced meat sauce (beef)	2,35
Falukorv (pork) and pasta	0,8
Hamburger with bread and potato wedges (beef)	3
Kebab stew with rice (pork)	0,95
Chicken stew with rice	0,9
Saithe with mashed potatoes	0,6
Meat and vegetable soup (beef)	1,95
Moussaka (beef)	2,4
Mean standard meal	1,62
Vegetarian meals	
Lentil sause with spaghetti	0,4
Bean stew with rice	0,6
Carrot and lentil soup	0,55
Mean vegetarian meal	0,52

(Sinclair, 2013; Sund & Florén, 2011)

Since the assumption that the 40 percent target was to be based on five non-vegetarian school lunches per week, the baseline of emissions was set to 5*1.62, which equals 8.1 kg CO_2e per student and week. Reaching the 40 percent target would result in a new weekly level of emissions of 4.86, i.e. 8.1*0.6. One way to reach this new level would be through having two non-vegetarian meals per week as well as three vegetarian ones, since 1.62*2 + 0.52*3 = 3.24 + 1.56 = 4.8.

The Proportion of Public Schools

The table below provides information about the share of upper secondary schools in Gothenburg that are public versus private, as well as how many students that are registered at them. The statistics are given separately for the whole city and for the sample in this study.

Table II. The distinction between public and private schools

Table II presents numerical statistics of upper secondary schools in Gothenburg, reporting both public and private schools.

	Number of schools	Number of schools with vegetarian policy	Number of students
In sample	11	2	893*
Public	2	1	169*
Private	9	1	724*
In total	46	-	21 401
Public	14	-	11 106
Private	32	-	10 295

*Denotes number of students when vegetarians and vegans are excluded. Total amount of observations before exclusion was 981 (72 vegetarians and 16 vegans).

Upper Secondary Schools in Gothenburg

Below is a compilation of all upper secondary schools in Gothenburg, what city region they are located in as well as contact details to the respective principals.

PUBLIC UPPER SECONDARY SCHOOLS (14)			
City region	**School**	**Principals**	**Email addresses**
Angered	Angeredsgymnasiet	Patrick Gladh 031-367 15 05 0727-26 15 94	info.angered@educ.goteborg.se patrick.gladh@educ.goteborg.se
Askim-Frölunda-Högsbo	Motorbranschens tekniska gymnasium	Kaj Sandgren 031-3671412	kaj.sandgren@educ.goteborg.se
Centrum	Bernadottegymnasiet	Christina Wesslén 031-367 05 60	christina.wesslen@educ.goteborg.se
	Burgårdens utbildningscentrum	Annika Andersson 031-36 70227 Tomas Savinainen 031-3670225 Ingemar Hansson 0703-608104 Lena Jangvik 031-36 70223 Lars Lorentzon 031-367 02 24	annika.andersson@educ.goteborg.se tomas.savinainen@educ.goteborg.se ingemar.hansson@educ.goteborg.se lena.jangvik@educ.goteborg.se
	Hvitfeldtska Gymnasiet	Gymnasieskolenhetschef Mikael O Karlsson 031-3670701	mikael.o.karlsson@educ.goteborg.se
	IHGR International Highschool	Maria Laasonen 031-708 92 29 0707-808456	Maria.Laasonen@educ.goteborg.se
	Katrinelundsgymnasiet	Mats Winqvist 031-367 05 15 Laila Gordon Von Hacht 031-367 05 14 Jan Tinnberg 031- 367 05 72 Christina Wesslén 031-367 05 60 Ingrid Blaxhult 031-367 05 16	mats.winqvist@educ.goteborg.se laila.gordon.von.hacht@educ.goteborg.se jan.tinnberg@educ.goteborg.se christina.wesslen@educ.goteborg.se ingrid.blaxhult@educ.goteborg.se
	Munkebäcksgymnasiet	Bengt Broberg 031-367 17 08 070-219 90 97 Katinka Wertsén 031-367 17 07	bengt.broberg@educ.goteborg.se katinka.wertsen@educ.goteborg.se
	Schillerska Gymnasiet	Kristina Bergman Alme 0707 - 85 44 42	kristina.bergman.alme@educ.goteborg.se

Lundby	Bräckegymnasiet	Benny Olausson 031-367 27 06 072-221 01 23	benny.olausson@educ.goteborg.se
	Ester Mosessons Gymnasium	Marianne Persson 031-367 22 76 Eva Fredmark 031-367 22 12 Peter Lindqvist 031-367 22 13	marianne.persson@educ.goteborg.se eva.fredmark@educ.goteborg.se peter.lindqvist@educ.goteborg.se
	Lindholmens Tekniska Gymnasium	Gymnasieskolenhetschef: Per Lindberg 031-367 25 10	per.lindberg@educ.goteborg.se
	Polhemsgymnasiet	Johan Gustavsson 031-367 24 08 070-305 54 95	johan.gustavsson@educ.goteborg.se
	Center för Språkintroduktion Lindholmen	Maria Edman 0725-11 83 06	info.lindholmen@educ.goteborg.se
Majorna -Linné	----------		
Norra Hisingen	----------		
Västra Göteborg	----------		
Västra Hisingen	----------		
Örgryte-Härlanda	----------		
Östra Göteborg	----------		
PRIVATE UPPER SECONDARY SCHOOLS (32)			
City region	**School**	**Principals**	**Email addresses**
Angered	----------		
Askim-Frölunda-Högsbo	Peabskolan Göteborg	Christer Borkenhagen 0725-33 36 08	christer.borkenhagen@peab.se
	Yrkesgymnasiet	Kommunikatör: Viktoria Skarler 0735-79 33 43	viktoria.skarler@yrkesgymnasiet.se
Centrum	Aniaragymnasiet	Lars Hegedus 031-13 19 90	lars.hegedus@aniaragymnasiet.se
	Drottning Blankas gymnasieskola	Lena Hellsten	lena.hellsten@dbgy.se
	GTI	Eleonora Eriksson	eleonora.eriksson@gti.se
	Gymnasieakademin	Mikael Andersson 0720-50 37 03	news@handelsakademin.se
	Göteborgs Högre Samskola	Peter Järvsén 031-63 19 01	peter.jarvsen@samskolan.se
	Hermods Gymnasium	Suah Nilsson 040-641 63 55	suah.nilsson@hermods.se
	Ingrid Segerstedts Gymnasium PILOT	Carl Nilsson 031-40 89 79	carln@isgy.se
	International IT College of Sweden	031-15 76 50	goteborg@initcollege.com
	IT Gymnasiet Göteborg	Ellen Lindqvist 031-741 21 10	ellen.lindqvist@it-gymnasiet.se
	Jensen Gymnasium Göteborg	Per Köhler 0704 94 32 72	per.kohler@jenseneducation.se

	Kitas gymnasium	Jonas Nilsson 031-774 47 33	jonas@kitas.se
	Kunskapsgymnasiet Göteborg	Tomas Claesson 08-510 084 10 0733 13 71 93	tomas.claesson@adm.kunskapsgymnasiet.se
	LM Engström	Arvid Bååth	arvid.baath@lme.nu
	Mikael Elias Gymnasium	Erik Wreland 0739-99 78 43	erik.wreland@mikaelelias.se
	NTI Mediegymnasiet	Eva Petersén 031-10 60 09	petersen@ntig.se
	NTI-gymnasiet kronhusgatan	Anette Edström 031-10 60 30	anette.edstrom@ntig.se
	Plusgymnasiet	Lina Augustsson 0708-89 36 05	lina.augustsson@plusgymnasiet.se
	Sigrid Rudebecks Gymnasium	Christina Olsson 031-10 75 72	ol@rudebecks.se
	Sjölins Gymnasium	Sara Karlsson 031-339 45 89	sara.karlsson@sjolinsgymnasium.se
	Thoren Innovation School	Cecilia Fossan 0725-76 30 12	cecilia.fossan@innovationsgymnasiet.se
Lundby	Donnergymnasiet	Jonas Mellby 0768-85 23 21	jonas.mellby@donnergymnasiet.se
	Göteborgsregionens Tekniska Gymnasium	Niclas Brattefors 031-760 34 14	niclas.brattefors@gtg.se
	LBS Kreativa Gymnasiet	Jennie Kohn 0708 393 007	jennie.kohn@lbs.se
	Rytmus Musikergymnasiet Göteborg	Lena Hermansson 0725-15 34 10	lena.hermansson@rytmus.se
Majorna -Linné	Cybergymnasiet	Kristina Haeffner 0768-85 20 66	kristina.haeffner@cybergymnasiet.se
	Framtidsgymnasiet i Göteborg	Jörgen Frohm 0768-22 00 16	jorgen.frohm@framtidsgymnasiet.se
	Praktiska i Göteborg	Anders Hedman 070-350 55 91 Annika Falmann 076-789 61 00	anders.hedman@vindora.se annika.falmann@vindora.se
	Realgymnasiet	Gymnasiechef: Matthias Trygg 011-19 42 06	matthias.trygg@larande.se
Norra Hisingen	----------		
Västra Göteborg	----------		
Västra Hisingen	----------		
Örgryte-Härlanda	----------		
Östra Göteborg	Aspero Idrottsgymnasium	Jens Naezer 031- 337 89 02 072-517 77 99	jens.naezer@asperofriskolor.se
	SKF Tekniska Gymnasium	Ann Malmberg 0727 17 38 84	ann.malmberg@skf.com

The Survey

Presented below is a copy the survey handed to the students. Question four in section II was randomly altered between 2, 3 or 4 vegetarian days per week as the policy proposal.

SKOLMATEN

Dina svar är självklart helt anonyma, vänligen svara så sanningsenligt som möjligt. Enkäten består av tre delar, notera att frågorna fortsätter på baksidan av papperet.

Ålder: ◻15 ◻16 ◻17 ◻18 ◻19 ◻ Annan **Kön:** ◻ Kvinna ◻ Man ◻ Annat

Jag är bosatt i: ◻ Angered ◻ Östra Göteborg ◻ Norra Hisingen ◻ Lundby ◻ Västra Hisingen ◻ Majorna-Linné ◻ Centrum ◻ Örgryte-Härlanda ◻ Askim-Frölunda-Högsbo ◻ Västra Göteborg ◻ Annat

Hur mycket pengar har du att röra dig med per månad?
(inkl. eventuella pengar hemifrån, bidrag, studiestöd, eventuell lön efter skatt, eventuella stipendier mm.)

◻ Mindre än studiebidraget, totalt ca……kr/mån. ◻ Studiebidraget, 1050kr/mån. ◻ Mer än studiebidraget, totalt ca……kr/mån.

I

Nedan följer 11 påståenden. Vänligen ringa in det alternativ som bäst stämmmer in på dig.

	Stämmer inte alls					Stämmer mycket väl
Jag är nöjd med den mat som serveras i skolan.	1	2	3	4	5	6
Att maten är god är viktigt för att jag ska äta skolunchen.	1	2	3	4	5	6
Jag har tillräckligt mycket pengar att röra mig med per månad.	1	2	3	4	5	6
Vegetarisk mat är äcklig.	1	2	3	4	5	6
När jag handlar kläder köper jag det second hand.	1	2	3	4	5	6
Skollunchen erbjuder alltid ett alternativ jag kan äta.	1	2	3	4	5	6
Jag är orolig över framtidens klimatförändringar.	1	2	3	4	5	6
Skolan ger goda lunchalternativ till alla oavsett vad de kan äta (kött, vegetariskt, veganskt, allergier, religion etc.).	1	2	3	4	5	6
Jag handlar ofta kläder.	1	2	3	4	5	6
Jag tycker att miljöfrågan är en viktig fråga.	1	2	3	4	5	6
Vegetarisk mat är dyrare än icke-vegetarisk mat.	1	2	3	4	5	6

Nedan följer 9 frågor relaterade till skollunchen. Vänligen ringa in det alternativ som bäst stämmmer in på dig.

Hur många ggr/vecka äter du i snitt en köttfri middag?	0	1	2	3	4	≧5
Hur många ggr/vecka köper du i snitt lunch utanför skolan?	0	1	2	3	4	5
Om du köper lunch utanför skolan, vad brukar den kosta?		Ungefär……kronor				
Har du någon gång ätit den vegetariska lunchen på skolan?		◻ Ja			◻ Nej	
Är du vegetarian?		◻ Ja			◻ Nej	
Är du vegan?		◻ Ja			◻ Nej	
Är du medlem i någon miljöintresserad organisation?		◻ Ja			◻ Nej	
Har du någon förälder som är vegetarian eller vegan?		◻ Ja			◻ Nej	
Har du någon nära vän som är vegetarian eller vegan?		◻ Ja			◻ Nej	

II

Den absoluta majoriteten av världens klimatforskare är idag överens om att klimatförändringarna med största sannolikhet påverkas av människans utsläpp och att det är av största vikt att jordens medeltemperatur inte ökar med mer än två grader till år 2100. Produktionen av livsmedel står för cirka en tredjedel av de globala utsläppen och produktionen av kött står för nästan en femtedel.

Göteborgs Stad vill vara en av världens mest klimatsmarta städer, och för att nå dit har de bland annat som mål att minska utsläppen som kommer från skolmåltider med 40 procent till 2030. En av strategierna för att nå detta mål är att stegvis ändra matsedlarna så att en del av kött- och mejeriprodukterna byts ut mot vegetabiliska alternativ. Om målet skulle nås enbart av förändrad kost skulle tre av fem luncher per vecka behöva vara vegetariska. Näringsmässigt kommer maten att vara oförändrad. Nedan följer ett antal påståenden och frågor om vad du skulle tycka om ett sådant förslag.Vänligen ringa in det alternativ som bäst stämmer in på dig.

	Stämmer inte alls					Stämmer mycket väl
Jag tycker att det låter som en bra idé att ha mindre kött i skolan.	1	2	3	4	5	6
Så länge det är lika gott så spelar det ingen roll.	1	2	3	4	5	6
Jag skulle inte bli mätt på en vegetarisk lunch.	1	2	3	4	5	6

Om förslaget blev verklighet, skulle du äta de tre vegetariska luncherna per vecka?

□ Ja *Om ja, hoppa över "Om nej".*

□ Nej *Om nej, gå vidare till "Om nej".*

Om nej, hur många av de vegetariska dagarna skulle du köpa lunch utanför skolan? 0 1 2 3

Hur många vegetariska skolluncher skulle du som mest kunna tänka dig att äta per vecka? 0 1 2 3 4 5

III

Har någon av dina föräldrar akademisk utbildning (tre eller fler år på högskola)? □ Ja □ Nej □ Vet ej

Ibland sätts de politiska inriktningarna upp på en höger-vänsterskala. Var skulle du placera dig själv på en sådan skala?

Vänster					Höger
1	2	3	4	5	6

Hur bor du?

□ Hos föräldrar □ Eget boende □ Inackorderad □ Annat

ETT STORT TACK FÖR DIN MEDVERKAN!

Vill du veta mer om projektet går det bra att skicka ett mail till gusmalmbbe@student.gu.se eller guskarjobo@student.gu.se