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Authors:
Professor Dr. Renate Schubert, ETH Zürich, renate.schubert@econ.gess.ethz.ch
Dr. Manuel Grieder, ETH Zürich, manuel.grieder@econ.gess.ethz.ch
Dr. Jan Schmitz, Radboud University, j.schmitz@fm.ru.nl
Rebekka Bärenbold, ETH Zürich, rebekka.baerenbold@econ.gess.ethz.ch

SFOE project coordinators:
Dr. Anne-Kathrin Faust, Anne-Kathrin.Faust@bfe.admin.ch

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Zusammenfassung

Der vorliegende Bericht setzt sich in zwei Teilprojekten anhand von Experimenten mit einer möglichen Liberalisierung des Schweizerischen Strommarkts für Haushaltskunden auseinander. Einerseits werden Folgen der Liberalisierung für die Nachfrage nach grünem Strom untersucht. Andererseits werden Politikinstrumente identifiziert, die geeignet sind, vor und nach einer möglichen Liberalisierung die Stromnachfrage der Haushalte in eine nachhaltigere Richtung zu lenken.

Im ersten Teilprojekt geht es um die Folgen einer möglichen vollständigen Liberalisierung des Schweizerischen Strommarktes für die Nachfrage privater Haushalte nach grünem Strom. Es zeigt sich, dass eine vollständige Liberalisierung zu einer Verschiebung der Konsumentennachfrage von grünem zu konventionellem Strom führen kann. Grund hierfür ist, dass die Liberalisierung für Privathaushalte eine starke Zunahme der Anzahl der zur Auswahl stehenden Stromverträge mit sich bringt. Dies erhöht die Komplexität der Entscheidung für einen Stromvertrag. Ohne begleitende Massnahmen, wie z.B. zusätzliche Informationen zu den Umweltattributen verschiedener Stromverträge, reagieren Konsumentinnen und Konsumenten hierauf, indem sie sich mehr auf die Preise und weniger auf die Umwelteigenschaften der angebotenen Stromverträge konzentrieren. Bei der aktuellen Preisstruktur für Strom aus erneuerbaren bzw. konventionellen Energiequellen führt die vollständige Liberalisierung des Strommarkts folglich zu einem unerwünschten Effekt, nämlich zu einer Schwächung der Nachfrage nach grünem und zu einer Stärkung der Nachfrage nach konventionellem Strom.

Im ersten Teilprojekt wird auch die Effizienz verschiedener standard- und verhaltensökonomischer Politikinstrumente untersucht, die das Ziel haben, die Stromnachfrage von privaten Haushalten in eine nachhaltigere Richtung zu lenken. Eine Lenkungssteuer auf konventionellen Strom erweist sich als wirksamstes Instrument zur Steuerung der Nachfrage in Richtung Strom aus erneuerbaren Quellen. Ausserdem zeigt sich eine klare Präferenz der Konsumentinnen und Konsumenten für einheimisch produzierten Strom. Insbesondere für Schweizer Wasserkraft, aber auch für Wind- und Solarstrom aus der Schweiz scheinen private Haushalte bereit zu sein, höhere Preise als für Strom aus ausländischen Quellen zu zahlen. Schweizer Konsumentinnen und Konsumenten sind also offenbar bereit, einen Beitrag zum Ausbau der nachhaltigen Stromproduktion in der Schweiz zu leisten.

Nachdem im ersten Teilprojekt eine Lenkungssteuer auf konventionellen Strom als wirksames Politikinstrument zur Steuerung der Stromnachfrage identifiziert wurde, befasst sich das zweite Teilprojekt mit dem Design von Umweltsteuern und Lenkungsabgaben, z.B. auf den Stromverbrauch privater Haushalte. Je nach Ausgestaltung des Verwendungszwecks der Steuereinnahmen kann eine Lenkungssteuer mehr oder weniger effektiv sein, d.h. das Konsumentenverhalten stärker oder weniger stark in eine nachhaltige Richtung lenken. Es zeigt sich, dass eine Zweckbindung der Steuereinnahmen für «grüne Zwecke» (z.B. für Investitionen in die Förderung grüner Technologien), wie sie häufig zur Erhöhung der Akzeptanz einer Lenkungssteuer vorgeschlagen wird, kontraproduktive Effekte haben kann. Die Nachfrage nach Gütern, die negative Externalitäten verursachen, geht bei einer Lenkungssteuer mit Zweckbindung unter Umständen weniger stark zurück als bei einer Steuer ohne Zweckbindung, weil die intrinsische Motivation der Konsumentinnen und Konsumenten, etwas für den Umweltschutz zu tun, reduziert wird. Entscheidet man sich für eine Rückverteilung der Steuereinnahmen, könnte dies ebenfalls die Akzeptanz einer Lenkungssteuer positiv beeinflussen, würde aber nicht zu einer Schwächung des Lenkungseffekts in Richtung von mehr Nachhaltigkeit führen.

Résumé

Dans deux sous-projets, ce rapport traite de l'éventuelle libéralisation du marché de l'électricité suisse pour les clients domestiques par le biais d'expériences économiques. D'une part, les conséquences de la libéralisation sur la demande d'électricité verte sont étudiées. D'autre part, des instruments politiques efficaces sont identifiés pour orienter la demande d'électricité des ménages dans une direction plus durable avant et après une éventuelle libéralisation.

Le premier sous-projet porte sur les conséquences d'une éventuelle libéralisation complète du marché suisse de l'électricité sur la demande d'électricité verte des ménages privés. Il est démontré qu'une libéralisation totale peut entraîner un déplacement de la demande des consommateurs de l'électricité verte vers l'électricité conventionnelle. La raison en est que pour les ménages privés la libéralisation entraînera une forte augmentation du nombre de contrats d'électricité disponibles. Cela accroît la complexité de la décision pour un contrat d'électricité. Sans aucune mesure d'accompagnement comme, par exemple, la fourniture d'informations supplémentaires sur les impacts environnementaux des différents contrats d'électricité, les consommateurs réagissent à cette situation en se concentrant davantage sur les prix et moins sur les caractéristiques environnementales des contrats d'électricité proposés. Compte tenu de la structure actuelle des prix de l'électricité produite à partir de sources d'énergie renouvelables ou conventionnelles, la libéralisation complète du marché de l'électricité pourrait donc entraîner un effet indésirable, à savoir un affaiblissement de la demande d'électricité verte et un renforcement de la demande d'électricité conventionnelle.

Le premier sous-projet examine également l'efficacité de divers instruments de politique économique standard et comportementale qui visent à orienter la demande d'électricité des ménages dans une direction plus durable. Une taxe sur l'électricité conventionnelle s'avère être l'instrument le plus efficace pour orienter la demande vers l'électricité provenant de sources renouvelables. En outre, il existe une nette préférence des consommateurs pour l'électricité produite au niveau national. Les ménages privés semblent prêts à payer plus cher pour l'hydroélectricité suisse en particulier, mais aussi pour l'énergie éolienne et solaire suisse, que pour l'électricité provenant de sources étrangères. Les consommateurs suisses sont donc apparemment prêts à contribuer à l'expansion de la production d'électricité durable en Suisse.

Après que le premier sous-projet ait identifié une taxe sur l'électricité conventionnelle comme un instrument politique efficace pour orienter la demande d'électricité vers des sources renouvelables, le second sous-projet concerne la conception optimale de taxes environnementales, par exemple sur la consommation d'électricité des ménages. Nous testons l'hypothèse qu'en fonction de l'utilisation des recettes fiscales, une taxe peut être plus ou moins efficace, c'est-à-dire qu'elle peut orienter plus ou moins fortement les choix des consommateurs dans une direction durable. Les résultats de notre expérience démontrent que le fait d'affecter les recettes fiscales à des "objectifs écologiques" (par exemple, à des investissements dans la promotion des technologies vertes), comme on le propose souvent pour augmenter l'acceptation d'une taxe par le public, peut avoir des effets contre-productifs. La demande de biens entraînant des externalités négatives diminue moins avec une taxe affectée qu'avec une taxe non affectée, car la motivation intrinsèque des consommateurs à faire quelque chose pour l'environnement est réduite. À la place de l'affectation les recettes fiscales pourraient être redistribués aux contribuables. Cela pourrait également avoir un effet positif sur l'acceptation d'une taxe, mais n'affaiblirait pas l'efficacité de la taxe pour orienter la demande des consommateurs vers une plus grande durabilité.

Summary

In two subprojects, this report deals with the possible liberalization of the Swiss electricity market for household customers by means of economic experiments. On the one hand, the experiments investigate consequences of the full market liberalization for the demand for green electricity. On the other hand, they identify policy instruments that are suitable for steering household electricity demand in a more sustainable direction before and after a possible liberalization.

The first subproject deals with the consequences of a possible full liberalization of the Swiss electricity market on the demand for green electricity by private households. The results indicate that a full liberalization can lead to a shift in consumer demand from green to conventional electricity. The reason is that for household customers liberalization will result in a sharp increase in the number of available electricity contracts. This increases the complexity of the decision for an electricity contract. Without any accompanying measures such as, for example, providing additional information about environmental impacts of different electricity contracts, , consumers react to this increased choice complexity by focusing more on prices and less on the environmental characteristics of the electricity contracts on offer. Given the current price structure for electricity from renewable or conventional energy sources, a full liberalization of the electricity market therefore leads to an undesirable effect, namely a weakening of the demand for green electricity and a strengthening of the demand for conventional electricity.

The first subproject also examines the efficiency of various standard and behavioral economic policy instruments that aim to steer household electricity demand in a more sustainable direction. A steering tax on conventional electricity proves to be the most effective instrument to steer demand towards electricity from renewable sources. Moreover, we find that there is a clear consumer preference for domestically produced electricity. Private households appear to be willing to pay higher prices for Swiss hydropower in particular, but also for wind and solar power from Switzerland, than for electricity from foreign sources. Swiss consumers are apparently willing to contribute to the expansion of sustainable electricity production in Switzerland.

After the first subproject identified a steering tax on conventional electricity as an effective policy instrument for steering electricity demand, the second subproject is concerned with the optimal design of green taxes that can be levied, for example, on private households' electricity consumption. We test the hypothesis that depending on the intended use of tax revenues, a green steering tax can be more or less effective for steering consumer demand in a sustainable direction. Specifically, the results of our experiment indicate that earmarking tax revenues for "green purposes" (e.g. for investments in the promotion of green technologies), an option that is often proposed to increase the public acceptance of a green tax, can have counterproductive effects. The demand for goods causing negative externalities may decrease less with an earmarked steering tax than with a non-earmarked tax, because earmarking weakens consumers' intrinsic motivation to do something for the environment. In contrast, redistributing tax revenues back to taxpayers could also have a positive effect on the public acceptance of a tax, but would not weaken the tax's steering effect in shifting consumer demand towards more sustainable options.

Main findings

- Increased choice complexity in a liberalized household electricity market leads to a shift in consumer demand from green to conventional electricity, as consumers focus more on prices and less on environmental attributes of electricity contracts.
- A tax on conventional electricity is successful in shifting consumer demand towards renewable energy sources, both in settings with low and high choice complexity (i.e., before and after a possible market liberalization).
- Earmarking the revenue of a green tax for green spending harms the steering effect of the tax and leads to a lower reduction in the consumption of the taxed good, when consumers are aware of the earmarking during their purchasing decisions.
- In contrast, redistributing the revenue of a green tax back to consumers does not impair the steering effect of the tax.

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Abbreviations

WTP Willingness to Pay

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1 Introduction

This final report comprises two subprojects. In the following, we shortly introduce the general topic of our research and describe the focus of and the linkages between the two subprojects. After that, the two subprojects will be presented and discussed separately.

We investigate two relevant research questions related to energy policy and environmental economics. First, we analyze how household consumers react to potential changes in the electricity market after a possible liberalization of the residential electricity market. Second, we are interested in how consumers' behavioral reactions affect the effectiveness of various policy instruments fostering green consumption choices.

Both subprojects apply a behavioral economics perspective propagating that changes in public policy and the effects of policy interventions have to be tested empirically, taking the actual behavior of consumers and citizens into account (see, e.g., Alm, 2010; Bernheim & Taubinsky, 2018; Chetty, 2015). In our subprojects, we collected such empirical data via incentivized economic experiments (with both student samples and representative participant samples).

Within each subproject, we tested different kinds of policy interventions. In the first subproject, we compared behavioral and standard policy instruments, such as social norms or taxes for steering the residential electricity demand. The second subproject focuses on the effectiveness of green taxes and how different ways of spending tax revenues (e.g., earmarking revenues for green spending) influence the effectiveness of such taxes.

1.1 Background information and current situation

Many countries have liberalized their residential energy markets in the past (see, e.g., Joskow, 2008; Pollitt, 2009, for discussions). Also, in Switzerland a move towards full market liberalization, including the household consumer market, is currently under discussion (see, e.g., Bundesamt für Energie, 2020a; Eidgenössisches Departement für auswärtige Angelegenheiten, 2019; Gysler & Marioni, 2015). From a standard neoclassical viewpoint, liberalization increases the societal welfare as it breaks up monopolies, establishes larger and more competitive markets, and fosters free consumer choice. However, a behavioral economics perspective points to possible obstacles that could weaken the positive welfare effects of liberalization, especially if consumer behavior does not correspond to the neoclassical assumption of full rationality. Thus, it is crucial to understand the consequences of liberalization for consumer behavior and for electricity demand, in particular for the demand for renewable energy.

The decision environment for consumers in the household electricity market changes if the market is liberalized. When a liberalized electricity market leads to a larger choice set of equivalent offers, households face many more choice options than in the current monopolistic market and thus choice complexity increases. In subproject A contained in this report, we investigate how consumers react to this increased choice complexity in such a liberalized market and what this means for consumers' demand for green and conventional electricity. It has to be noted here that our experiment does not investigate the possible emergence of newly designed markets (such as local markets, for example) following a liberalization of the Swiss residential electricity market. As we show, the increased choice complexity induced by the full market liberalization reduces the demand for green electricity. To provide some insights on how to counter this effect, we also investigate which policy instruments are most effective for shifting Swiss households' electricity demand towards renewable energy.

Green taxes, such as, for instance, a tax on conventional energy that changes the relative prices of green compared to conventional electricity, are a prominent policy instrument for steering household electricity demand. Subproject B contained in this report investigates the effectiveness of such a green tax in detail. Proponents of green taxes often build on the arguments made by Pigou (1920), according to which a negative externality (such as environmental pollution) can be internalized through a tax mirroring the damage of the externality. From a standard economic perspective, the effects of green taxes on goods that carry a negative externality are straightforward: they reduce consumption, and hence the extent of the externality. From a behavioral economics perspective however, a tax could also affect consumers' intrinsic motivation to avoid negative externalities caused by their consumption decisions. We investigate this possibility in subproject B.

1.2 Purpose of the project

As mentioned above, the liberalization of the Swiss residential electricity market is currently under discussion. After a possible full liberalization, Swiss electricity consumers would face a complex decision environment with many more electricity contracts to choose from than currently. This raises the question of how consumers react to this increased choice portfolio in terms of electricity demand, and which policy interventions will be effective in shifting the demand towards electricity produced from renewable sources. The purpose of our first subproject is to find answers to these questions. In addition, we were also interested in whether there is a preference for domestically produced energy and whether the consumer demand for domestic or foreign electricity might be affected by a move to a liberalized market. To answer these research questions, we developed an incentivized online experiment with several experimental manipulations. First, we implemented a small and a large electricity contract choice set to mimic a monopolistic and a liberalized market setting respectively. Second, we introduced several interventions in the form of standard and behavioral policy instruments. Our results indicate that consumers are overwhelmed with the larger choice set when moving from a monopolistic to a liberalized market. To reduce the complexity of choice, consumers predominantly focus on easy to understand attributes such as the price of an electricity contract. Given the current price structure of the electricity market this leads to an increase in the consumption of conventional energy. A possible solution for this problem could be the development of an environmental score which is easy to understand for consumers. Further, we find clear evidence in our experiment that the standard policy instrument in the form of a tax on conventional electricity is the most effective policy instrument for steering the electricity demand towards renewables, both in a monopolistic and in a liberalized market setting.

Building on this finding, the second subproject examines the effects of a green tax in more detail. From a behavioral economics perspective, two questions arise with regard to the effects of a green tax on consumer choices. First, what does levying a green tax mean for consumers' personal motivation to reduce externalities voluntarily? Specifically, does such a tax crowd out consumers' intrinsic motivation to avoid externalities? Second, does the effect on consumers' personal motivation depend on the framing of the tax, and especially on what the tax revenues are used for?

Concerning the use of tax revenues, Kallbekken et al. (2011) have shown that consumers' acceptance of a tax depends crucially on how the accrued tax revenue is spent. Relatedly, in a recent paper, Beiser-McGrath & Bernauer (2019) have found that the public acceptance of a green tax can be increased by earmarking the tax revenues for green spending (e.g., in the form of compensation projects). However, "moral licensing" might occur when tax revenues are earmarked for environmental purposes. Moral licensing in this context means that paying a green tax, internalizing the negative externalities of polluting activities makes people feel "licensed" to engage in these activities more often. In contrast, without the tax they might voluntarily refrain from doing so.

In subproject B, bearing all of this in mind, we conducted an incentivized economic experiment testing the effectiveness of a green tax for reducing the consumption of an externality-causing good. In particular, the experiment investigates to what extent the tax effectiveness depends on the spending purpose of the generated revenues. Our results indicate that earmarking tax revenues for green spending significantly reduces the effectiveness of a green tax in terms of consumption reduction. In contrast, redistributing the tax revenues back to consumers does not have this negative effect.

1.3 Objectives

The first subproject investigates two tightly related major research questions. First, we want to understand how a more complex decision environment in a liberalized market affects consumers' demand for different types of electricity contracts. Specifically, we are interested in the effects of market liberalization on consumers' demand for green electricity, as well as for domestically produced vs. foreign produced electricity. Second, we want to test the effectiveness of various policy instruments to steer households' electricity demand and to foster environmentally responsible consumption in a liberalized electricity market.

The main objective of our second subproject is to investigate how the effectiveness of a specific policy instrument, a green tax, depends on the exact design of the tax. In particular, we tested the hypothesis that earmarking tax revenues for green spending harms the consumption-reducing effect of the tax.

2 Subproject A: How Choice Complexity in Liberalized Markets Hurts the Demand for Green Electricity

Subproject Summary

Many countries have liberalized their residential electricity markets or—as Switzerland for example—are considering to do so. Liberalization provides consumers with more freedom of choice but also leads to higher choice complexity as consumers face a much larger number of available electricity contracts. We hypothesize that consumers react to this increased choice complexity in liberalized markets by applying simplified decision strategies that allow them to reduce cognitive effort. In particular, we predict that with increasing size of choice sets, consumers focus more on simple price attributes of electricity contracts and less on the relatively complex environmental attributes, leading to a decrease in the demand for green electricity. In two online experiments conducted in a representative ($n = 610$) and a student sample ($n = 1{,}212$) in Switzerland, we find that indeed when faced with a larger choice set participants focus more on prices and choose cheaper electricity contracts containing less renewable and more conventional energy than when faced with a smaller choice set. In addition, we also find evidence that a tax on conventional energy is a more effective policy instrument for shifting demand towards renewables than behavioral instruments in the form of social norm interventions. Our results suggest that a possible liberalization of the household electricity market has to be carefully managed such that consumers are not overwhelmed and do not shift their demand to cheaper but less environmentally-friendly energy sources.

2.1 Introduction

Many countries have liberalized their residential electricity markets during the last decades (see, e.g., Joskow, 2008; Pollitt, 2009 for discussions). In liberalized markets private households have the freedom to choose their electricity provider and their type of electricity contract, for instance, with respect to the sources from which electricity is generated. Also, for Switzerland, the liberalization of the residential electricity market is a possible option (e.g., Bundesamt für Energie, 2020a; Eidgenössisches Departement für auswärtige Angelegenheiten, 2019; Gysler & Marioni, 2015). From a neoclassical economic perspective, liberalization should be able to increase societal welfare because it increases competition and reduces inefficiencies on the supply side and fosters more consumer choice on the demand side. Focusing on the demand side, as we do in this subproject A, a liberalized market means that consumers can choose from a wider set of options and select the product that most closely corresponds to their preferences. Liberalization can thus increase the welfare of consumers.[1]

However, the argument that increasing consumer choice raises consumer welfare essentially holds in theory and rests on some important assumptions. In particular, the standard economic theory of consumer choice assumes that consumers are fully rational, i.e., they have well-defined and stable preferences, are in possession of all relevant information, and have unlimited mental capacity to process this information (e.g., Simon, 1955). According to this view, consumers should thus be able to navigate a larger choice set and select their preferred option just as easily as they do in a smaller choice set. They can therefore only benefit from the increased number of options available in a larger set as they will be able to find a product that is a better match for their personal preferences. Yet, empirical findings from cognitive psychology and behavioral economics shed doubt on the validity of these assumptions. There is the possibility that more choice can become too much choice as people can be overwhelmed by the number of options, especially when the products are complex and people do not have well-defined preferences, such as, for instance, in the case of different electricity products (Chernev et al., 2015). Moreover, as real human-beings have limited knowledge, limited time and attention span, as well as limited cognitive capacity (they are "boundedly rational," see, e.g. Selten, 1990; Simon, 1997) when faced with increasingly complex decision situations, they tend to adapt their decision strategies and rely more on heuristic approaches that are less cognitively demanding but may still lead to "good-enough" decisions in many situations (Gigerenzer & Goldstein,1996; Payne, 1985).

In a fully liberalized electricity market, consumers face a much larger choice of electricity contracts than in the current non-liberalized market in Switzerland, where they can typically choose from between two to six contracts offered by their local monopolist. For Germany, a country in which the household electricity market has been liberalized, the comparison platform verivox.de shows between 200 and 400 electricity contracts from which a consumer can choose. In this subproject, we report the results from an incentivized economic experiment investigating what this massive increase in choice set size, when moving from a non-liberalized to a liberalized electricity market, means for consumer choice and the demand for green vs. conventional

[1] Of course, consumer welfare may also increase because of falling prices or, more generally, efficiency gains on the supply side because of increased competition. Note, however, that in this subproject A, we focus uniquely on the consumer perspective and how consumers deal with the increased choice they have in liberalized markets. This is an important perspective, as liberalization only increases competition on the supply side to the extent that consumers take an active role in selecting their preferred suppliers and products.

electricity. In particular, building on the literature from cognitive psychology and behavioral economics on choice overload and the use of heuristics to simplify complex choices, we hypothesize that when faced with larger compared to smaller choice sets of electricity contracts, consumers focus more on electricity prices as an important attribute of a contract, and less on the energy sources or the environmental consequences of the electricity generation, because they try to reduce the cognitive complexity of the choice.

Importantly, given the current price structure in the electricity market, this increased focus on the price as the most important criterion for selecting an electricity contract, means that when the choice set size increases, the market share of green electricity decreases, because—at least currently—green electricity produced by renewable sources (especially new renewables such as wind and solar) is still more expensive for consumers than conventional electricity.[2] This side-effect of liberalization, caused by the increasingly complex choice for consumers in a liberalized market, may thus work against the policy goal of increasing the market share of green electricity sources, and in particular of the new renewables.

To investigate how policy makers may best react to this challenge, in one of our experiments we also tested the effectiveness of several standard and behavioral policy instruments for increasing the demand for green electricity. The standard policy instrument we tested was a tax on conventional electricity and the behavioral instruments included the use of descriptive and prescriptive norms, two common and increasingly popular instruments that have proved to be able to affect people's choices and behaviors in the energy domain (e.g., Allcott, 2011; Goldstein et al., 2008). In addition, we also tested the implications of a standard ("anchor") contract, a common feature of choice sets in the electricity market (see, e.g., Ghesla et al., 2020).

In our experimental set-up, participants had to choose one electricity contract from either a small or a large choice set of contracts that differed in price and in source (nuclear, hydro, wind, or solar) and origin (Switzerland or Germany) of electricity production. The small choice set, consisting of only six different contracts from which participants could choose, was designed to represent the current monopolistic situation of the Swiss residential electricity market. The large choice set, consisting of sixty different contracts to choose from, represented the situation in a liberalized market. Importantly, participants' choices were incentivized such that they had to pay more money (which means they earned less money for their participation in the experiment) for choosing greener contracts. The price structure mirrored the current average price structure for different electricity sources for end consumers in the Swiss residential electricity market. To incentivize the choice of electricity sources, we bought certificates of origin according to participants' choices (see also Ghesla, 2017). We conducted two studies, one in a nationally representative sample ($n = 610$) to test our main effects and one in a larger but non-representative sample of student participants ($n = 1,212$) to be able to include more experimental conditions testing different policy instruments in the small and the large choice set conditions.

The results indicate that the large choice set (compared to the small choice set) indeed decreased the demand for green electricity and led participants to choose cheaper contracts. We also find that in both choice sets, the standard policy instrument of a tax on conventional

[2] The price disadvantage of renewable compared to conventional energy does not necessarily have to persist in the future. New renewables, such as wind and solar energy, have very low or almost zero marginal cost of dispatch. Thus, in theory, in a liberalized market, electricity from solar or wind sources could be priced very competitively. This may also be problematic, however. With a growing share of renewable energy in the electricity market, marginal cost pricing may destroy the incentives for investors to continue extending the capacity of renewable energy production (see Blazquez et al., 2018).

electricity was most effective in fostering the demand for green electricity. The behavioral instruments were directionally successful in increasing the demand for green electricity in the small choice set (even though not in a statistically significant manner). They were clearly ineffective in the large choice set. This is in line with price considerations becoming more important in the large choice set. With regard to the geographic location of electricity production, we find that consumers in general have a preference for domestically produced electricity, especially hydro energy. In terms of policy instruments, a tax on conventional electricity is the most successful in increasing the demand for domestic renewables.

The report on subproject A proceeds as follows: Section 2.2 briefly summarizes and discusses related literature. Section 2.3 describes the experimental design in detail. Section 2.4 presents our hypotheses. Section 2.5 describes the results. Section 2.6 discusses the implications of our results and concludes.

2.2 Related Literature

2.2.1 Choice Complexity and Choice Set Size

Extant research shows that households across many countries have a positive WTP for renewable energy sources (see Soon & Ahmad, 2015 and the references therein). In their meta-analysis, which considers studies from countries all over the world, Soon & Ahmad (2015) find that, on average, households are willing to increase their spending for energy by about USD 7 per month to shift to renewable energy sources. However, field data from liberalized electricity markets reveals that these environmental preferences do not fully translate into actual electricity contract choices by private households in many countries. Specifically, the WTP for green electricity measured in unincentivized stated preference experiments seems considerably higher than the actually observed demand for green electricity in liberalized markets (Kaenzig et al., 2013).

We argue that this gap may be at least partly explained by detrimental effects of choice complexity caused by the large size of the choice set, i.e., the large number of electricity contracts from which consumers can choose in liberalized markets. It is well documented in the literature that people use different strategies to make decisions depending on the context of a decision and on moderating factors such as the way information is presented or time pressure. In particular, choice complexity has been shown to influence the selection of a decision strategy (Swait & Adamowicz, 2001). Payne (1985) shows that people adapt their decision strategies when choice complexity increases to keep the cognitive effort needed for the choice within the bounds of their cognitive capacity available at the time of the decision. An important determinant of choice complexity is the number of alternatives, i.e., the choice set size (Shiloh et al., 2001). Bettman et al. (1991) argue that the choice set size influences the decision strategies used. Specifically, they state that in large choice sets, people use strategies that lead to an early elimination of a number of alternatives. For instance, Payne (1976) finds that subjects selecting an apartment seek a smaller percentage of the total available information when the choice set size (the number of available apartments) increases. Timmermans (1993) shows that the choice set size also influences the number of attributes considered. She analyzes the evaluation of candidates for open jobs according to several attributes (e.g., age, experience or education). The author finds that decision makers use fewer attributes for the evaluation when there are more candidates among which to choose. In general, research in this field studies the effect of large choice sets on cognitive processes mainly with verbal protocols or eye-tracking techniques (Swait & Adamowicz, 2001). The consequences of such changes in cognitive processes on decision-making outcomes are rarely studied.

A simple decision strategy for choosing an electricity contract would be to decrease the number of attributes considered and to focus only on the “most important" ones. When private households make a decision, we hypothesize that the large size of the choice sets in liberalized electricity markets increases the importance of the price attribute compared to other attributes like environmental impacts of electricity generation. Surveys show that the electricity price plays an important role for consumers when choosing an electricity contract in liberalized electricity markets (Kaenzig et al., 2013). The unidimensional price attribute is very easy to understand and has direct and well-defined consequences for the decision maker, which is particularly relevant when making complex choices in large choice sets (Iyengar & Kamenica, 2007). Environmental attributes of electricity contracts, such as the environmental impact of different forms of electricity generation, are much harder to understand and compare and do not have an immediate consequence for the decision maker. Thus, when choice set size increases the relative importance of prices in consumers’ decision-making processes may increase and out-weigh the importance of other attributes like environmental attributes. In the spirit of Gabaix (2014), this corresponds to the decision maker simplifying his or her decision model by setting the decision weight of less relevant parameters to zero and focusing more on the monetary criterion “price." Such a strategy would then reduce the demand for green electricity as prices for electricity contracts positively correlate with the share of green electricity in the contract.

In addition to triggering the use of simpler decision strategies, large choice sets can also make consumers more reluctant to make a choice at all. Indeed, there seems to be a tendency that decision makers avoid making a decision when the choice seems difficult, for instance because the choice set is large. This latter effect is commonly referred to as “choice overload.” Most papers on choice overload study choices between relatively simple goods such as jams (Iyengar & Lepper, 2000), chocolate (Chernev, 2003) or pens (Shah & Wolford, 2007). Research into more complex goods is scarce. Some econometric evidence for the detrimental effect of large choice sets on switching behavior exists for insurance (Frank & Lamiraud, 2009) and pension plans (Huberman & Jiang, 2006). However, choices involving complex goods, such as electricity contracts, are cognitively demanding for individuals, which makes them, ceteris paribus, more likely to lead to choice overload than choices involving less complex goods (Chernev et al., 2015). In their meta-analysis, Chernev et al. (2015) show that the likelihood that large choice sets trigger choice overload is larger for products that differ on many attributes and for which consumers do not have well-defined preferences and only little product-specific knowledge. Electricity contracts seem to fall in exactly this category of products, which suggests that choice overload effects could be strong in liberalized electricity markets. However, there is hardly any empirical literature on the existence of choice overload effects in liberalized electricity markets. The only empirical evidence in this regard comes from Jilke et al. (2016). In an experiment, they confronted participants with a hypothetical situation, in which their electricity provider had a service failure. The participants were then provided with a choice set of alternative electricity providers and were asked, if they wanted to switch to an alternative provider. The experimenters varied the number of hypothetical alternative electricity providers offered to the subjects. Their results show that increased provider choice reduced people’s motivation to switch to another provider. This is in line with the empirical evidence presented by Defeuilley (2009) showing that consumers in liberalized electricity markets often remain passive and do not switch suppliers.

Our first subproject builds on and adds to this literature by studying how an increase in choice set size affects consumer decision making in the electricity market. Rather than just investigating the possibility that choice set size affects people's decision-making strategies, we are interested in the consequences of increasing the choice set size and what this means for the relative demand of households for green vs. conventional electricity.

2.2.2 Behavioral Policy Instruments: Social Norms

In our experiment, we also test behavioral policy instruments in the form of descriptive and prescriptive norms and compare them with a standard policy instrument (a tax on conventional energy). Hereby, our goal is to assess which policy instrument is most effective in steering household demand and how relevant the market setting, particularly the choice set size, is. We review the existing evidence on the effectiveness of descriptive and prescriptive norm interventions in the energy domain below.

In our set-up, a descriptive norm intervention entails the provision of information about what most people do in terms of electricity contract choice, for instance by communicating descriptive statistics about the most commonly selected electricity contracts. Descriptive norms work via peer comparison. In several previous studies, descriptive norm interventions providing information and feedback about people's own electricity consumption in comparison to their peers' have been found effective for motivating people to save electricity (see Miller & Prentice, 2016 for an overview or, for instance, Allcott, 2011; Ayres et al., 2013; Schultz et al., 2007, for specific applications).

In contrast to descriptive norms that simply describe the most prevalent behaviors or choices, prescriptive norms tell people how they should behave according to common moral standards (Cialdini et al., 1990; Reno et al., 1993). For example, prescriptive policy measures could include the education of electricity consumers about the environmental impacts of energy production and consumption and the benefits of green energy. The goal would be to reduce energy consumption overall and to move demand towards more sustainable sources of energy production (Carrico & Riemer, 2011; Schelly et al., 2012). Relatedly, Carrico & Riemer (2011) found that using peer educators to educate employees about how to save energy in a workplace setting reduced energy consumption significantly compared to an information-only control design.

Related to the discussion about the effectiveness of prescriptive and descriptive norms, it seems interesting to investigate which design of norms is more effective in fostering households' pro-environmental behavior. Some researchers argue that prescriptive measures are more effective as they can steer behavior across a range of contexts, whereas descriptive norms are always specific to a given context (Cialdini et al., 2006; Reno et al., 1993). Furthermore, some energy studies report a boomerang effect for consumers who outperform a descriptive norm or standard (e.g., consumed less energy than the communicated average). Providing such already well-performing households with the information that they are actually doing better than their peers may demotivate them and lead them to lower their efforts, thus causing an undesired decrease in pro-environmental behavior for these consumers (Allcott & Rogers, 2014; Schultz et al., 2007). Prescriptive norm interventions, in contrast, do not face this problem, as they always provide a better role model to which to aspire to. Therefore, the literature tends to suggest an advantage of prescriptive compared to descriptive norm interventions for motivating pro-environmental choices in the energy domain. Based on that, we expect a better performance of the prescriptive norm in our experiment.

2.2.3 Standard Policy Instrument: Tax

In our experiment, we compared behavioral policy instruments with a standard policy tool, namely a tax on conventionally-produced electricity. This comparison helps to evaluate which policy instrument is most effective in reducing consumer demand for conventional electricity and shifting it towards green electricity.

From a neoclassical perspective, taxes are a useful policy instrument as they put an additional price on the good which typically leads to a significant reduction in consumption. Such taxes are widely used in various fields (see, e.g., Benabou, 2002; Lombardini- Riipinen, 2005; Pirttilä & Tuomala, 1997; Smed et al., 2007). Most work on energy taxes has been done in the context of the economic effects of carbon taxes, studying how effective they are in reducing greenhouse gas emissions (see, e.g., Bergin et al., 2004; Wissema & Dellink, 2007). As our experiment was carried out within the framework of the electricity market, we narrowed the relevant literature down to studies about taxes in electricity markets (see, e.g., Berkhout et al., 2004; Chen & Tseng, 2011; Gerbelová et al., 2014; Olsen et al., 2018). In particular, Berkhout et al. (2004) concluded that household demand for electricity reacts especially strongly to changes in energy prices. Following that, we expect that introducing a tax on conventional energy will shift demand towards green electricity in our experiment.

2.3 Experimental Design

The main goal of our experiment was to investigate how moving from a monopolistic to a liberalized electricity market affects the relative demand for green and for conventional energy and how different policy interventions perform with regard to the goal of shifting households' demand towards renewable energies. To study these effects, we developed an online experiment where participants had to choose their preferred electricity contract from a small or a large choice set of contracts, mirroring consumers' choice situation in a monopolistic and a liberalized market, respectively. All electricity contracts offered to participants covered a fixed amount of 150 kWh of electricity, which roughly corresponds to the average monthly electricity consumption of a two- person household in Switzerland. The contracts differed in their prices and in their shares of energy from different sources and locations. Participants' choices were incentivized, i.e., they had to pay more (and thus received less money for their participation in the study) when choosing more expensive energy sources. Participants received a budget of 22 CHF at the beginning of the experiment, from which they had to pay for their selected electricity contract. To make sure that participants' choices had real consequences not only in terms of payouts to participants, but also on the electricity market, we bought certificates of origin according to the electricity sources contained in the specific electricity contracts chosen by the participants (see Ghesla, 2017, for a similar approach).

The full experiment consisted of a 2x5 between-subjects design. We implemented two types of choice sets: a small choice set and a large choice set. The small choice set contained six different electricity contracts to choose from and illustrated consumer choice in a setting where consumers face one monopolistic supplier. The large choice set with sixty different contracts, in contrast, mirrored the choice for consumers in a competitive (liberalized) market. In both choice sets, we ran five different experimental conditions: a baseline control condition, an anchor contract condition (in which one contract was pre-selected as the standard contract), two conditions testing behavioral policy instruments (a prescriptive and a descriptive norm intervention), and, finally, a condition testing the effects of a tax on conventional energy as a standard policy instrument affecting monetary incentives. In the following, we first describe the design of the choice sets and then turn to the other experimental conditions.

2.3.1 Design of Choice Set

As described above, we had two choice sets of different size in our experiment, a small and a large one. Participants who faced the small choice set could choose between six different electricity contracts. We opted for six contracts as this mirrors relatively closely the current situation in Switzerland where household customers usually have the choice between two to six different electricity contracts offered by their local monopolists. The large choice set consisted of sixty contracts and mimics the much larger choice of contracts that household customers face in liberalized markets. Note that the exact number of sixty contracts available in the large choice set was somewhat arbitrary. What is important is mainly that the large choice set was considerably larger than the small choice set. We believe that for our purposes a tenfold increase of the number of contracts was sufficient.[3] However, compared to the 200 to 400 different electricity contracts currently available to household consumers in the liberalized German market, for instance, our manipulation seems rather conservative.

All contracts contained in the small choice set were also included in the large choice set. Therefore, the large choice set consisted of the six contracts from the small choice set plus fifty-four additional contracts. We made sure that the cheapest and the most expensive contract were featured both in the small and in the large choice set, and that the average price of a contract was the same in both choice sets. The electricity contracts were presented to the respondents in a random order. However, to facilitate the decision-making process we incorporated two sorting options on the contract selection screen: price and name of the electricity contract. We incorporated these two sorting options as they are the most commonly used in reality (see, for instance, the online comparison platform verivox where the sorting option “price” is the default option). We do not expect any bias based the choice of sorting options in the experiment as the sorting options were held constant in both choice sets (i.e., small and large) and in all experimental treatments.[4]

[3] As we show in section 2.5, the manipulation check data we collected on perceived choice complexity support this conjecture.

[4] As we discuss in the conclusion, further research should investigate the effects of making other sorting options, such as environmental footprint scores available and salient.

The sorting option "price" led to a sorting starting with the cheapest contract and ending with the most expensive contract. To be able to implement the sorting by name option, the contracts were given names in the form of a number from one to six in the small choice set and from one to sixty in the large choice set. If a respondent chose to sort by name the contract with name “1" was presented at the top and the contract with name “60" at the bottom. Moreover, the available electricity contracts differed on three dimensions: price, energy source, and location of energy production. We describe each of these dimensions in more detail below.

Prices

The prices of the contracts in our experiment mirrored as closely as possible the actual prices household customers pay for similar electricity contracts in Switzerland. As we incorporated two locations of energy production, Switzerland and Germany, we determined two different prices for each energy source (nuclear, hydro, wind and solar energy) contained in the contracts in the experiment. To determine the appropriate domestic (Swiss) energy prices we conducted an extensive online data collection in May 2019. In each canton (district) of Switzerland we identified the dominant local electricity provider and compiled a list of the different electricity contracts or products these providers offered to their household customers. For each offered contract, we collected the electricity mix, i.e., the energy sources contained in the contract and the prices charged for the respective contract. Based on the collected data, the average price for each energy source for household customers in Switzerland was then calculated in a regression approach. This led to the following prices per kWh of electricity: 0.07 CHF for nuclear energy, 0.08 CHF for hydro energy, 0.20 CHF for solar energy and 0.13 CHF for wind energy. The full list of Swiss electricity providers included in the data collection can be found in Appendix A.1.[5]

For the foreign location of energy production, we chose Germany.[6] For determining the German energy prices included in our experiment we relied on existing secondary research. As the Swiss energy prices considered in our experiment were very recent, the challenge was to find the most recent German energy prices as well in order to facilitate a comparison between Swiss and German energy prices. Specifically, the German energy prices we featured in our experiment were (per kWh): 0.06 CHF for nuclear (Simon, 2014), 0.07 CHF for hydro (Wronski & Fiedler, 2017), 0.09 CHF for wind (Heck, 2020), and 0.09 CHF for solar energy (Fraunhofer-Institut für solare Energiesysteme ISE, 2018).

To determine the prices of the different contracts in the experiment, the above-listed prices per source were multiplied by the number of kWh of the given energy sources contained in a contract. Note that we only considered pure energy prices for determining the contract prices in

[5] Note that we could not reliably distinguish in our data collection whether the electricity from a specific source in a certain contract was actually produced in Switzerland or whether it was imported. However, for nuclear, hydro, and solar the available aggregate data (Pronovo AG, 2020, most recent data are for 2018) show that the largest part of the electricity consumed in Switzerland stemming from these sources is also produced in Switzerland (92.1%, 77.5%, and 99.2% in the case of nuclear, hydro, and solar, respectively). For wind energy, this is not the case. Only 13.6% of the wind energy consumed in Switzerland is actually produced in Switzerland. The fact that we could not make this distinction reliably means that we potentially underestimate the price difference between Swiss and German energy sources. Our data should therefore not be interpreted as a reliable source for estimating price differences between Swiss and German energy production. This was also not a goal of our study, however. For the purposes of the experimental design, it is mainly important that the price differences are qualitatively correct, which we are confident is the case, as the Swiss-produced energy is consistently more expensive than the German energy.

[6] We chose Germany, as the location of foreign energy production, as it is the largest neighboring country and typically the largest source of imports into the Swiss electricity grid.

our experiment. This means that the contract prices only reflected energy sourcing and no grid charges, taxes, etc.

Energy Source

A second important characteristic of our electricity contracts was the "energy source". In total we featured four different sources of energy in the offered contracts: nuclear, hydro, wind, and solar energy. We chose nuclear energy as it is the most common source used for conventional energy production in Switzerland. Hydro, wind, and solar energy were incorporated as, again, they are the three most used sources of renewable energy in Switzerland. Some contracts in our experiment consisted of 100% Swiss or German nuclear or 100% Swiss or German hydro energy. However, most contracts were a mix of different energy sources.

Location of Energy Production

As a third attribute, we included different locations of the energy production in the electricity contracts. As mentioned, we considered two production locations: Switzerland (domestic) and Germany (foreign). In the small choice set, the contracts were either fully from Swiss or German production. There were three contracts from Swiss and three contracts from German production. To increase choice complexity, the large choice set incorporated additionally some mixed contracts. A mixed contract was composed of energy sources from Swiss and German production. In total, in the large choice set, we had twenty contracts from only Swiss production, twenty from only German production and twenty from mixed, i.e., partly Swiss and partly German, production.

Figure 1 displays all six contracts available in the small choice set. For the large choice set, please refer to Appendix A.2.

Figure 1: Small Choice Set Base Condition

Electricity contract: 1

Energy source	Share	Location	Price
Nuclear	0%		
Hydro	70%	DE	11.40 CHF
Wind	10%	DE	
Solar	20%	DE	

Electricity contract: 2

Energy source	Share	Location	Price
Nuclear	0%		
Hydro	100%	DE	10.50 CHF
Wind	0%		
Solar	0%		

Electricity contract: 3

Energy source	Share	Location	Price
Nuclear	100%	CH	
Hydro	0%		10.50 CHF
Wind	0%		
Solar	0%		

Electricity contract: 4

Energy source	Share	Location	Price
Nuclear	0%		
Hydro	100%	CH	12.00 CHF
Wind	0%		
Solar	0%		

Electricity contract: 5

Energy source	Share	Location	Price
Nuclear	100%	DE	
Hydro	0%		9.00 CHF
Wind	0%		
Solar	0%		

Electricity contract: 6

Energy source	Share	Location	Price
Nuclear	0%		
Hydro	70%	CH	16.40 CHF
Wind	10%	CH	
Solar	20%	CH	

2.3.2 Interventions

In total, we had ten experimental conditions in a 2x5 between-subjects design. The conditions differed based on two dimensions: the size of the choice set and the intervention featured. Specifically, the size of the choice set (small or large) was crossed with the presence or absence of certain policy interventions (prescriptive or descriptive norm and tax) and two control conditions (baseline and anchor contract). In the following we describe these control conditions and the policy interventions in more detail.

Base

The base conditions were control treatments (both for the small and the large choice set) and entailed no policy intervention. That is, participants were simply presented with the small or the large choice set and chose their preferred electricity contract.

Anchor Contract

Participants in the anchor contract treatments were assigned a pre-selected anchor (or “standard”) contract and had the possibility to stick with this contract instead of making an active choice for another electricity contract. The provision of an anchor or standard contract is a common feature in many household electricity markets. In Switzerland, as in most other countries, new customers are served with a standard electricity mix defined by their local provider’s standard contract as long as they do not make an active choice for another contract. We incorporated a standard contract in our design, because previous research has shown that it can have very strong effects on consumer decision making (see, e.g., Ebeling & Lotz, 2015; Ghesla et al., 2020). The pre-selected anchor contract in our experiment consisted of 100% Swiss hydro energy, as it is common for many Swiss electricity providers. The anchor treatment was implemented such that participants were first informed about the content of the anchor contract and could then decide to either stick with the anchor contract or to look at the other five (in the small choice set) respectively fifty-nine contracts (in the large choice set).

Prescriptive Norm

A prescriptive norm tells people how they should behave according to some moral standards. It is thus related to the common moral standards in a society (Cialdini et al., 1990; Reno et al., 1993). The prescriptive norm we used in our experiment was a combination between educating people about the effects of consuming energy from different energy sources and telling them what is necessary in order to fulfill the goals defined in Switzerland’s energy strategy 2050. By doing so, we essentially called upon people’s self-awareness and responsibility in relation with their actions. We opted for the mentioned combination as the literature shows that educating people may have a distinct effect on their energy consumption (Carrico & Riemer, 2011; Schelly et al., 2012). Taking into account these findings from the relevant literature, we constructed and used the following prescriptive norm for our experiment (see Appendix A.3. for the original German version):

> *In Switzerland, conventional electricity is mainly produced from nuclear energy. Nuclear energy has the disadvantage that the waste produced is very dangerous. In addition, possible nuclear power plant accidents would have devastating consequences for people and nature. Green electricity, on the other hand, is produced from renewable sources such as wind, sun, biomass, water and geothermal energy. Renewable energies have the advantage that their use produces hardly any waste or pollutant emissions. In addition, these energy sources regenerate themselves again and again in a natural way. In its Energy Strategy 2050, the Swiss Federal Office of Energy (SFOE) therefore proposes to significantly increase the production and consumption of renewable energies.*
>
> *By opting for an electricity contract based on renewable energies, you are thus making an important contribution to the fight against global warming, supporting the Federal Government’s Energy Strategy 2050 and helping to create a greener future for you and your fellow human beings.*
>
> Sources: Bundesamt für Energie (2020b); Energiestiftung Schweiz (2020a,b)

Descriptive Norm

A descriptive norm entails the status quo, i.e., it provides information about the most current behavior in a society or, in our case, about the current situation in the household electricity market (Cialdini et al., 1990; Reno et al., 1993). The descriptive norm manipulation we implemented in our experiments thus simply provided participants with data on the consumption of different energy sources in the Swiss electricity market (see Appendix A.3. for the original German version):

> *The evaluation of the 2016 electricity labelling scheme shows that 62 %, i.e. almost two thirds (2015: 58.3%) of the electricity consumed in Switzerland comes from renewable sources (such as wind, solar, hydro and geothermal energy). In 2017, a total of 15,309 GWh/a or 42.3% of electricity from renewable sources (2016: 14,183 GWh/a) was consumed in the form of deliberately selected electricity products from renewable energies. This corresponds to almost 26% of total electricity consumption. In terms of private consumption, this means that around one third of all Swiss households deliberately order electricity products from renewable energy sources.*
>
> Source: Verein für umweltgerechte Energie VUE, im Auftrag des Bundesamtes für Energie (2019)

Tax

In addition to the two behavioral policy instruments described above, we also implemented a standard policy instrument that affects consumers' monetary incentives via a tax. In our experimental set-up the tax approximates a taxation system with low (or negative) tax rates for electricity from renewable sources and high tax rates for conventionally-produced electricity (often called "differenzierte Stromabgabe" in the Swiss context). Thus, we levied a uniform tax on nuclear energy but the other (renewable) energy sources (hydro, wind, solar energy) remained tax-free. The level of the tax was chosen in consultation with the Swiss Federal Office of Energy (SFOE) to make sure that the tax level we implemented in the experiment was as realistic as possible. After consulting the SFOE, we opted for a tax of 0.02 CHF on every kWh of nuclear energy. Therefore, in the tax treatments all contracts containing nuclear energy were more expensive than in the other experimental conditions (with the exact price increase depending on the amount of nuclear energy contained in the contract). The tax was implemented as a pure price increase, i.e., the tax was not made salient to participants and they did not know about the existence of the tax when making their choice for an electricity contract. The treatment thus identifies the pure price effect of the tax, excluding any possible behavioral effects (e.g., crowding-out of intrinsic environmental motivation because of the tax, see, e.g., Frey, 1999; Nyborg, 2010).[7]

[7] According to Frey (1999) and Nyborg (2010), external interventions such as taxes could reduce consumers' intrinsic motivation to act pro-environmentally and thus reduce the extent of green choices. See also the results of subproject B contained in this report. By not mentioning the existence of the tax in the tax treatment in our experiment, we excluded the possibility that such an effect can occur.

2.3.3 Data Collection and Procedure

Two experiments were conducted with two different participant samples: a representative sample for the Swiss population and a student sample. The experiment was essentially the same in both samples but differed with regard to the number of experimental conditions we could implement. As the cost per participant was much higher in the representative sample, in that sample we only implemented the base and anchor contract conditions both in the small and in the large choice set, thus effectively reducing the design to a 2x2 design. In the student sample, we implemented all experimental conditions of the 2x5 design described above.

The online experiment with the representative sample was conducted by DemoSCOPE on our behalf in January 2020. We did not specify any exclusions restrictions in terms of participant demographics, with the exception of the requirement that participants had to be 18 years or older. Out of the 610 participants, 300 (49%) were male and 310 (51%) were female. The experiment was conducted in German and French. 152 (25%) participants were French speakers, and 458 (75%) were German speakers. The mean age was 48.06 years ($sd = 0.68$).

The experiment with the student sample was carried out in December 2019. The ETH Decision Science Laboratory recruited participants for the experiment from the subject pool for economic and behavioral experiments at ETH and the University of Zurich. Again, we did not specify any exclusions restrictions. In total, our student sample constituted of 1,212 participants. Out of these 1,212 people, 1,181 were university students. 642 participants (53%) were women and 569 (47%) were men. The mean age was 21.90 years ($sd = 0.09$).

Treatments were randomly assigned to participants via a randomizing function within the experimental software. In the experiment with the representative sample, where we implemented four treatments, we aimed for 150 participants per treatment. The experiment with the student sample had ten treatments in total. As in the representative sample, we wanted 150 participants in each base and anchor contract condition. For the policy intervention conditions, we aimed at having 100 participants in each condition. These sample sizes had been determined beforehand through statistical power calculations based on pilot studies conducted in November 2019.

In both samples, participants received an online link which allowed them to take part in the experiment. Participants thus completed the experiment using their own electronic devices. At the beginning of the experiment, participants received detailed instructions about the content of the experiment. After that, participants were asked to answer a few control questions in order to make sure that they understood the important concepts of the experiment and the consequences of their choices. At the end of the experiment, participants answered a final questionnaire. The instructions presented to participants are displayed in Appendix A.4.

Participants' remuneration for the experiment corresponded to an initial endowment of 22 CHF minus the price paid for the electricity contract chosen by the participant. Participants in the representative sample earned on average CHF 8.66, and respondents in the student sample earned on average CHF 9.83. There was no show-up fee included and the experiment lasted for around 15 minutes. According to the choices participants made in the experiment with regard to energy sources, we bought certificates of origin.[8]

[8] We thank Fairpower AG for purchasing the certificates of origin

2.4 Hypotheses

To formulate the hypotheses to be tested in our experiment, we proceed in three steps. We first focus on the most fundamental hypothesis concerning the effects of a small vs. a large choice set on participants' contract choices and their demand for green electricity. We then consider the effects of different policy instruments for fostering the demand for green electricity. Finally, we briefly touch on the preference for domestic vs. foreign energy.

2.4.1 Effects of Small vs. Large Choice Set

The fundamental hypothesis we test in this subproject is that the increase in choice set size that consumers experience when moving from a monopolistic electricity market to a liberalized, competitive market, changes consumers' electricity contract choices and has a negative effect on the demand for green electricity. The main manipulation in our experiments thus concerns the size of the choice set. A small choice set (with six contracts to choose from) mimics a monopolistic electricity market, i.e. the current situation for private households in Switzerland, whereas a large choice set (with sixty contracts to choose from) mirrors a liberalized electricity market. In a liberalized market, private households have more contracts to choose from and thus face a more complex decision environment, which is more cognitively demanding (Shiloh et al., 2001) and may cause choice overload (Iyengar & Lepper, 2000). As discussed in the literature review in section 2.2, to deal with this increased choice complexity, people may apply simplified decision strategies such as reducing the number of attributes they take into consideration when making a decision (Bettman et al., 1991; Payne, 1985; Swait & Adamowicz, 2001; Timmermans, 1993). We conjecture that in the context of electricity contract choices this means that when faced with a larger compared to a smaller choice set, people attach more importance to an easy to understand attribute such as the price of an electricity contract and put less weight on attributes that are more complicated to evaluate such as the environmental impact of different energy sources or the location of production. Thus, in a large choice set people focus more on prices than in a small choice set.

Nuclear energy is still the cheapest source of energy as of today, whereas green energy (captured by the production sources of hydro, wind, and solar energy in our experiment) is more expensive (at least when judged by the prices currently charged to household consumers in the Swiss electricity market). Thus, the cheapest contracts in our experiment come with a lower share of green energy and a higher share of nuclear energy. Therefore, if a large choice set leads participants to choose cheaper contracts, this means that they will choose contracts with less green and more nuclear electricity.

Hypothesis 1 *In a large choice set, the demand for green electricity is smaller than in a small choice set.*

Note that in the experiment the amount of electricity that the participants needed to buy was fixed. A decrease in the demand for green electricity therefore also means that demand shifts toward nuclear electricity.[9]

2.4.2 Effects of Policy Instruments

Policy instruments may help to shift consumers' electricity demand towards green energy. We consider two instruments from the toolkit of behavioral economics, a descriptive and a prescriptive norm intervention, and compare them with a standard policy instrument, a tax on nuclear energy. According to the literature, prescriptive measures may be more effective than descriptive measures for fostering the demand for green energy as they are applicable to a wider range of contexts (Cialdini et al., 2006; Reno et al., 1993). Further, they avoid boomerang effects by demotivating households who already have a high pro-environmental motivation (see the results in Allcott & Rogers, 2014; Schultz et al., 2007).

Hypothesis 2 *A prescriptive norm is more effective than a descriptive norm for shifting consumers' electricity demand towards green energy.*

Concerning the tax, the literature does not provide any guidelines on whether a tax on conventional energy, i.e., on nuclear energy in our study, is more or less effective than the behavioral instruments described above for increasing the demand for green energy. However, as a tax puts an additional price on the consumption of conventional (nuclear) energy, and because monetary considerations are clearly important for consumers in electricity markets (Kaenzig et al., 2013), we expect the demand for nuclear electricity to decrease if it is taxed and thus, the demand to shift towards green electricity, relatively to the non-tax cases.

Hypothesis 3 *A tax on nuclear energy leads to an increase in the demand for green electricity.*

Policy-makers are interested in the differential effects of policy instruments if markets are moved from monopolistic to competitive structures (which means moving from a small to a large choice set for consumers). For formulating these hypotheses, we mainly draw on the literature on the effects of increasing choice complexity on people's decision strategies and the attributes on which they base their decisions on. As stated above when introducing Hypothesis 1, we expect that people faced with a large choice set focus more on the price attribute to the detriment of other potential attributes of electricity contracts, such as the environmental impact of the electricity generation technology, to reduce the complexity of the choice. As the tax increases prices, it should be effective in shifting the demand towards green energy in both market regimes.

Hypothesis 4 *A tax on nuclear electricity increases the demand for green electricity, both in the small and in the large choice set.*

[9] Note also that one of the policy instruments we tested was the introduction of a tax on nuclear energy. With that tax nuclear energy is surpassed by hydro energy as the cheapest source of energy. Therefore, Hypothesis 1 does not apply in that specific scenario.

As the behavioral policy instruments, i.e. the descriptive and prescriptive norm, work through other canals than price signals, we expect them to be less effective in the large choice set.

Hypothesis 5 *Descriptive and prescriptive norm interventions are successful in shifting demand towards green electricity in the small choice set but not in the large choice set.*

2.4.3 Preferences for Domestic vs. Foreign Energy

From the individual perspective of rational and purely self-interested consumers, it should not matter where the electricity they purchase is produced, as electricity is a perfectly homogeneous good. However, it seems as if there exist preferences for domestically or non-domestically produced electricity and there are several arguments how to explain such preferences. On the one hand, concerns about securing national energy autonomy could lead to a preference for domestically produced energy. On the other hand, concerns about local negative externalities (e.g., the risks associated with nuclear energy production or the visual effects of wind-turbines on landscapes, etc.) may lead to a preference in the other direction. We will analyze the results in this regard in an exploratory fashion in section 2.5.3.

2.5 Results

We report the results of our experiments in three steps. First, we look at the effects of the size of the choice set (large vs. small) on the demand for nuclear vs. green electricity (hydro, wind and solar energy), thus focusing on Hypothesis 1. Second, we analyze the effectiveness of different policy instruments for steering electricity consumption towards renewable sources, and whether and how the effectiveness of these instruments is affected by an increase in the size of the choice set. This corresponds to testing Hypotheses 2 to 5. Third, we analyze participants' preferences for domestic vs. foreign energy, i.e., whether they are willing to pay higher prices for the same electricity product depending on where the electricity is produced.

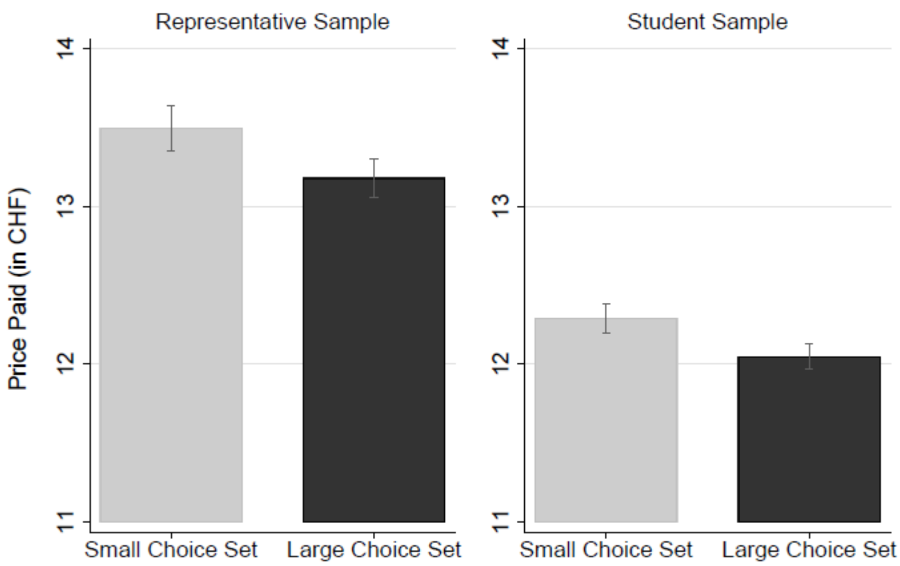
2.5.1 Effects of Small vs. Large Choice Set

In line with Hypothesis 1, people faced with the large choice set chose cheaper contracts with less green energy than people faced with the small choice set. These effects hold both in the representative and in the student participants sample. Figure 2 and 3 show the average price (in CHF) of the electricity contracts chosen by the participants and the shares of green electricity (hydro, wind, or solar energy) in the chosen contracts for the small and the large choice set conditions. In both figures, the panel on the left-hand side displays the result for the representative sample, and the panel on the right-hand side portrays the result for the student sample.

Table 1 shows the results of OLS regressions allowing to test the statistical significance of the differences in average prices paid and shares of green energy between the small and the large choice set. In columns (1) and (2) the dependent variable is the price paid by the participant (in CHF) and in columns (3) and (4) it is the shares of green energy (in percent) in the chosen electricity contracts. "Large Choice Set" is a dummy independent variable taking on the value 0 if a participant was faced with a small choice set and value 1 if the participant was faced with the large choice set. The regression results show that the effect of a large choice set on price paid and shares of green energy chosen is marginally significant in the representative sample ($p = .10$ for both dependent variables) and (highly) significant in the student sample ($p = .04$ for price paid and $p < .01$ for the shares of green electricity in the chosen contract).[10]

Thus, participants in the large choice set tended to choose cheaper contracts than participants in the small choice set. Green energy is currently still more expensive than conventional (nuclear) energy in Switzerland. In line with our Hypothesis 1, this led participants in the large choice set to choose contracts with less green electricity than participants in the small choice set.

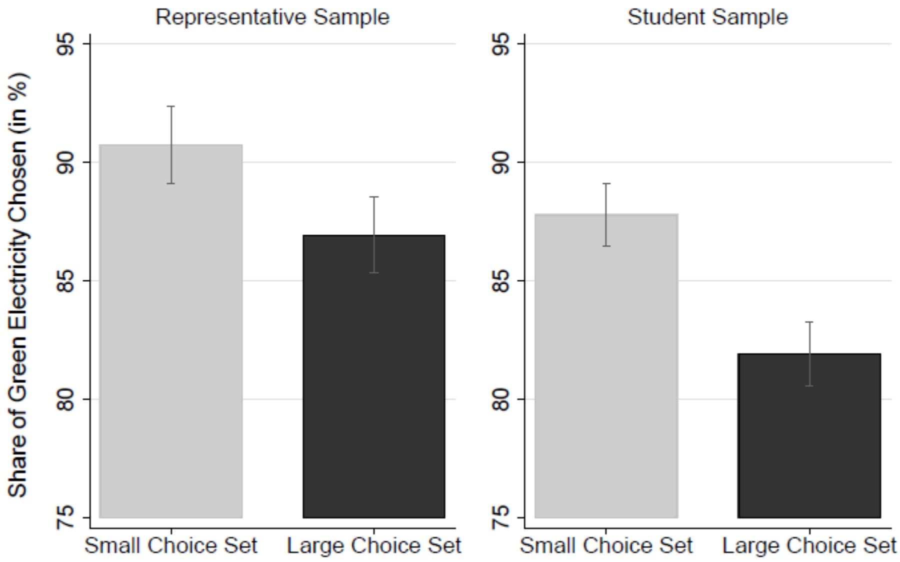
Figure 2: Prices of Chosen Electricity Contracts



Notes: The figure shows the average price of the chosen electricity contracts in the representative (left panel) and the student sample (right panel). Error bars represent plus/ minus one standard error of the mean. Number of participants: Small Choice set, representative sample: $n = 314$; large choice set, representative sample: $n = 296$; small choice set, student sample: $n = 607$; large choice set, student sample: $n = 605$.

10 Note that all p-values shown in this report are for two-tailed significance tests.

Figure 3: Shares of Green Electricity in Chosen Contracts



Notes: The figures show the average shares of green electricity (percent of hydro, wind or solar energy) in the chosen electricity contracts in the representative (left panel) and the student sample (right panel). Contracts were for a total of 150 kWh of electricity. Error bars represent plus/ minus one standard error of the mean. Number of participants: Small choice set, representative sample: $n = 314$; large choice set, representative sample: $n = 296$; small choice set, student sample: $n = 607$; large choice set, student sample: $n = 605$.

Table 1: Effects of Large Choice Set on Prices Paid and Shares of Green Electricity

	Price Paid (in CHF)		Share of Green Electricity (in %)	
	(1)	(2)	(3)	(4)
	Repr. Sample	Student Sample	Repr. Sample	Student Sample
Large Choice Set	-0.32^{*}	-0.24^{**}	-3.82^{*}	-5.88^{***}
	(0.19)	(0.12)	(2.29)	(1.88)
Constant	13.50^{***}	12.29^{***}	90.76^{***}	87.81^{***}
	(0.14)	(0.09)	(1.64)	(1.33)
R^2	0.004	0.003	0.005	0.008
Observations	610	1212	610	1212

$^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$

Notes: Robust standard errors are in parentheses. The dependent variable in columns (1) and (2) is the price a participant paid (in CHF) for the chosen electricity contract. The coefficients can be directly interpreted as monetary units (CHF) spent on the chosen electricity contract. In columns (3) and (4) the dependent variable is the share of green electricity (hydro, solar or wind energy, in percent) in the chosen contract. Thus, the coefficients can be interpreted as percentages. The small choice set is the omitted baseline category represented by the constant. Data collapsed across all other experimental conditions.

To gather evidence on people's choice processes, and in particular on the importance of the price attribute in the small compared to the large choice set, we featured sorting options on the decision screens in our experiment. The standard display of electricity contracts was in a random order. However, participants had the possibility to sort contracts by either price or name. We find that participants in the large choice set conditions chose to sort by price significantly more often than participants in the small choice set conditions ($z = 4.83, p < .01$ in the representative and $z = 8.00, p < .01$ in the student sample).[11] This finding shows that people seem to rely more on the price attribute to make their decisions as the choice set size increases, thus providing some insights into the mechanism behind the effect we find on green electricity demand.

In the post-experimental questionnaire, we asked participants to rate (on 5-point Likert scales) how difficult they had perceived the electricity contract choice to be and to indicate how important the prices respectively the energy sources were for their decisions. In both participant samples, people in the large choice set perceived choosing an electricity contract as significantly more difficult than people in the small choice set ($t = 3.97, p < .01$ in the representative and $t = 5.41, p < .01$ in the student sample). The manipulation of the choice set size we implemented in our experiments thus indeed led to a more complex choice environment in the large choice set conditions. However, there were no significant differences between the small and the large choice set conditions in participants' self-reported answers about the importance of the price ($t = 1.09, p = .27$ in the representative and $t = 1.21$, $p = .23$ in the student sample) or the electricity source ($t = 0.65$, $p = .52$ in the representative and $t = 0.42$, $p = .67$ in the student sample).[12] Thus it seems that the increased focus on the price that led people to choose cheaper contracts in the large choice set was not a conscious decision strategy employed by participants, but rather occurred unconsciously.

2.5.2 Effects of Policy Instruments

One of the main interests of our research is the question which policy instruments are effective in steering household electricity demand towards renewable sources. Moreover, we also want to analyze how the increase in the choice set size, which comes with market liberalization, affects the effectiveness of different policy instruments.[13] This part thus focuses on Hypotheses 2 to 5.

[11] Note that also the use of the sorting by name option increased in the large compared to the small choice set, indicating that a larger choice set also simply increases the need for sorting. However, the increase in sorting by name caused by the large choice set was only statistically significant in the representative sample ($z = 2.04, p = .04$) but not in the student sample ($z = 1.39, p = .16$). Moreover, in both samples, the increase in the use of the price sorting option was stronger than the increase in the use of the name sorting option ($\chi 2(2) = 31.15$, $p < .01$ in the representative and $\chi 2(2) = 104.92$, $p < .01$ in the student sample).

[12] In the post-experimental questionnaire, we also asked participants about their satisfaction with the choice they made and about the importance of the production location (Switzerland or Germany) for their decision (also on 5-point Likert scales). There are no significant differences between the large and the small choice set for these two variables (satisfaction: $t = 1.63$, $p = .10$ in the representative and $t = 0.16$, $p = .88$ in the student sample; importance of production location: $t = 0.71$, $p = .48$ in the representative and $t = 0.09$, $p = .93$ in the student sample).

[13] Note that the results reported in this section are all based on the student sample, as we tested the effectiveness of the different policy instruments only in that sample.

Table 2 provides the results of regression analyses that allow assessing the effectiveness of the different policy instruments we tested in our experiments for shifting the demand towards green electricity (columns 1 and 2) or, more narrowly, towards green electricity from Swiss sources (columns 3 and 4). The dependent variable in columns (1) and (2) is thus the shares of green electricity (hydro, wind, or solar energy) both from Switzerland or Germany. In columns (3) and (4) the dependent variable captures the shares of green electricity from Swiss sources only. To compare the effectiveness of the different policy instruments between the small and the large choice set conditions, columns (1) and (3) consider only data from the small choice set conditions, whereas columns (2) and (4) consider only data from the large choice set conditions. In all regressions the respective baseline condition without any policy instrument (or anchor contract) is the omitted base category that is captured by the constant. In the baseline conditions, participants made their choices for an electricity contract without any experimental manipulations such as an anchor contract, social norm interventions or taxes. The regression coefficients thus show by how much a given policy instrument (respectively the anchor contract) in the small or the large choice set shifted the demand towards (Swiss) green electricity compared to the control condition without any policy instrument.

Considering first the demand for green electricity overall and focusing on the small choice set (column (1) of Table 2), we find that all policy instruments and also the anchor contract led to a positive shift in demand towards green electricity. However, only the tax on nuclear electricity achieved a significant increase in the demand for electricity from renewable sources ($p < .01$) by making conventional electricity relatively more and green electricity thus relatively less expensive. The positive effects of the other policy instruments are not statistically significant ($p = .15$ for the prescriptive norm and $p = .26$ for the descriptive norm). Also, the anchor contract (placed on Swiss hydro energy) did not lead to a significant increase in the shares of green electricity overall ($p = .78$).[14]

[14] The anchor contract did, however, lead to an increase in demand for Swiss hydro energy (which was the electricity source contained in the anchor contract), both in the small and in the large choice set in the representative sample. We discuss these results in section 2.5.3.

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Table 2: Effects of Anchor Contract and Policy Instruments

	Share of Green Electricity (in %)		Share of Green Electricity from CH (in %)	
	(1)	(2)	(3)	(4)
	Small Choice Set	Large Choice Set	Small Choice Set	Large Choice Set
Anchor Contract	1.21	−5.02	3.02	6.27
	(4.28)	(3.74)	(5.70)	(5.14)
Prescriptive Norm	6.32	−0.63	3.88	4.56
	(4.35)	(4.12)	(6.33)	(5.76)
Descriptive Norm	5.11	−12.09***	2.08	−3.14
	(4.48)	(4.54)	(6.40)	(5.81)
Tax	16.12***	10.12***	11.73*	6.16
	(3.22)	(3.11)	(6.16)	(5.76)
Constant	82.89***	83.63***	55.92***	53.04***
	(3.07)	(2.40)	(4.04)	(3.65)
R^2	0.029	0.042	0.006	0.007
Observations	607	605	607	605

$^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$

Notes: Robust standard errors are in parentheses. The dependent variable in columns (1) and (2) is the shares of green electricity (hydro, solar or wind energy, in percent) in the chosen contracts. In columns (3) and (4) it is the shares of green electricity from Swiss sources. The Base condition is the omitted baseline category represented by the constants. Columns (1) and (3) consider only data from the small choice set conditions, columns (2) and (4) consider only data from the large choice set conditions.

In the large choice set (column (2) and (4) of Table 2), the traditional policy instrument in the form of a tax on nuclear electricity continued to have a significantly positive effect on the demand for green electricity ($p < .01$). The prescriptive norm, in contrast, was clearly ineffective ($p = .88$). For the descriptive norm we even find a significantly negative effect on the shares of green electricity in the large choice set ($p < .01$). This may be somewhat surprising. However, one potential explanation could be that this finding corresponds to the potential boomerang effects of descriptive norm feedback documented in previous literature (e.g., Allcott & Rogers, 2014; Schultz et al., 2007). The anchor contract had a non-significant effect on the shares of green electricity overall in the large choice set ($p = .18$).

The regression analyses reported in columns (1) and (2) of Table 2 provide some evidence in line with our Hypothesis 2 stating that prescriptive norms would be more effective than descriptive norms for increasing the demand for green electricity. In the small choice set, there is no significant difference between the two ($p = .79$ in a post- estimation F-test), but in the large choice set the prescriptive norm fared better than the descriptive norm ($p = .03$). However, this latter difference is mainly due to the backfiring of the descriptive norm and not to the good performance of the prescriptive norm.

We do find clear evidence in agreement with Hypotheses 3 and 4 concerning the effectiveness of a tax. In line with both of these hypotheses, the tax is effective both in the small and in the large choice set. Indeed, the tax is the only policy instrument that had a significantly positive effect on the demand for green electricity in any of the two choice set conditions.

Finally, the evidence is only partly in line with Hypothesis 5, stating that descriptive and prescriptive norms would be successful in shifting demand towards green electricity in the small choice set but not in the large choice set. In fact, we find that the norm interventions were only directionally but not significantly successful in the small choice set. In line with the hypothesis, however, they were clearly unsuccessful, or even counterproductive, in the large choice set.

Turning to the second dependent variable considered in columns (3) and (4) of Table 2, the shares of demand for green electricity from Swiss sources, we find that the tax led to a (marginally) significant positive effect in the small choice set ($p = .06$ in the regression reported in column 3). This positive effect was mainly due to an increase in the demand for Swiss hydro energy, which was more than 10 percentage points higher in the condition with a tax on nuclear energy compared to the base condition with no tax (see also Figure 5 in section 2.5.3). Participants also consumed more Swiss solar energy in the tax treatment but to a much lesser degree. The consumption of wind energy from Switzerland was hardly changed by the introduction of a tax on nuclear energy. In the large choice set, the effect of the tax on the shares of green energy from Swiss sources was directionally positive, but not statistically significant ($p = .29$). For the prescriptive norm, we also see positive effects on the shares of green electricity from Switzerland, without reaching statistical significance ($p = .54$ in the small and p $= .43$ in the large choice set). The descriptive norm had non-significant effects ($p = .75$ in the small and $p = .59$ in the large choice set), and the same holds for the anchor contract ($p = .60$ in the small and $p = .22$ in the large choice set).

Taken together, the results on the effectiveness of different policy instruments that we tested in the experiment with the student sample clearly show that, among the tested instruments, a tax on conventional energy is the most effective tool for shifting consumer demand away from conventional and towards green electricity. The tax had a statistically significant effect in the desired direction both in the small and in the large choice set conditions.

2.5.3 Preferences for Domestic vs. Foreign Energy

In general, participants in both the representative and the student sample chose electricity contracts with energy predominantly from Swiss sources. This is noteworthy, as for a given production technology the sources of German origin were always cheaper than the Swiss sources, even though the price differences were rather small.[15] Specifically, in the representative sample, 80% of the electricity in the chosen contracts came from domestic production. In the student sample 63% came from domestic production, likely reflecting a higher price sensitivity of the student participants.

Figure 4 (for the representative sample) and Figure 5 (for the student sample) show the

[15] As a reminder, the exact prices per kWh were the following: nuclear CH 0.07 CHF, nuclear DE 0.06 CHF, hydro CH 0.08 CHF, hydro DE 0.07 CHF, wind CH 0.13 CHF, wind DE 0.09 CHF, solar CH 0.20 CHF, solar DE 0.09 Rp.

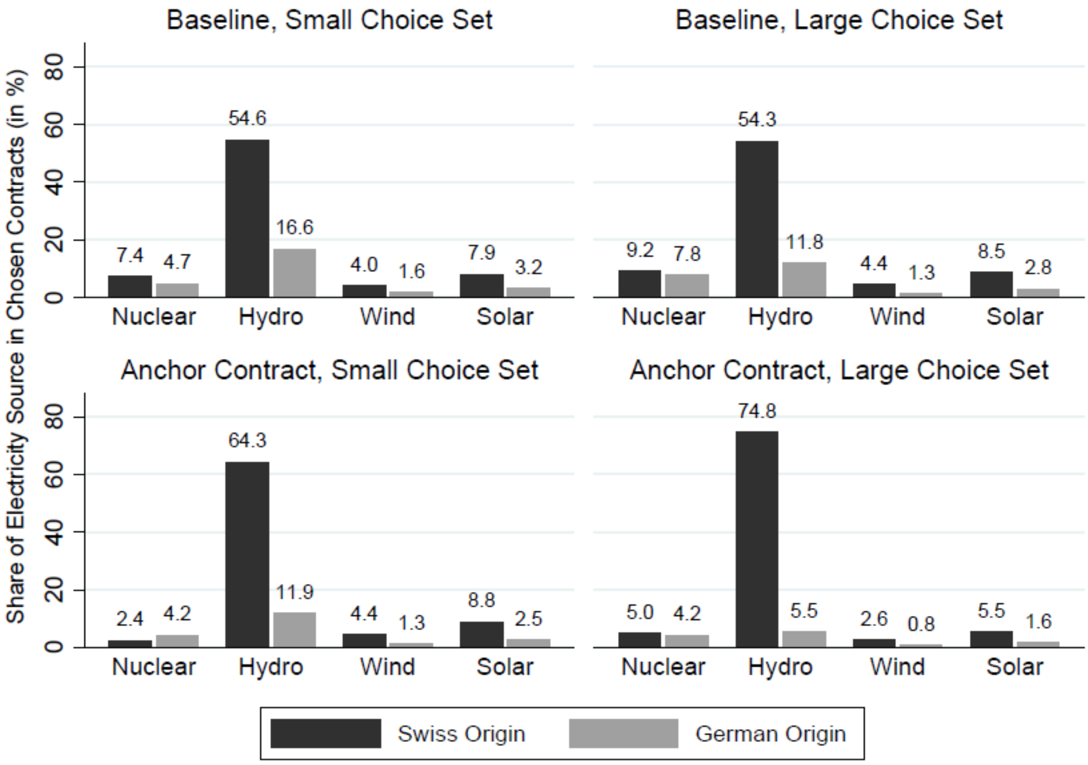
electricity mix of the average chosen contract in terms of production technology (nuclear, hydro, wind, or solar energy) and origin of production (Switzerland or Germany). The data shows that the preference for domestically produced renewable energy was observed in all experimental treatments and in both samples. Specifically, for all renewable sources (hydro, wind, and solar), participants always chose a larger share of domestic compared to foreign production. This was not the case for nuclear energy, where the cheaper German source was more frequently preferred. This latter finding could indicate that people choosing nuclear energy were the most price sensitive and simply went for the cheapest electricity source (which was nuclear energy from Germany in all treatments except for the tax treatments).

Figure 4 and 5 show that Swiss hydro energy proved to be most popular with participants. Overall, in the representative sample, Swiss hydro energy made up for 62.1% of the electricity in the chosen contracts in the representative sample and 52.2% in the student sample. In every single experimental condition, Swiss hydro energy was the most popular energy source.

In the representative sample, we can see that the presence of the anchor contract consisting of 100% Swiss hydro energy further increased the share of Swiss hydro energy that was consumed. Specifically, the anchor contract significantly increased the share of Swiss hydro from 54.6% to 64.3% in the small choice set ($t = 2.21$, $p = .03$) and from 54.3% to 74.8% in the large choice set ($t = 5.29$, $p < .01$). The increase in the share of Swiss hydro energy caused by the anchor contract in the large choice set was (at the margin) significantly more pronounced than in the small choice set ($t = 1.84$, $p = .07$). This is in line with the idea that the anchor contract becomes more attractive as the choice complexity increases in the large choice set (see also the results by Jilke et al., 2016). In the student sample, however, the effect of the anchor contract on the share of Swiss hydro energy in the chosen contracts was less pronounced and not statistically significant ($t = 0.53$, $p = .60$ in the small choice set and $t = 1.58$, $p = .11$ in the large choice set).

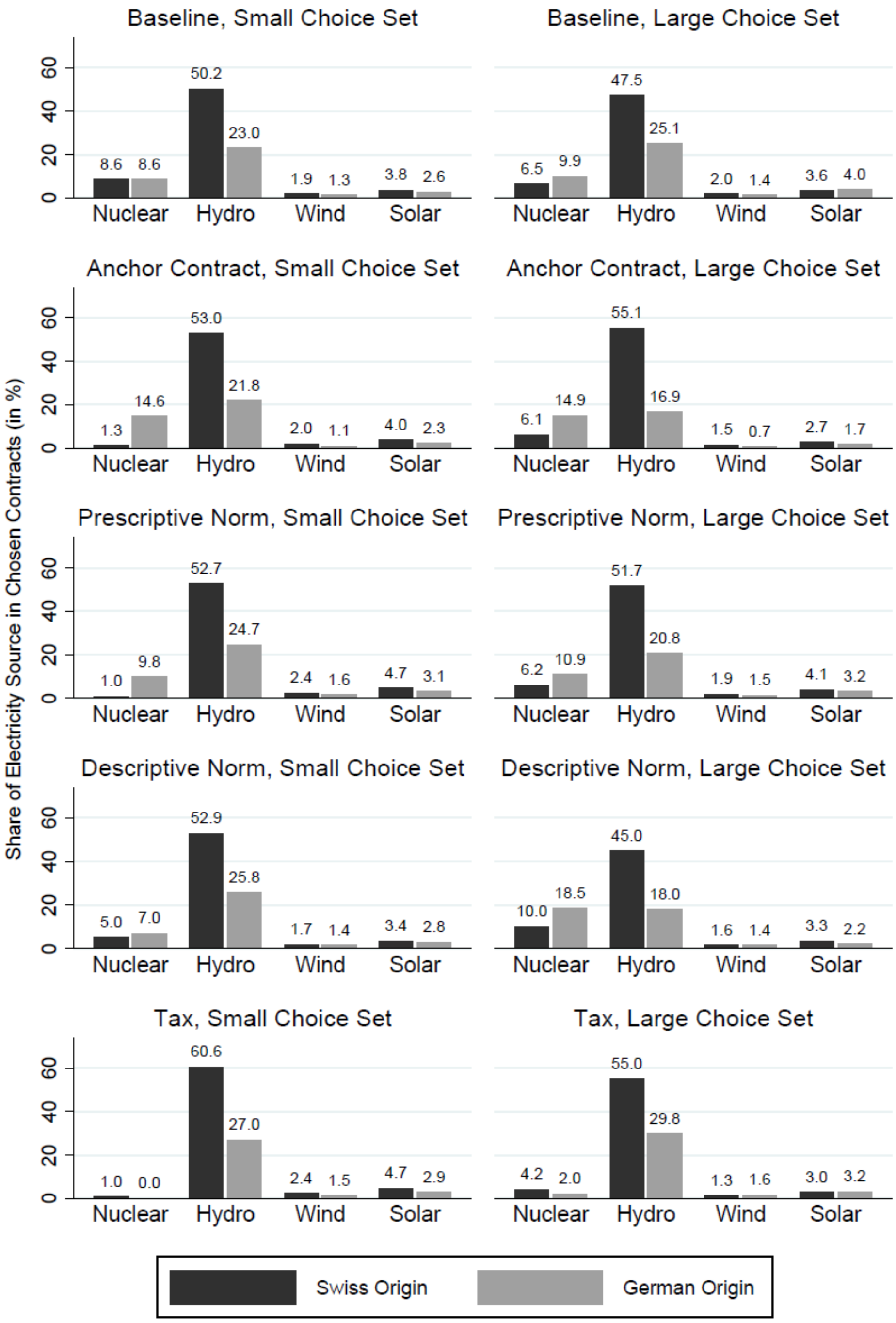
In summary, there is a clear preference for domestic green energy (mainly hydro energy) in both samples. This preference prevails even in the presence of higher prices for Swiss renewables compared to German renewables. A tax on nuclear energy and an anchor contract set on Swiss hydro energy both lead to a shift in demand towards Swiss hydro energy.

Figure 4: Representative Sample: Shares of Electricity Sources by Origin



Notes: The figure shows the average shares of each electricity source, separated by the country of origin, in the chosen electricity contracts in the representative sample. Contracts were for a total of 150 kWh of electricity. Number of participants: Baseline, small choice set: $n = 149$; baseline, large choice set: $n = 147$; anchor contract, small choice set: $n = 165$; anchor contract, large choice set: $n = 149$.

Figure 5: Student Sample: Shares of Electricity Sources by Origin



Notes: The figure shows the average shares of each electricity source, separated by the country of origin, in the chosen electricity contracts in the student sample. Contracts were for a total of 150 kWh of electricity. Number of participants: Baseline, small choice set: $n = 152$; baseline, large choice set: $n = 153$; anchor contract, small choice set: $n = 151$; anchor contract, large choice set: $n = 151$; prescriptive norm, small choice set: $n = 102$; prescriptive norm, large choice set: $n = 100$; descriptive norm, small choice set: $n = 100$; descriptive norm, large choice set: $n = 101$; tax, small choice set: $n = 102$; tax, large choice set: $n = 100$.

2.6 Discussion and Conclusions

In this report on subproject A, we have reported the results from incentivized economic experiments investigating how the increased choice of electricity contracts in liberalized electricity markets affects consumer demand for green and for conventional electricity. Given that the choice of an electricity contract is already a cognitively demanding task, we hypothesized that the increased choice complexity in liberalized markets would lead consumers to revert to simpler decision strategies that help them to reduce cognitive effort. We find evidence in two different participant samples that consumers faced with larger (compared to a smaller) choice sets focus more on easily understandable attributes of electricity contracts, such as prices, to the detriment of attributes that are harder to understand, such as the environmental impacts of electricity production. This leads to a shift in demand away from renewable green electricity into the direction of cheaper conventional electricity. Such an effect may reduce the profitability of renewable electricity production and undermines the required transition from conventional to renewable electricity sources.

In our experiment with the student sample we tested which policy instruments are effective for shifting demand from conventional to renewable electricity. Our findings suggest that levying a tax on conventional (nuclear) electricity has the biggest impact on decreasing the level of nuclear electricity consumed and, at the same time, fostering the demand for renewable electricity. Behavioral instruments such as a prescriptive or descriptive norm did not achieve significant effects in our experiment. For the descriptive norm we even saw a backfire effect, i.e. the consumption of nuclear electricity increased significantly in that experimental condition. Importantly, the tax proved to be effective both in the small and in the large choice set conditions, suggesting that it can be a helpful instrument even after a possible market liberalization.

Furthermore, our results provide evidence that there exists a consumer preference for domestic production of renewable electricity compared to foreign sources. The preference for domestic production is especially pronounced in the case of hydro energy but the result applies to all renewable energy sources tested in our experiment and in both of our participant samples. As the Swiss-produced electricity was more expensive for the participants in our experiment, consumers seem to be willing to pay a price premium to support domestic production of renewable electricity. This is an encouraging finding in the light of the energy transition, as it suggests that consumers are ready to contribute financially (by paying higher prices) towards building up facilities for the production of renewable electricity in Switzerland.

Our results lead to a number of policy recommendations. First, in order to make sure that after a possible market liberalization consumer demand does not shift away from renewables back to conventional energy, policy makers could consider taking or promoting certain accompanying measures. As the results from our experiment indicate, consumers react to an increased choice complexity in larger choice sets by applying simpler decision strategies. In the case of electricity contract choices, an easy choice strategy for consumers is to focus more on prices and less on environmental attributes. This effect could potentially be countered by trying to make environmental attributes easier to understand and process for consumers. One approach could be, for instance, to assign an "environment score" to each possible electricity contract. Ideally, this information should be provided to consumers at the point where they are comparing different contracts when making a decision, this means, for instance, on online comparison platforms (e.g., verivox.de in Germany). Of course, such a score would need to placed prominently such that the salience of the environmental dimension also increases. Further research on how such tools should be designed and placed in order to make a difference is still needed.

Second, our results indicate that a standard economic intervention in the form of a tax on nuclear electricity is more effective than social norm interventions for shifting demand towards electricity from renewable sources. In our experiments all social norm interventions failed to produce statistically significant effects, and in the large choice set condition the descriptive norm intervention even backfired. Thus, although positive effects of social norms on energy conservation has been documented in previous research (e.g., Allcott, 2011), our study finds no evidence that they can also be effective for fostering more environmentally-friendly electricity contract choices. However, as we have implemented only a limited number of behavioral interventions, future research should continue testing the effectiveness of different forms of behavioral interventions (social norms and others) to reach the desired policy goals in the household electricity market. When successful, behavioral interventions are highly attractive policy tools, as they are often low-cost measures which are easy to implement and still guarantee the freedom of choice to the consumers.

With regard to the implementation of a tax as a policy instrument to steer the demand in the household electricity market, important questions remain concerning the exact design as well as the public and political support for such a tax. In our experiments, we applied a simple uniform tax on conventional (nuclear) electricity. However, there are other possible forms of taxes such as basing the level of the tax on the carbon intensity of the energy production or on other environmental impacts. An important question concerning the introduction of a tax is the support of the public. Future research should therefore shed light on which tax design is best at achieving the desired results and at the same time obtaining public and political support. Importantly, as the results of subproject B contained in this report demonstrate, there may also be trade-offs between ensuring public support and the effectiveness of the tax, for instance if tax revenues are earmarked for certain forms of green spending.

In conclusion, we hope that our results provide helpful inputs into the discussion about a possible liberalization of the Swiss energy market for private households and the effect of such a liberalization on the demand for green electricity. More broadly, our results show that policy makers should pay attention to the design of the consumers' decision environment in the household electricity market, as this may have relevant effects on the relative demand for green vs. conventional electricity.

3 Subproject B: How Revenue Earmarking Impairs the Steering Function of Green Taxes

Subproject Summary

Green taxes, for instance on carbon emissions, are a prominent policy instrument for decreasing the consumption and reducing the negative external effects involved in the production or consumption of goods with a problematic environmental footprint. A tax leads to higher consumer prices, which typically lowers the consumption, the intended goal of a steering tax. However, in this report we provide evidence from laboratory experiments that green taxes may be less effective than assumed because of unintended behavioral effects. Especially earmarking the revenues of a green tax for environmental purposes—a practice that is popular with voters and policy makers—can crowd out consumers' intrinsic motivation to avoid negative externalities. If this is the case, the tax not only increases consumer prices but also raises consumers' willingness to pay for the taxed good. This, in turn, can offset the price effect and lowers the intended consumption-reducing effect of the tax. Our results suggest that such unintended behavioral effects can be avoided by not earmarking the tax revenue.

3.1 Introduction

The production and consumption of many goods causes negative environmental externalities. Burning fossil energy, for instance, leads to greenhouse gas emissions such as CO_2. These emissions constitute a negative externality that is not reflected in market prices leading to an overconsumption of externality-causing goods compared to the socially optimal level. According to Pigou (1920), consumption can be brought down to the socially optimal level by internalizing the negative externality via a tax mirroring the social and environmental damages caused by the externality. Whereas calculating the exactly correct amount of a Pigou-tax is almost impossible in practice, green taxes or environmental levies, that simply aim at reducing the consumption of externality- causing goods, are frequent. Examples are the Swiss CO_2 levy on fossil fuels or CO_2 taxes in other countries.

Carbon taxes, specifically, are an increasingly prominent policy instrument aimed at decreasing the consumption of CO_2-intensive goods and services. By introducing such taxes and decreasing the consumption of these goods, policy makers aim to reduce the negative external effects involved in the production and consumption of such goods. According to basic microeconomics, a tax typically leads to higher consumer prices, which then lowers the demand. In this subproject B, we consider the non-standard behavioral effects of green taxes. Specifically, from a behavioral economics perspective two questions arise: First, what does levying a green tax mean for consumers' personal motivation to reduce negative externalities voluntarily? Can such a tax crowd out consumers' intrinsic motivation to avoid negative externalities in their consumption decisions (Frey, 1999; Nyborg, 2010)? Second, does the effect on consumers' personal motivation depend on the framing of the tax spending, and especially on the purposes the tax revenue is used for?

In practice, there are different ways in which tax revenues may be spent. First, tax revenues may be used for compensating third parties experiencing damages because of a negative externality. Tax revenues could be earmarked to curb the negative effects of the externality either now or in the future (e.g., CO_2 compensation projects or green spending in general). Internationally, we find a number of green taxes with their revenues flowing into some sort of green spending (e.g., Japan's tax for climate change mitigation or the French energy consumption tax; see Carl & Fedor, 2016, for an overview). In Switzerland, one third of the revenues generated by the CO_2 levy on fossil fuels is earmarked for measures and subsidies for building refurbishments to increase energy efficiency. Second, in order to avoid that a steering levy increases governments' general tax revenues and thus the tax burden for citizens, tax revenues might be redistributed to consumers. In Switzerland, such a redistribution is currently implemented for the remaining two thirds of the revenues generated by the CO_2 levy on fossil fuels. Finally, the tax revenues could be used to finance regular government activities.

The use of revenues created by green taxes is an important topic in the political and public debate on a possible introduction of such tax schemes. Indeed, Kallbekken et al. (2011) and Beiser-McGrath & Bernauer (2019) have found that voters' acceptance of a green tax depends crucially on how the accrued tax revenue is spent, and that acceptance can be increased if the tax revenues are earmarked for green investments or for compensating the environmental damages caused by the consumption of the taxed good.

From a behavioral economics perspective, the decision on how the tax revenues are spent may be relevant for the effectiveness of the tax. The spending purpose may impact on the extent to which the tax reduces the consumption of the taxed good and thus the amount of negative externalities caused by that consumption. Specifically, "moral licensing" may occur when the tax revenues are explicitly earmarked for environmental purposes. Moral licensing in this context means that paying a green tax that partially internalizes the negative externalities of a polluting activity, makes people feel "licensed" to engage in this activity more often. The tax may thus crowd out people's intrinsic motivation to avoid negative externalities (see also Frey, 1992a, 1999; Nyborg, 2010; Nyborg et al., 2006). In the end, the effect of earmarking the tax revenues may be counterproductive and even increase the amount of behaviors triggering negative externalities.

Previous empirical studies have shown that voluntary participation in carbon offsetting programs can lead to such licensing or crowding-out effects (Harding & Rapson, 2013; Jacobsen et al., 2012). It seems as if—at least for some consumers—carbon offsetting can work as a mechanism to assuage "guilt" and to justify engaging in polluting activities (see also Lange et al., 2014; Lange & Ziegler, 2017).[1] Compared to voluntary offsetting programs, a compulsory carbon tax touches a lot more people. Yet, it is ex- ante unclear whether such a tax leads to similar behavioral mechanisms as voluntary offsetting. From a researchers' point of view, it therefore matters to investigate whether an earmarked tax has similar licensing effects. From a policy-makers' perspective it is equally important to understand such potential unintended behavioral effects of a green tax. Moreover, policy-makers might be particularly interested in the design of a tax that avoids such effects.

To test the unintended behavioral effects of green taxes, we designed an incentivized laboratory experiment in which participants made decisions about whether or not to buy a consumption good that causes a negative externality in the form of CO_2 emissions. By comparing experimental treatments with and without carbon tax, and by comparing different forms of handling the tax revenues ("burning" it, redistributing it to participants or earmarking it for environmental purposes), the experiment aims at answering two main research questions: Can green taxes have unintended effects by providing a justification for people to engage more in polluting activities? And does this effect depend on how the tax revenues are used?

Our results indicate that indeed a tax with earmarked revenues for environmental purposes (CO_2 compensation projects specifically) seems to crowd out participants' intrinsic motivation to avoid negative externalities. Hence, the effectiveness of the tax in terms of its steering function is

[1] It is important to note, however, that the availability of offsetting possibilities does not necessarily lead to an increase in consumption of the polluting good and that the net effect of offsetting possibilities on emissions does not have to be negative. The latter mainly depends on the effectiveness or the price of the offsetting technology (see Lange & Ziegler, 2017, for a theoretical model).

reduced.[2] We do not observe such an effect when the tax revenues are not earmarked.

We further tested the effectiveness of green taxes in two different decision environments: an individual decision-making set-up, in which participants in the role of consumers make individual buying decisions without interacting with each other, and a market set-up in which the externality-causing good is traded between buyers and sellers in a double auction. We find that earmarking fully eliminates the consumption- reducing effect of the green tax in the individual decision-making set-up, leading consumption to revert back to the levels of a no-tax baseline. In the market set-up, the earmarked tax even backfires leading to a higher level of consumption than in the no- tax baseline. The evidence from our experiment thus shows that earmarking the tax revenue is not advisable if policy-makers desire to reach a steering effect with the introduction of the tax. The fact that earmarking tax revenue does not achieve a reduction in consumption of the taxed good is especially important when trying to comply with high CO_2 reduction goals.

The report on subproject B proceeds as follows: Section 3.2 briefly summarizes and discusses related literature; section 3.3 describes the experimental design in detail; section 3.4 presents behavioral hypotheses; section 3.5 describes the results and section 3.6 discusses the implications of our results and concludes.

3.2 Related Literature

Many pro-environmental behaviors are voluntary and involve a cost for the individual (e.g., in the form of effort or a reduction in comfort) without yielding a direct tangible benefit. Moral motivations and intrinsic motivation are therefore particularly relevant in this domain (see, e.g., Steg, 2016; Turaga et al., 2010, for overviews). There are various studies showing that engaging in pro-environmental behaviors depends to a large extent on people's intrinsic or moral motivation (see, e.g., Bamberg & Möser, 2007, for a meta-analysis). Some studies show that moral motivation predicts the extent to which participants are willing to decrease their car use (Eriksson et al., 2008) or that moral motivation is the strongest predictor of recycling behavior (Saphores et al., 2012). In line with this, Taufik et al. (2015) argue that acting in a pro-environmental way is intrinsically rewarding and yields a "warm glow" like other altruistic behaviors.[3]

Since many decades, the concept of intrinsic motivation is well established and very influential in social psychology. It is typically used to distinguish between intrinsically motivated actions

[2] In this paper, we focus on the steering function of green taxes. When talking about tax effectiveness, we thus mean the extent to which a tax is effective in steering consumption decisions in a desired direction, for instance, in order to reduce the amount of CO2 caused by the targeted consumption. If the goal is to move closer to net zero emissions, consumption patterns need to change and steering taxes on CO2-intensive goods are a prominently discussed policy instrument to achieve such changes (e.g., Metcalf, 2009; Tvinnereim & Mehling, 2018).

[3] Taufik et al. (2015) find that study participants who were told that they had acted environmentally- friendly actually perceived the current room temperature to be higher than participants who were told that they had acted environmentally-unfriendly; thus a "literal warm-glow."

that people take out of their pure free will and extrinsically motivated actions that they take because of external forces such as rewards, punishments or restrictions (see, e.g., Deci & Ryan, 1985; Ryan & Deci, 2000). By the nature of their discipline, economists tend to emphasize the power of external incentives. Yet, in the meantime, the importance of intrinsic motivation has been recognized and integrated into behavioral economics approaches (e.g., Bénabou & Tirole, 2003; Frey, 1992b, 1997; Le Grand, 2003). In our case, the intrinsic motivation to avoid negative externalities harming other people or the environment is closely related to the idea of social preferences and moral considerations. The importance of such social preferences has been increasingly studied by (behavioral) economists in the last three decades (see, e.g., Fehr & Schmidt, 2006, for an overview). For instance, Andreoni (1990) has coined the term “warm glow” to explain why people—in contrast to the predictions of the rational and selfish actor (“homo oeconomicus”) model—engage in altruistic actions that do not have a direct benefit to themselves. Moral motivation in the sense that people want to do the morally right thing has been studied increasingly and its importance has been recognized for situations when individual choices cause positive or negative externalities for other people or the environment (e.g., Bénabou et al., 2018a, b; Bénabou & Tirole, 2006; Brekke et al., 2003).

An important and frequently discussed issue is the possibility that extrinsic incentives can crowd out intrinsic motivation. The concern is that the introduction of external rewards or punishments can weaken people’s intrinsic motivation. Specifically, crowding-out of intrinsic motivation might occur when people feel externally controlled or when people feel that an intervention liberates them from their personal responsibilities (Frey & Jegen, 2001). Several empirical studies have documented such crowding out effects in various domains (see, e.g., Frey & Jegen, 2001 for a general overview or, for instance, Gneezy & Rustichini, 2000a, b; Mellström & Johannesson, 2008; Pellerano et al., 2017, for specific cases).

As discussed above, intrinsic motivation seems particularly important in the environmental domain. Hence, it is crucial to understand the relationship between intrinsic and extrinsic motivation when designing policy instruments in the environmental area (Bowles & Hwang, 2008; Frey, 1999). Directly speaking to our research questions, Nyborg (2010) has discussed the possibility that the introduction of green taxes could undermine people’s intrinsic moral motivation to behave in an environmentally-friendly way. Based on a theoretical model, Nyborg et al. (2006) have shown that if a green tax is perceived as reducing individuals’ responsibility for environmental outcomes, it might crowd out consumers’ moral motivation to act pro-environmentally. In line with this conjecture, Lanz et al. (2018) find that a price increase framed as a Pigouvian tax is less effective in reducing the consumption of externality-causing goods than a neutral price increase that is not linked with a tax (see also Perino et al., 2014).

Our report on subproject B builds on this literature and advances it by providing an experimental test of whether and under which circumstances the introduction of a green tax can indeed reduce consumers’ intrinsic motivation to avoid negative externalities caused by their consumption decisions. We provide a new aspect to this discussion by studying whether the possible crowding-out effect depends on the specific design of the tax, notably on the spending purpose the tax revenue. We hypothesize that earmarking tax revenues for environmental purposes leads to crowding-out as it weakens consumers’ responsibility for a negative externality. Given the current political and public debate on the introduction of green tax schemes, for instance to reduce CO_2 emissions, and on how the revenues from such schemes should be used, this is a particularly relevant topic.

3.3 Experimental Design

To study the unintended behavioral effects of green taxes and the conditions under which they emerge, we developed a novel laboratory experiment, in which participants were presented with the choice to purchase an (abstract) good with a (monetary) consumption value to the buyer. Yet, the purchase also leads to an increase of CO_2 emissions into the atmosphere, thus entailing a negative externality for the environment. We implemented the negative externality by buying and subsequently retiring a number of CO_2 certificates on the European Market for Emission Trading.[4] The number of retired certificates depended on the trading and buying decisions of the participants in the experiment, so that it was possible to specify the marginal impact of each buying decision on CO_2 emissions. Specifically, we retired one fourth of a certificate (corresponding to 0.25 *t* of CO_2) less for each purchase of the good in the experiment (please refer to the experimental instructions displayed in Appendix B.1. and B.2. to see how exactly this mechanism was implemented and explained to the participants).

The experiment consisted of a 4x2 between-subjects design, in which we implemented four different experimental tax treatments: a no-tax baseline; a tax that was collected but "burnt" (corresponding to revenues being used in the general budget); a tax that was redistributed to participants, and a tax that was earmarked for environmental purposes. The four experimental tax treatments were conducted in two types of decision environments: an individual decision-making set-up and a competitive market set-up. In the following, we first describe the two decision environments and then the four experimental tax treatments.

3.3.1 Decision Environments

Similar to Kirchler et al. (2016),[5] who studied the effectiveness of different policy instruments for promoting pro-social behavior, we investigated the behavioral effects of different forms of a green tax in two different decision environments. In one setting, participants indicated their WTP for purchasing the good using a price list similar to the Becker-DeGroot-Marschak mechanism (Becker et al., 1964). The second setting was a competitive market setting, in which the good was traded between buyers and sellers in a double auction. The individual decision-making set-

[4] We first intended to buy and retire certificates on the Swiss market for emissions trading. However, as the Swiss market was linked with the European market for emission trading on January 1st, 2020, we finally bought the certificates on the European market.

[5] We are grateful to Kirchler et al. (2016) for sharing their experimental materials and software files with us.

up serves to measure the pure effect of a tax on people's individual WTP for the taxed good, in the absence of any strategic or competitive considerations. The market set-up extends the perspective by considering that most goods are bought by consumers in competitive markets, which may have an effect on moral considerations that are potentially relevant for goods that carry negative externalities (see, e.g., Bartling et al., 2015; Falk & Szech, 2013). We describe the two set-ups in more detail below.

Individual Decision-Making: Price Lists. The individual decision-making set-up serves to measure participants' WTP for buying the experimental good or, inversely, their WTP to avoid the emission of 0.25 *t* of CO_2. Participants had to choose between two options in 26 decision pairs. Each decision pair constituted of the following two options: Not buying the good (option A) vs. buying the good (option B). The consumption value of the good, which was realized when a participant chose to buy the good was always 50 CHF. However, the price for buying the good (in option B) varied and decreased by 1 CHF per decision pair, starting at a price of CHF 35 and going down to CHF 10 in the no-tax baseline. In the tax treatments a tax of 5 CHF was added to the purchase price in each decision pair. As the price decreased, the monetary payoff a participant could receive from choosing to buy the good (option B) increased by 1 CHF per decision pair (starting from 15 CHF in the first pair and going up to 40 CHF in the no-tax baseline, and from 10 CHF up to 35 CHF in the tax treatments). The monetary payoff associated with choosing not to buy the good (option A) remained constant across all decision pairs and was always 15 CHF. The decision screen showed the monetary profit made for both options in each decision pair and the CO_2 emissions caused by the option (screenshots of decision screens are featured in the experimental instructions displayed in Appendix B.1.). The experiment was run for ten periods. For each participant, one decision pair in one of the ten periods was randomly selected and the choice made by the participant in that selected pair was implemented and relevant for the participants' payout and for the CO_2 emissions. Participants were made aware of this procedure in the instructions. As the decision pair and thus the price to be paid for the good was determined randomly, participants could not affect the price of the good by strategically altering their WTP. This procedure thus ensures that we elicited individual participants' true WTP for buying the good (Becker et al., 1964).

Markets: Double Auctions. In the market environment, participants were randomly assigned to the role of either a buyer or a seller of the good and were matched with each other in markets of four buyers and five sellers each. Each buyer or seller could buy or sell a maximum of one unit of the good. As there were more sellers than buyers in each market, the markets were competitive and one seller would typically not be able to trade. Trading took place in ten periods, with each period lasting for three minutes during which trading was possible. Trades were made in a double auction format, where buyers could enter buying offers specifying the maximum price, they were willing to pay (bid offers) and sellers could enter selling offers specifying the minimum price at which they were willing to sell (ask offers). A trade was concluded if a buyer accepted a selling offer from a seller or, conversely, if a seller accepted a buying offer from a buyer (screenshots of decision screens are featured in the experimental instructions displayed in Appendix B.2.). Each concluded trade caused a negative externality of 0.25 *t* of CO_2 as explained above. For sellers, the monetary profit associated with trading corresponded to the price sellers received. For buyers, the profit amounted to the consumption value of the good (50 CHF, as in the individual decision-making treatments) minus the price paid in the trade. In the no-tax baseline, the price sellers received was equal to the price buyers paid. In the tax treatments, a tax of 5 CHF was collected per trade, which meant that the price buyers had to pay was always 5 CHF higher than the price sellers received. If participants (both sellers or buyers) did not conclude a trade, they earned a no-consumption outside option worth 15 CHF (identical to the payoff of not buying the good in the individual decision-making treatments). As in the individual decision-making treatments, one period was randomly selected and the trades made (or not made) in that period were relevant for participants' payouts and for the CO_2-emissions.

3.3.2 Tax Treatments

As described above, we implemented four different tax treatments in each of the two decision environments.

Base: No Tax. In the baseline treatment no tax was levied on the externality-causing good.

Burnt: Tax Collected and "Burnt". In this treatment a tax of 5 CHF was added to the purchase price. The tax revenue was not used in any further way, i.e., the collected amount was simply destroyed. However, the tax and its purpose of reducing consumption was made salient to participants. Specifically, participants were told in the instructions that "to reduce emissions, a CO_2 tax of CHF 5 is levied on the good" (note that the same wording was also used in the other tax treatments that are described below). Apart from the price effect, the Burnt tax treatment thus also contains the moral signal that goes together with a tax.

Redistributed: Tax Collected and Revenue Redistributed to Participants. Also in this treatment, a tax of 5 CHF was levied on the good. The tax revenue was fully redistributed to participants. The redistribution occurred within groups of 9 participants (corresponding to the size of one market in the market treatments). Each participant thus received one ninth of the collected tax revenue, independent of whether the participant consumed (or traded) the good or not. This treatment corresponds to a frequently used form of environmental levies (e.g., the CO_2 levy on fossil fuels in Switzerland), for which (parts of the) tax revenues are redistributed evenly to the population in order to ensure that the tax has a steering effect, while not increasing the overall tax burden in the economy.

Earmarked: Tax Collected and Used for CO_2 compensation. Again, a tax of 5 CHF was levied on the good. In this treatment the tax revenue was earmarked for environmental purposes. Specifically, participants were informed that the tax revenue would be used "to finance existing projects, which aim to reduce global CO_2 emissions." Participants did not receive any information about the effectiveness of these projects. They were simply informed that the money collected through the tax in the experiment would be donated to myclimate, a Swiss NGO specialized in CO_2 compensation projects. Participants were provided with two examples of such projects (moorland renaturation in Switzerland and the financing of efficient cooking stoves in Kenya), without going into further details. This treatment corresponds to the frequent call of earmarking green taxes for environmental purposes in order to make them more attractive to voters (e.g. Beiser-McGrath & Bernauer, 2019; Kallbekken et al., 2011).

3.3.3 Data Collection and Procedure

The experiment was conducted in November 2019 at the Decision Science Laboratory at ETH Zurich and was implemented by using the software zTree (Fischbacher, 2007).

In total, we had 215 participants in the individual decision making treatments (number of participants per tax treatment: Base: n = 54, Burnt: n = 54, Redistributed: n = 54, Earmarked: n = 53) and 279 participants in 31 markets in the market treatments (number of markets per tax treatment: Base: n = 8, Burnt: n = 8, Redistributed: n = 8, Earmarked: n = 7).[6] The ETH Decision Science Laboratory recruited participants for the experiment from the participant pool for economic and behavioral experiments at ETH Zurich and the University of Zurich using the software hroot (Bock et al., 2014), following standard procedures in the lab. We did not specify any exclusion restrictions (e.g., based on study subject) for the recruitment. The participant pool consists mainly of students at ETH Zurich and the University of Zurich. In the individual decision-making treatments participants' mean age was 22.06 years (sd = 2.67) and 55.81% of participants were women. In the market treatments mean age was 22.97 years (sd = 5.08) and 57.35% of participants were women.

Tax treatments were randomly assigned to participants within an experimental session, whereas the decision environment (individual decision making vs. markets) was randomly assigned to sessions. Random assignment to tax treatments (within a session) was conducted by participants drawing their seat-number out of a bag. We aimed at having 36 participants per session, but because of no-shows, the actual session size varied between 27 and 36 participants.[7] Sample sizes had been determined in advance based on statistical power calculations using the results from pilot sessions.

Participants received detailed written instructions at the beginning of every experimental session and had to answer correctly several control questions before the experiment was started. While the participants read the instructions, they had the possibility to ask comprehension questions, which were answered in private. In the market treatments, subjects participated in one trial period that did not have any payoff consequences, in order to familiarize themselves with the market set-up and the trading interface. In the individual decision-making environment, no such trial period was conducted, as the set-up was more straightforward. Finally, a summary of the instructions was read aloud before the experiment started. After the experiment, participants answered a short post-experimental questionnaire on their motivation behind their decision-making processes, environmental and political attitudes, demographics and their overall satisfaction with the experiment.

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[6] Note that for the market treatments, we treat a market as the independent unit of observation, as participants interacted with each other within a market. To account for this, in the statistical analyses we cluster standard errors at the market level in the market treatments (as is customary in the literature, see, e.g., Bartling et al., 2015; Kirchler et al., 2016). In the individual decision-making treatments participants made decisions independently from each other and we can thus treat participants as the independent unit of observation. Where appropriate, we cluster standard errors at the participant level in the statistical analyses.

[7] No-shows are also the reason why we have only seven markets for the Earmarked Tax market treatment instead of eight for which we had aimed.

Participants earned on average 32.00 CHF in the individual decision-making sessions and 31.60 CHF in the market sessions, always including a show-up fee of 10 CHF. An experimental session lasted for around 30 to 45 minutes for individual decision making and for around 60 to 75 minutes for markets. Note, however, that we invited participants for 75 minutes for all sessions in order to avoid any selection effects based on the duration. To implement the negative externalities, we bought and retired CO_2 certificates corresponding to 30.25 *t* of CO_2 on the European market of emissions trading.[8] If no purchases had occurred at all in the experiment, we would have bought and retired certificates corresponding to 84.75 *t* of CO_2.[9] The participants' decision in the experiment thus increased the potential maximum of emissions by 54.5 *t* of CO_2. To implement the earmarking, we donated the tax revenue of 295 CHF from the randomly selected choices and periods in the Earmarked Tax treatments to myclimate, a Swiss NGO, for CO_2 compensation projects.

3.4 Behavioral Hypotheses

The introduction of a tax is a standard policy tool when trying to reduce the consumption of a particular good that causes negative externalities. As long as neither demand or supply are perfectly price-inelastic, a tax will have an effect on the demand side and reduce consumption because it increases the price, which consumers have to pay.

In this subproject, however, we want to extend the perspective of how the introduction of a green tax—a tax on carbon emissions in our experiment—affects consumption decisions by considering not only the above-described price effect of a tax but also potential non-standard psychological effects. In particular, building on the perspective of Frey (1999) and Nyborg et al. (2006), we hypothesize that levying a green tax can affect consumers' intrinsic motivation to avoid consuming goods that cause a negative externality (e.g., carbon emissions in the case of our experiment). To illustrate how this process may work, consider the following utility function of a decision maker who needs to decide whether or not to consume an externality-causing good. The consumption utility (U_{cons}) of the decision maker who decides whether or not consume a unit of the good is given by:[10]

$$U_{cons} = v - p - t - \theta x \tag{1}$$

[8] We thank Compensators e.V., a German NGO, for handling these transactions for us.

[9] If all 215 participants in the individual decision-making set-up had chosen not to buy the good in the randomly selected decision, we would have retired 215 × 0.25 = 53.75 *t* of certificates. In the market set- up, there were 31 markets with 4 buyers each. If none of these 31 × 4 = 124 buyers had bought the good in the randomly selected period, we would have retired 124 × 0.25 = 31 *t* of certificates. Thus, in total the maximum number of certificates we would have retired (if none of the participants' decisions had caused an externality) would have corresponded to 53.75 + 31 = 84.75 *t*.

[10] Note that, corresponding to the decision-making situation in our experiment and to simplify the ex- position, we reduce the analysis to a binary decision between consuming or not consuming one unit of the externality-causing good.

In this utility function v corresponds to the consumption value of the good, which was implemented as a monetary benefit in our experiment (fixed at 50 CHF), p is the (market) price the consumer pays for the good, and t is a possible tax that increases the amount a consumer has to pay for the good (note that $v \geq 0, p \geq 0, t \geq 0$). The variables v, p, and t are the determinants of the consumption decision according to standard economics, with a rational decision maker choosing to consume the good, whenever $v - p - t$ is more attractive than the non-consumption alternative (which was fixed at 15 CHF in our experiment). The variable x captures the extent of the negative external effect the consumption has on the environment (in our case this corresponds to the negative environmental effects of the emission of 0.25 t of CO_2, e.g., in terms of global warming), and the parameter θ ($\theta \geq 0$) captures an individual's concern about (or felt "guilt" because of) this negative externality. Parameter θ thus determines the extent by which the fact that his or her consumption decision has a negative external effect on the environment reduces the decision maker's overall utility from consuming the good. In a first step, one can think of θ as being relatively large for people with a high concern for the environment and of being zero for people who do not care at all about the environment and the negative external effects their consumption decisions have. Note that $\theta = 0$ corresponds to the standard homo oeconomicus case of pure self-interest, reducing consumption utility to $U_{cons} = v - p - t$.

The utility function defined in (1) captures the consumption reducing effect of a tax. Whenever a tax $t > 0$ is introduced, consumers will buy less of the good.[11] This holds also for consumers who care for the environment, i.e., consumers with $\theta > 0$, as long as we assume that θ does not depend on t. We assume that this case corresponds to our Burnt Tax treatment.

Hypothesis 1 *In the Burnt Tax treatment, the consumption of the externality-causing good will be lower than in the no-tax Baseline.*

Most interesting in our experiment is, however, the possibility that the levying of a green tax may actually reduce people's concern about or felt guilt because of the externality. Specifically, we hypothesize that earmarking the tax revenue for environmental purposes can actually assuage the (intrinsic) disutility felt about causing the negative externality. Participants may believe that because of the earmarked tax something positive will be done to cope with the externality. As the extent of the externality x remains constant, in terms of the utility function defined in (1), this would correspond to a dependency of θ on the presence and size of the tax: $\frac{d\theta}{dt} < 0$. Ceteris paribus, a decreasing concern about the externality θ, means that the consumption option is better than the no-consumption outside option for higher prices than before. Thus, a decrease in the concern about the externality, i.e., a decrease in θ, should manifest itself via a willingness to pay higher prices for the externality-causing good.

Hypothesis 2 *The WTP for buying the externality-causing good is greater in the Earmarked Tax treatment than in the no-tax Baseline and in the Burnt Tax treatment.*

[11] Note that in a market setting the tax burden is shared by buyers and sellers such that the increase in the price buyers pay is only in special cases equal to the full tax amount (notably when supply is perfectly elastic). For the qualitative result that the consumption utility decreases and consumption becomes less likely, it only matters, however, that the price increase because of the tax is positive, i.e. $t > 0$.

Given a possible decrease of the concern for the externality, and the accompanying increase of the WTP for buying the good in the Earmarked Tax treatment, the effect of the Earmarked Tax treatment on consumption (compared to the no-tax Baseline) is ambiguous. It depends on the relative size of the price effect and the decreasing concern effect. Given that the tax amount is the same in the Burnt and the Earmarked Tax treatments, we can formulate a hypothesis for the difference in consumption between these two treatments. As we hypothesize that the Burnt Tax does not affect the concern about the negative externality, whereas we expect the Earmarked Tax to decrease this concern, we have:

Hypothesis 3 *The consumption of the externality-causing good is lower in the Burnt Tax treatment than in the Earmarked Tax treatment*.

Note that we have so-far not formulated a hypothesis for the Redistributed Tax treatment. There is no apparent reason to believe that the redistribution of the tax revenue affects the participants' intrinsic concern about the negative externality of their consumption. Nevertheless, redistribution may affect the consumption choice. To see why, let us extend the consumption utility from (1) to include the redistribution component:

$$U_{cons} = v - p - t - \theta x + \frac{nt}{N} \qquad (2)$$

The added component $\frac{nt}{N}$ captures the amount a consumer receives from the redistribution scheme. N is the number of people in the group within which the redistribution occurs and n is the number of people in that group who consumed the good and paid the tax. Whereas N is fixed and can be known by the consumer, the individual consumer can only guess what the other consumers' decisions are and does therefore not know the exact number n. However, the marginal effect of a given consumer's consumption decision on the amount the consumer gets out of the redistribution scheme is $t/_N$ and is independent of the other consumers' consumption decisions (and therefore also independent of n). Nevertheless, compared to the Burnt Tax treatment, the redistribution element makes consumption more attractive, as it reduces the negative effect of the tax on consumption utility by the marginal effect of an individual's consumption on the individual's receipts from redistribution ($t/_N$). Thus, similar to Hypothesis 3, we can expect that also the Redistributed Tax will lead to higher consumption levels than the Burnt Tax:

Hypothesis 4 *The consumption of the externality-causing good is lower in the Burnt Tax treatment than in the Redistributed Tax treatment.*

Note that in our experiment the number of consumers within a redistribution group was $N = 9$ and corresponded to the number of participants in the Burnt Tax treatment in a given experimental session. Compared to most real-life applications of redistribution schemes, such as for instance the redistribution scheme for the CO_2 tax on fossil fuels in Switzerland, the parameter $N = 9$ in our experiment is very small. This is a relevant difference, because as N

grows larger, the marginal effect of the individual's consumption decision on the proceeds the individual consumer gets from the redistribution system ($^t/_N$) gets smaller and becomes much less relevant. Therefore, if we did find in our experiment that redistribution hurts the effectiveness of the tax, we would need to be careful to extrapolate this finding to real-life tax redistribution schemes in which the number of people among which redistribution occurs is much larger. Nevertheless, by looking at an extreme case, our results are still informative as they establish an upper bound of how much revenue redistribution may hurt the effectiveness of a green tax.

In general, the Redistributed Tax treatment is an interesting treatment for a comparison with the other tax treatments (Burnt and Earmarked). The redistribution of tax revenue is a relevant policy option and a possible alternative to earmarking when it comes to making a green tax a viable option in the political process. In particular, it ensures that tax revenue is not used to finance general government activity, which may help garner support from voters and political parties concerned with the expansion of government activity.

3.5 Results

As outlined in section 3.3 describing the experimental design, we have examined the effects of a green tax in two different decision environments. In the first environment, the individual decision-making set-up, participants made individual decisions on their own in a price list format, without any interactions with other participants. In the second decision environment, the market set-up, participants interacted with each other within competitive markets (four buyers and five sellers). The externality-causing good was traded within these markets and prices as well as trades were determined in a double auction format. In each of these decision-making environments we implemented four different tax treatments (no-tax Baseline, Burnt Tax, Redistributed Tax, and Earmarked Tax). Below we first describe the results of these tax treatments in the individual decision-making set-up and then the results in the market set-up.

3.5.1 Individual Decision Making: Price List Treatments

We start by analyzing whether and how the WTP for the externality- causing good differed between tax treatments, thus testing our Hypothesis 2 about the potential crowding out of the intrinsic concern for the negative externality by an earmarked green tax. We then turn to the analysis of how the WTP translated into consumption levels in the different tax treatments, thus testing Hypotheses 1, 3, and 4.

In line with Hypothesis 2, the top panel of Figure 6 shows that participants' WTP for buying the externality-causing good differed by tax treatment in the individual decision-making set-up. While the tax increased prices by design (by 5 CHF), it also seems to have increased participants' WTP for buying the good, especially in the Earmarked Tax treatment. In column (1) of Table 3, we report the results from OLS regression analyses with the WTP for buying the good as the dependent variable on which treatment dummies were regressed. The Base treatment is the omitted baseline category represented by the constant. As the regression results show, in line with Hypothesis 2, earmarking the tax led to a significant increase in the WTP for the good compared to the no-tax baseline ($p < .01$).[12] Post-estimation tests based on the regression results reported in column (1) of Table 3 reveal that also the differences in WTP between the Earmarked and the Burnt ($p = .04$) and the Earmarked and the Redistributed Tax ($p = .02$) treatments were statistically significant, indicating that it was the earmarking that was the important element for increasing the WTP. The differences with respect to the no-tax baseline were not statistically significant for the Burnt Tax ($p = .30$) and for the Redistributed Tax ($p = .42$), even though there was also a directional increase in the WTP in these two tax treatments.

Another way of looking at this result is to consider the amount of money participants were willing to give up to avoid the negative externality, i.e., to avoid that 0.25 *t* of CO_2 were going to be emitted because of their consumption decision. We can thus frame this amount as the WTP to avoid 0.25 *t* of CO_2. The bottom panel of Figure 6 shows the corresponding results, which were, by design, perfectly symmetric to the WTP for buying the good that is displayed in the top panel of Figure 6. This perspective illustrates the hypothesized mechanism through which the tax affected the WTP: the tax seems to have lowered participants' concern about the CO_2 emissions their consumption would cause. In particular, in the Earmarked Tax treatment participants were less willing to give up money by refraining from buying the good in order to avoid causing the negative externality compared to all other treatments. We summarized this point, which is in line with our Hypothesis 2, in our first result.

Result 1 *The earmarked green tax reduced people's WTP to avoid the negative externality caused by their consumption decision and increased their WTP for buying the externality-causing good.*

Figure 7 shows the development of the WTP for buying the good across the ten decision periods of the experiment in the individual decision-making set-up. The results indicate that in all individual decision-making treatments, the WTP did not change much across periods and that decisions remained relatively stable. Additional regression analyses, not reported here, confirm that there were no significant time trends overall nor in any individual treatment ($p > .10$). Moreover, the WTP was not significantly different in the final period compared to the first in all treatments ($p > .10$).

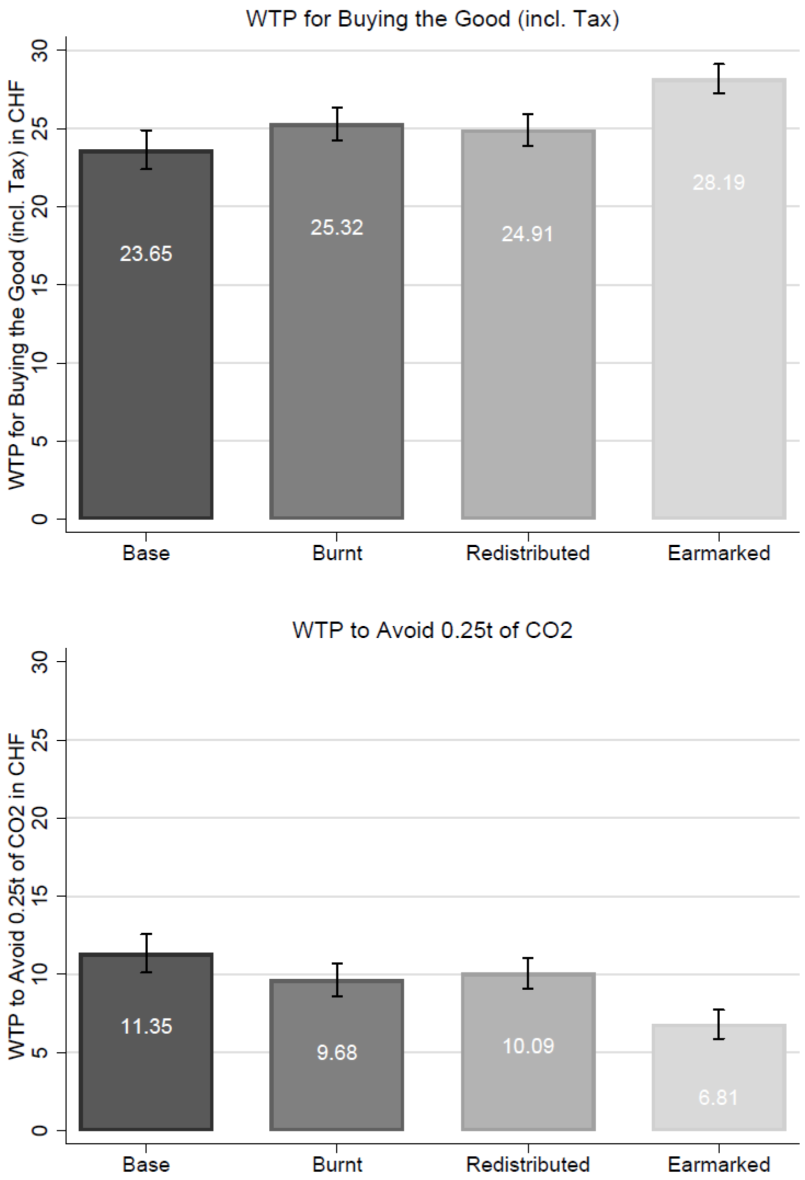
So far, we have established that apart from raising prices green taxes can also increase the WTP for buying an externality-causing good. As this increase in the WTP countervails the increase in the purchase price, the effect of a tax on consumption levels becomes ambiguous. What was the overall effect of the tax on actual purchases in our experiment? Speaking to our Hypotheses 1, 3, and 4, Figure 8 shows consumption decisions, or more precisely, the relative frequency with which participants decided to purchase the good. This frequency can be

[12] Note that all p-values shown in this report are for two-tailed significance tests.

calculated simply as the number of times in which a participant preferred to buy the good to not buying the good divided by the total number of decisions. In each of the 10 periods, there were 26 decision pairs (thus 260 in total across the entire experiment) in which participants had to indicate whether they wanted to buy the good at a certain price (option B) or whether they wanted to refrain from buying the good (option A). The tax was implemented as an increase in the prices reflected in option B, such that participants' consumption utility for option B was always lowered by 5 CHF in all decision pairs in the tax treatments compared to the baseline treatment.

The results displayed in Figure 8 show that in line with Hypothesis 1 the Burnt Tax reduced the consumption compared to the no-tax baseline. The same holds for the Redistributed Tax. However, because of the increase in the WTP, the Earmarked Tax was ineffective and did not lower the relative consumption frequency compared to the baseline. The regression results reported in column (2) of Table 3 provide the corresponding significance tests. Both in Figure 8 and in column (2) of Table 3 the dependent variable is a participant's relative frequency of buying the good, i.e., the number of times in the 26 decisions per period the participant chose to buy rather than not to buy the good. In line with Hypothesis 1, the regression results show that the Burnt Tax led to a significant decrease in consumption compared to the no-tax baseline ($p = .04$). A similar effect occurred for the Redistributed Tax ($p = .02$). The Earmarked Tax turned out to be ineffective, however, as there was no significant decrease in consumption compared to the baseline ($p = .77$). Comparing the consumption between the different tax treatments, we find, in line with Hypothesis 3, that the Burnt Tax led to a significantly lower consumption of the externality-causing good than the Earmarked Tax of the same size ($p = .04$ in a post-estimation test based on the regression results reported in column (2) of Table 3). We do not find support for Hypothesis 4, however. The Redistributed Tax did not reduce consumption by less than the Burnt Tax ($p = .77$). In fact, the Redistributed Tax also reduced the consumption by more than the Earmarked Tax ($p = .02$). These results indicate that earmarking the revenue made the tax ineffective for reducing consumption, whereas redistribution proved to be unproblematic.

Figure 6: Average WTP for Buying the Good or Avoiding the CO_2 Emission in Individual Decision-Making



Notes: The figure shows the average maximum WTP for buying the good (top panel) and the corresponding average WTP for avoiding the negative externality of 0.25 *t* of CO_2 (bottom panel). Error bars represent plus/ minus one standard error of the mean clustered by participant (as every participant made 10 decisions). Number of participants per treatment: Base: $n = 54$; Burnt: $n = 54$; Redistributed: $n = 54$; Earmarked: $n = 53$.

Result 2 *In the individual decision-making set-up, the Earmarked Tax did not lead to a decrease in consumption compared to the no-tax baseline. The earmarking increased people's WTP higher prices caused by the tax. As the Burnt and the Redistributed Tax did not increase the WTP, they were successful in reducing consumption.*

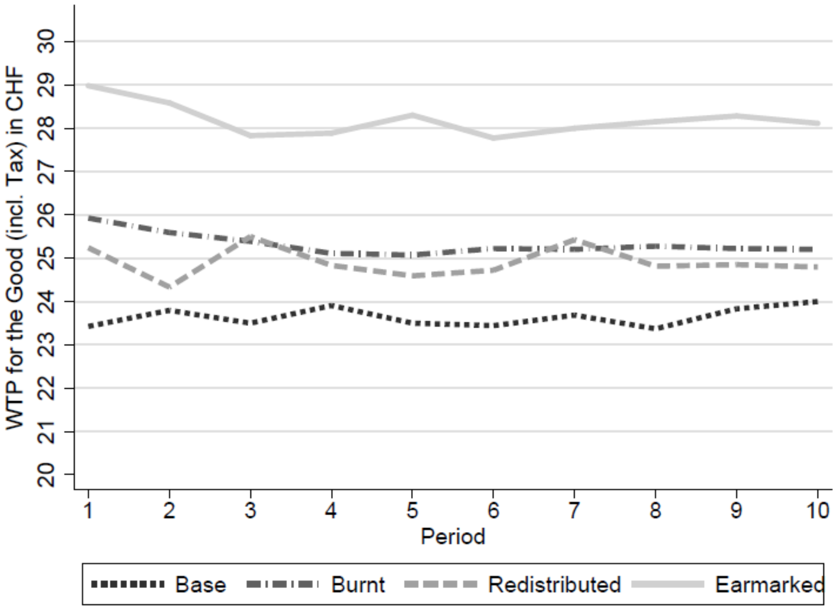
Table 3: Regression Results Individual Decision-Making Treatments

	(1) WTP for Good	(2) Relative Consumption Frequency
Burnt	1.68	-0.13^{**}
	(1.61)	(0.06)
Redistributed	1.26	-0.14^{**}
	(1.57)	(0.06)
Earmarked	4.54^{***}	-0.02
	(1.54)	(0.06)
Constant	23.65^{***}	0.56^{***}
	(1.23)	(0.05)
R^2	0.04	0.04
Observations	2150	2150

$^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$

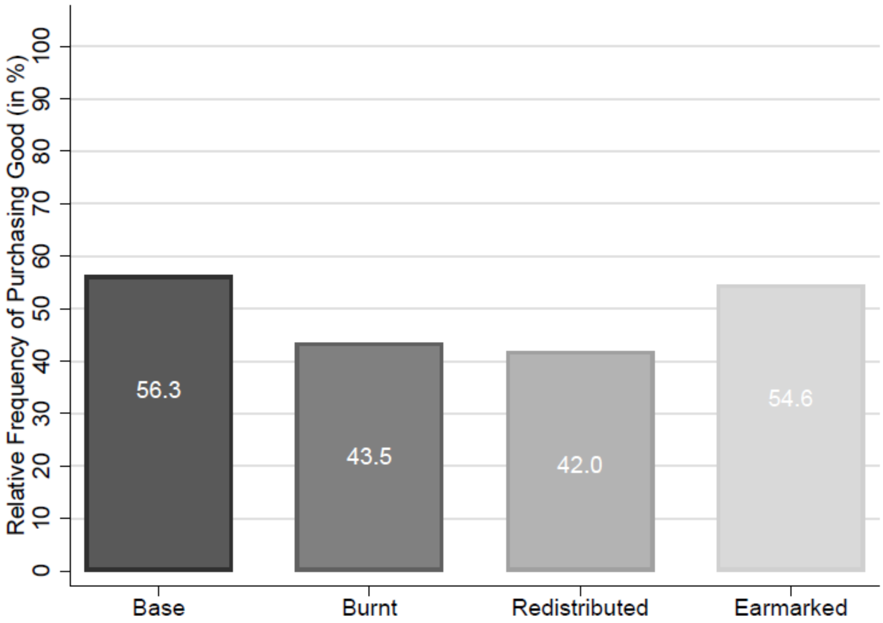
Notes: OLS estimates. Standard errors, clustered by 215 participants, are in parentheses (as every participant made 10 decisions). In model (1), the dependent variable is the WTP for the good in (in CHF) including the tax in the tax treatments. In model (2) the dependent variable corresponds to the percentage of the 26 decision pairs in a period in which a participant preferred buying the good to not buying the good. The independent variables are treatment dummies. The Base condition without a tax is the omitted baseline category represented by the constant.

Figure 7: Average WTP for buying the Good across Periods in Individual Decision-Making Treatments



Notes: The figure shows the average maximum WTP for consuming the good for each of the 10 decision periods separately. Number of participants per treatment: Base: $n = 54$; Burnt: $n = 54$; Redistributed: $n = 54$; Earmarked: $n = 53$.

Figure 8: Average Relative Frequency of Buying the Good in Individual Decision-Making Treatments

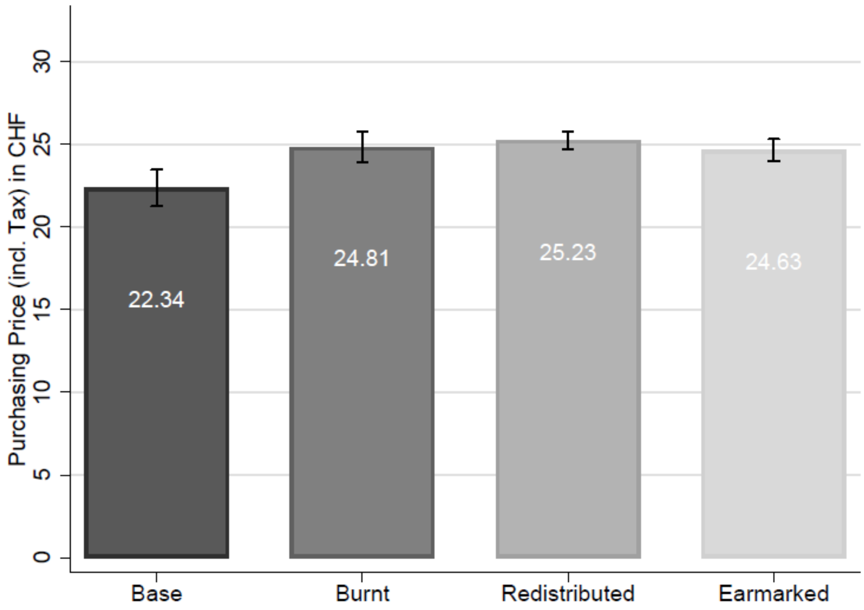


Notes: The figure shows the average relative frequency of purchasing the good for an average participant in each individual decision-making treatment. The relative frequency is derived from dividing the number of choices in which a given participant indicated he or she preferred buying the good to not buying the good divided by the total number of such choices made in each period. Number of participants per treatment: Base: $n = 54$; Burnt: $n = 54$; Redistributed: $n = 54$; Earmarked: $n = 53$.

3.5.2 Market Behavior: Double Auction Treatments

In the market treatments, prices were determined in a double auction. In case of tax treatments, the prices paid by the buyers were always 5 CHF higher than the prices the sellers received, as the tax was deducted from the purchase price. Unlike in the individual decision-making treatments, it was thus ex-ante not clear by how much the tax would increase the purchase prices for the consumers, even though the tax was of the same size. Figure 9 shows the results of the double auction treatments. As expected, the tax did increase purchase prices in all tax treatments compared to the baseline. Regression results reported in column (1) of Table 4 show that the increase in purchase prices compared to the no tax baseline was at least marginally significant in all three tax treatments ($p = .08$ in Burnt, $p = .02$ in Redistributed, and $p = .07$ in Earmarked).

Figure 9: Average Purchase Price Buyers Paid in Market Treatments



Notes: The figure shows the average purchasing price buyers paid in the four double auction treatments (including the tax in the tax treatments). Error bars represent plus/ minus one standard error of the mean clustered by market. Number of markets per treatment: Base: $n = 8$, Burnt: $n = 8$, Redistributed: $n = 8$, Earmarked: $n = 7$.

Figure 10 displays the development of prices across auction periods in the market treatments. Unlike for the WTP in the individual decision-making treatments there were some noticeable trends in the development of purchase prices across periods. The figure indicates that purchase prices increased across periods in Base, whereas they decreased in all three tax treatments. Additional regression analyses, not reported here, show that when "period" is treated as a continuous regressor, the increase in prices over periods in Base nor the decrease in Burnt are statistically significant ($p = .20$ and $p = .18$ respectively). In the Redistributed Tax treatment, the decrease over periods is marginally significant ($p = .07$) and in the Earmarked Tax treatment it is highly significant ($p < .01$). When comparing prices in the first to the final period, we find that the increase in prices is not significant in Base ($p = .35$). In contrast, in all tax treatments there was a significant decrease from first to final period ($p = .05$ in Burnt, $p = .04$ in Redistributed, $p < .01$ in Earmarked). Despite these statistically significant developments over time, we focus the following analyses on the data pooled across periods. We do so because in this second subproject we are mostly interested in the tax effectiveness, i.e., in the consumption-reducing effect of green taxes, and in assessing how unintended behavioral effects can lower the tax' effectiveness.

Table 4: Regression Results Market Treatments

	Purchase Price	Relative Consumption Frequency	
	(1)	(2)	(3)
	OLS	OLS	Probit
Burnt	2.47*	−0.08	−0.26
	(1.38)	(0.08)	(0.28)
Redistributed	2.89**	−0.03	−0.10
	(1.17)	(0.08)	(0.30)
Earmarked	2.29*	0.12**	0.69**
	(1.23)	(0.06)	(0.27)
Constant	22.34***	0.82***	0.92***
	(1.05)	(0.06)	(0.22)
(Pseudo-)R^2	0.11	0.04	0.04
Observations	1021	1240	1240

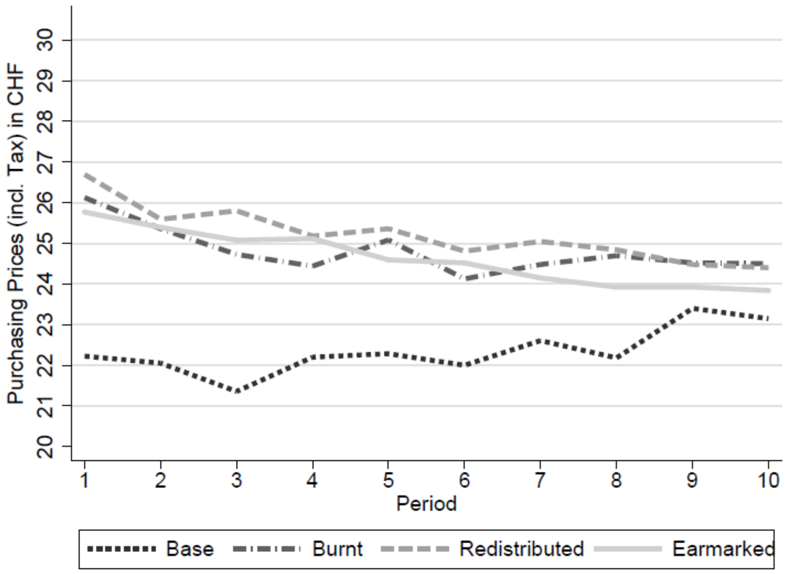
$^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$

Notes: Standard errors, clustered by 31 markets, are in parentheses. In model (1), the dependent variable is the purchasing price paid by the buyers (in CHF) including the tax in the tax treatments. The number of observations corresponds to the total number of trades in experiment. In model (2) the dependent variable is an indicator variable taking on value 1 if a possible trade was concluded and taking on value 0 if it was not concluded. The number of observations corresponds to the total number of possible trades in the experiment. The independent variables are treatment dummies. The Base condition without a tax is the omitted baseline category represented by the constant.

Given the trends displayed in Figure 10, pooling the data across periods, means that our results show a higher consumption-reducing effect of green taxes than the individual lines do. This means that we underestimate the countervailing behavioral effect of a tax (assuming that this effect remains constant across periods). We prefer this approach in order to provide conservative estimate of the behavioral effect of a green tax.

In the individual decision-making treatments, we saw that the Earmarked Tax raised consumers' WTP for buying the good. Given this increase in the WTP because of the tax, it is again an open empirical question how much the price increases due to the tax affected consumption levels in the market set-up. To assess the effects of the tax treatments on consumption, and thus to test Hypotheses 1, 3, and 4 in the market set- up, Figure 11 plots the average relative frequency of realized trades (in percent of all possible trades). This relative frequency indicates how likely it was that a given buyer made a trade and bought the good. Directionally in line with Hypothesis 1, the results show that the Burnt Tax seems to have reduced consumption compared to the no-tax baseline. As in the individual decision-making case, the Redistributed Tax also seems to have decreased the consumption. However, in the market set-up, the Earmarked Tax resulted not only in a higher relative frequency of consumption than the other two tax options but even led to a higher consumption frequency than the baseline.

Figure 10: Average Purchase Price Buyers Paid across Periods in Market Treatments

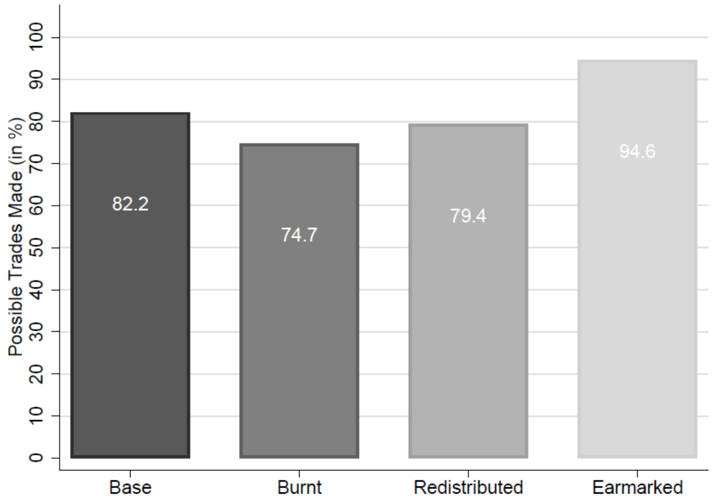


Notes: The figure shows the average purchasing price buyers paid for each of the 10 decision periods separately. Number of markets per treatment: Base: $n = 8$, Burnt: $n = 8$, Redistributed: $n = 8$, Earmarked: $n = 7$.

Columns (2) and (3) of Table 4 provide the corresponding regression results using an OLS and a probit specification respectively.[13] The dependent variable is an indicator variable taking on a value of 1 if a possible trade was concluded and a value of 0 if it was not. The results show that there was only directional support for Hypothesis 1 in the market set-up, as the decrease in trade (and thus in consumption) between the no-tax baseline and the Burnt Tax treatment was not statistically significant ($p = .34$ with OLS, $p = .35$ with probit). The decrease in consumption was also not significant for the Redistributed Tax compared to the baseline treatment ($p = .74$ with OLS and probit). However, the increase in consumption caused by the Earmarked Tax compared to the no-tax baseline was statistically significant ($p = .05$ with OLS, $p = .01$ with probit). Moreover, in line with Hypothesis 3, post-estimation tests (based on the regression results reported in columns (2) and (3) of Table 4) show that the Earmarked Tax led to higher levels of consumption than the Burnt Tax ($p < .01$ with OLS and probit). The same holds for the comparison of the Earmarked Tax with the Redistributed Tax ($p = .02$ with OLS, $p < .01$ with probit). Thus, the earmarking of the tax led to an increase in consumption compared to the other two versions of the tax we tested. There was again no support for Hypothesis 4, as consumption did not differ between the Redistributed and the Burnt Tax treatment ($p = .35$ with OLS, $p = .56$ with probit).

[13] We provide the OLS results in the sense of a linear probability model (see, e.g., Moffitt, 1999; Angrist & Pischke, 2009, pp. 94-99; Wooldridge, 2010, pp. 561-565) to ensure direct comparability with Figure 11.

Figure 11: Average Possible Trades Realized in Market Treatments



Notes: The figure shows the average relative frequency of a trade being made in each treatment (in percent of all possible trades). The relative frequency is derived from dividing the number of trades in a market by the number of possible trades. Number of markets per treatment: Base: $n = 8$, Burnt: $n = 8$, Redistributed: $n = 8$, Earmarked: $n = 7$.

Result 3 *In the market set-up, the Earmarked Tax led to an increase in consumption compared to the no-tax baseline. The Burnt and the Redistributed Tax led to a (non-significant) reduction of consumption compared to the no-tax baseline.*

3.6 Discussion and Conclusions

In this second subproject we have reported the results from a laboratory experiment testing unintended behavioral effects of green taxes. We focused on the example of a carbon tax, a prominent policy instrument for curbing CO_2 emissions and fighting climate change. The intention of carbon taxes is to lower the demand for CO_2-intensive goods by increasing prices. Yet, previous literature has conceptually discussed and theoretically analyzed the idea that such taxes may also have unintended behavioral effects by crowding out consumers' intrinsic moral motivation to act in an environmentally- friendly way. Our experimental results provide empirical evidence to support this. Crowding-out can actually harm the effectiveness of a green tax in terms of its steering function.

Our results are more nuanced, however, and provide clear directions to policy makers on how to design green taxes that are effective in reducing consumption of goods causing negative externalities on the environment. Specifically, we find that earmarking tax revenues for green purposes leads to significant crowding-out effects that make the tax less effective. If the revenues of a green tax are not earmarked (either simply put into the general governmental budget or redistributed back to participants), the price effect of the tax clearly dominates and the tax is effective in reducing the consumption of goods with negative externalities. This finding is particularly relevant for policy-makers who are determined to achieve a high reduction of CO_2 emissions.

The framing of a green tax, specifically the purposes for which the revenues generated by the tax are used, seems to be relevant to ensure the effectiveness of such a tax. Our results suggest that in order to reduce the consumption of a good that causes negative externalities, it is more effective to impose a tax for which revenues are either redistributed to the consumers or flow into the ordinary government budget. Making the explicit link between a tax and green spending does not seem advisable, as it may trigger crowding-out dynamics.

Our results do not mean that green spending per se, e.g., in the form of investing into research aimed at developing environmentally-friendly technologies or other projects that reduce CO_2 emissions in the future, is in general ineffective. The revenues collected by the earmarked tax in our experiment went into projects that will have a positive impact on mitigating the effects of CO_2 emissions. However, our results show very clearly that green spending should not be directly linked to green taxes. It would be more effective to reduce both the consumption of CO_2-intensive goods and to invest into additional measures such as CO_2 compensation projects or technology development projects without linking the two. In principle, this can be easily accomplished by introducing a tax that is not earmarked but simply flows into the ordinary government budget from which green spending can then be financed.

A remaining question is how to ensure politicians' and voters' support for the introduction of green taxes given that the popular option of earmarking proves to make a tax less effective. Answering this question was not the key focus of our study. However, we can offer the observation from our experiment that the redistribution of the tax revenues to participants did not affect the effectiveness of the tax. We obtained this result even though the redistribution occurred within very small groups in our experiment. In reality, redistribution takes place within far larger groups, which makes it even less likely that redistribution has problematic effects that impair the effectiveness of a tax. This is good news as the redistribution of a tax can be a way to garner political support for the introduction of green taxes. The results by Beiser-McGrath & Bernauer (2019) who find that using the revenue from a carbon tax to finance general tax rebates also increases support for a carbon tax to a similar extent as using the revenue for green spending, suggest that this may indeed be a feasible option.

We hope that our results can provide a constructive input on how to design effective carbon (and other green) taxes that reduce the consumption of CO_2-intensive goods and thus contribute to the goal of substantially decreasing global CO_2 emissions. Green tax schemes have recently gained popularity in the political and public debate and are likely to be introduced or extended in many countries in the years to come. It is important that these schemes are designed in the most effective way possible. Our results show that policy makers should pay attention to the framing of these schemes in order to avoid unintended behavioral effects and to ensure optimal effectiveness.

4 Conclusions

This final report contains the results of two subprojects investigating how consumers' demand for green electricity is affected by a possible liberalization of the residential electricity market, and what policy instruments are effective for moving consumer choices toward more sustainable electricity contracts. In our research, we applied a behavioral economics approach to analyze the effectiveness and the design of public policy interventions, hereby stressing the importance of considering non-standard facets of human decision-making.

In our first subproject, we show that moving from a monopolistic to a liberalized residential electricity market affects consumer choices for electricity contracts. In particular, we find that the much larger number of available options in a liberalized market (compared to the current monopolistic set-up) increases the complexity of the electricity contract choice for consumers. To deal with this increased choice complexity in a liberalized market, consumers focus more on prices and less on the environmental attributes of electricity contracts. Given the current pricing structure in the market, with electricity produced from renewable sources being sold at higher prices than conventionally produced electricity, a move to a liberalized market could impair the demand for green electricity. Ceteris paribus, such an effect could reduce the profitability of investments in renewable electricity production. It is thus problematic in light of the goals of the Swiss energy strategy 2050 and the desired transition of electricity generation towards renewable sources. A full market liberalization should therefore go hand in hand with additional measures to ensure that it is not detrimental to the goal of increasing the share of green electricity in the Swiss electricity market.

It could be beneficial, for instance, to introduce measures that facilitate and support the consumers' decision-making process in a liberalized electricity market. One such measure could be the provisioning of online platforms for comparing available electricity contracts. Such platforms should provide, in addition to contract prices, aggregated information on the environmental footprint of different electricity contracts. In general, all choice architecture tools that allow for reducing the choice complexity for consumers and increasing the salience of the environmental dimension of electricity contracts could help to weaken the negative effects of a possible market liberalization on the demand for green electricity. Future research should provide more insights on what specific choice architecture interventions could be most successful in this regard.

An encouraging result from our experiments conducted in subproject A is that participants displayed a preference for electricity from Swiss sources, especially in the case of renewable energy, and most pronounced for hydro energy. We observed this preference for Swiss renewable energy despite the fact that in the choice sets offered to our participants Swiss produced electricity was always more expensive than the electricity produced by the same technology in other countries. This shows that in general, Swiss consumers seem to be willing to contribute to the energy transition in Switzerland by paying a price premium for domestically produced green electricity.

Concerning the effectiveness of policy instruments, the results from subproject A show that a tax on conventional electricity is the most effective instrument to shift the demand from conventional towards green electricity. Behavioral instruments such as social norms were not effective in our set-up. Interestingly, in subproject B we see that the exact design of a green tax matters for a successful reduction of the consumption of goods causing negative externalities. Earmarking the revenues of a green tax for environmental purposes impairs the effectiveness of a tax for reducing the consumption of an externality-causing good. Thus, whereas earmarking revenues for green spending is a popular option to increase the public acceptance of a green tax, it also has the undesirable side effect that it makes the tax less effective for steering consumption. A better option could consist in the redistribution of revenues back to consumers. This option may also make a tax more acceptable, but it does not impair its effectiveness in terms of consumption reduction.

5 Outlook and next steps

The results of our first subproject show that a liberalization of the residential electricity market increases the choice complexity for consumers and that consumers react to this increased complexity by applying simplified decision strategies allowing them to reduce the cognitive effort necessary to select an electricity contract. We find that these simplified decision strategies entail an increased focus on the price of electricity contracts, and that this can hurt the demand for green electricity. The question emerges how such an effect can be avoided or at least weakened. It seems that accompanying measures are needed to reduce the negative effects of a possible market liberalization on the demand for green electricity. Choice architecture interventions and decision aids that decrease the choice complexity and help consumers to navigate the larger choice sets in liberalized markets could be promising. Online comparison platforms (such as verivox.de in the German market) could play an important role in a liberalized market. Ideally, future research should investigate which interventions would be most effective to reduce the choice complexity for consumers and to increase their inclination to take into account the environmental effects of different electricity contracts.

With regard to the effectiveness of different policy instruments, we found that behavioral instruments were not successful in significantly fostering the demand for green electricity. However, we only tested a limited number of specific behavioral instruments, i.e., social norm interventions. There are many other possible policy instruments from the behavioral economics' toolkit that could be considered in future research. The non-significant effects we found for the social norm interventions in our subproject A should not be taken as "proof" that behavioral instruments do not work in general. Some behavioral instruments, such as, e.g., choice defaults, have already clearly proven their effectiveness in the electricity (and other) markets. Further instruments are currently being developed (e.g., personalized nudges building on advances in machine learning) and should be tested more broadly in the near future.

Our research has clearly shown that a tax on conventional electricity can be effective in shifting consumers' demand towards green electricity. The optimal design of such a tax is not fully clear and more research is still needed. Our second subproject already contributes to this research, showing that the way in which tax revenues are spent has relevant effects on the effectiveness of the tax. Revenue earmarking should not be implemented if a decrease in the consumption of conventional electricity and a demand shift towards green electricity is intended. Future research should test further elements of possible tax designs and analyze the effects on both, public support for the tax, as well as tax effectiveness.

6 National and international cooperation

We collaborated with the following Swiss partners: Decision Science Lab at ETH Zurich (for the recruiting of participants and the running of experiments in subprojects A and B); Fairpower AG (for the purchasing of certificates of origin for subproject A); DemoSCOPE AG (for recruiting the participants of the representative sample and running the corresponding experiment in subproject A); and myclimate (for donating to CO_2 compensation projects in subproject B). Internationally, we collaborated with the Compensators E.V. from Germany (for retiring the CO2 certificates for subproject B).

In addition, we benefitted from fruitful exchanges and discussions with other researchers at ETH Zurich, the Center for Energy and the Environment at the Zurich University of Applied Sciences (ZHAW), Radboud University Nijmegen, the University of Innsbruck, IESE Business School in Barcelona, and Pöyry Management Consulting GmbH in Vienna.

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8 Appendices

Appendix Subproject A.

A.1. Electricity Providers Considered for Swiss Electricity Prices

Canton	Electricity Provider
Aargau	AEW
	Eniwa
	EW Oftringen
	EWW Wettingen
	IBB Brugg
	IBW Wohlen
	Regionalwerke AG Baden
	StWZ
	SWL Lenzburg
	TB Suhr
Appenzell-Ausserrhoden	SAK
Appenzell-Innerrhoden	EWA
Basel-Landschaft	EBL
	primo energie
Basel-Stadt	IWB
Bern	BKW
	Energie Thun
	ESB
	EWB
Glarus	TBGlarus
	TBGN
	TBGS
Graubünden	EWD
	IBC Chur
	Repower AG
	Rhiienergie AG
	St. Moritz Energie
Luzern	CKW
	EWL
Nidwalden	EWN
Obwalden	EWO
Schaffhausen	EKS

Schwyz	EKZ Einsiedeln AG EW Höfe AG Freienbach EWS GWA Arth
Solothurn	AEK A.EN Energieversorgung EV Biberist EUG Elektra Untergäu Regio Energie Solothurn SWG
St. Gallen	EW Mels EWB Buchs EWJR Rapperswil-Jona Regionalwerk Toggenburg Sankt Galler Stadtwerke Stadtwerke Gossau Technische Betriebe Flawil Technische Betriebe Goldach Technische Betriebe Rorschach Technische Betriebe Wil (SG)
Thurgau	Arbon Energie EW Aadorf EW Münchwilen EW Romanshorn EW Sirnach Genossenschaft Elektra Egnach RegioEnergie Amriswil Technische Betriebe Bischofszell Technische Betriebe Kreuzlingen Technische Betriebe Wängi Technische Betriebe Weinfelden Werkbetriebe Frauenfeld
Uri	EWA Altdorf
Zug	WWZ
Zürich	die Werke Wallisellen

EKZ
Energie Uster
EWZ
Glattwerk AG
IBK Kloten
Stadtwerke Wetzikon
Stadtwerke Winterthur

A.2. Large Choice Set Base Condition

Stromvertrag: 1

Energiequelle	Anteil	Herkunft	Preis
Kern	0%		
Wasser	80%	CH	15.10 CHF
Wind	5%	CH	
Solar	15%	CH	

Stromvertrag: 2

Energiequelle	Anteil	Herkunft	Preis
Kern	30%	DE	
Wasser	40%	DE	11.00 CHF
Wind	15%	DE	
Solar	15%	DE	

Stromvertrag: 3

Energiequelle	Anteil	Herkunft	Preis
Kern	70%	CH	
Wasser	25%	CH	11.30 CHF
Wind	5%	CH	
Solar	0%		

Stromvertrag: 4

Energiequelle	Anteil	Herkunft	Preis
Kern	90%	DE	
Wasser	5%	CH	9.40 CHF
Wind	0%		
Solar	5%	DE	

Stromvertrag: 5

Energiequelle	Anteil	Herkunft	Preis
Kern	5%	CH	
Wasser	80%	CH	13.80 CHF
Wind	5%	DE	
Solar	10%	CH	

Stromvertrag: 6

Energiequelle	Anteil	Herkunft	Preis
Kern	0%		
Wasser	70%	CH	16.40 CHF
Wind	10%	CH	
Solar	20%	CH	

Stromvertrag: 7

Energiequelle	Anteil	Herkunft	Preis
Kern	95%	DE	
Wasser	5%	DE	9.10 CHF
Wind	0%		
Solar	0%		

Stromvertrag: 8

Energiequelle	Anteil	Herkunft	Preis
Kern	50%	CH	
Wasser	30%	CH	14.30 CHF
Wind	5%	CH	
Solar	15%	CH	

Stromvertrag: 9

Energiequelle	Anteil	Herkunft	Preis
Kern	25%	DE	
Wasser	65%	CH	11.40 CHF
Wind	0%		
Solar	10%	DE	

Stromvertrag: 10

Energiequelle	Anteil	Herkunft	Preis
Kern	25%	CH	
Wasser	65%	CH	13.40 CHF
Wind	0%		
Solar	10%	CH	

Stromvertrag: 11

Energiequelle	Anteil	Herkunft	Preis
Kern	20%	CH	
Wasser	60%	CH	12.00 CHF
Wind	5%	DE	
Solar	15%	DE	

Stromvertrag: 12

Energiequelle	Anteil	Herkunft	Preis
Kern	40%	CH	
Wasser	55%	CH	11.80 CHF
Wind	5%	CH	
Solar	0%		

Stromvertrag: 13

Energiequelle	Anteil	Herkunft
Kern	90%	CH
Wasser	5%	CH
Wind	0%	
Solar	5%	CH

Preis

11.60 CHF

Stromvertrag: 14

Energiequelle	Anteil	Herkunft
Kern	15%	CH
Wasser	70%	CH
Wind	5%	CH
Solar	10%	CH

Preis

14.00 CHF

Stromvertrag: 15

Energiequelle	Anteil	Herkunft
Kern	60%	CH
Wasser	35%	CH
Wind	0%	
Solar	5%	CH

Preis

12.00 CHF

Stromvertrag: 16

Energiequelle	Anteil	Herkunft
Kern	80%	DE
Wasser	15%	DE
Wind	0%	
Solar	5%	DE

Preis

9.50 CHF

Stromvertrag: 17

Energiequelle	Anteil	Herkunft
Kern	100%	CH
Wasser	0%	
Wind	0%	
Solar	0%	

Preis

10.50 CHF

Stromvertrag: 18

Energiequelle	Anteil	Herkunft
Kern	0%	
Wasser	100%	80% CH, 20% DE
Wind	0%	
Solar	0%	

Preis

11.70 CHF

Stromvertrag: 19

Energiequelle	Anteil	Herkunft
Kern	0%	
Wasser	95%	DE
Wind	0%	
Solar	5%	DE

Preis

10.70 CHF

Stromvertrag: 20

Energiequelle	Anteil	Herkunft
Kern	30%	CH
Wasser	40%	CH
Wind	15%	DE
Solar	15%	DE

Preis

12.00 CHF

Stromvertrag: 21

Energiequelle	Anteil	Herkunft
Kern	100%	60% DE, 40% CH
Wasser	0%	
Wind	0%	
Solar	0%	

Preis

9.60 CHF

Stromvertrag: 22

Energiequelle	Anteil	Herkunft
Kern	0%	
Wasser	75%	DE
Wind	10%	DE
Solar	15%	DE

Preis

11.30 CHF

Stromvertrag: 23

Energiequelle	Anteil	Herkunft
Kern	80%	CH
Wasser	15%	CH
Wind	0%	
Solar	5%	CH

Preis

11.70 CHF

Stromvertrag: 24

Energiequelle	Anteil	Herkunft
Kern	0%	
Wasser	100%	DE
Wind	0%	
Solar	0%	

Preis

10.50 CHF

Stromvertrag: 25

Energiequelle	Anteil	Herkunft
Kern	0%	
Wasser	70%	DE
Wind	10%	CH
Solar	20%	DE

Preis

12.00 CHF

Stromvertrag: 26

Energiequelle	Anteil	Herkunft
Kern	40%	DE
Wasser	55%	DE
Wind	5%	DE
Solar	0%	

Preis

10.10 CHF

Stromvertrag: 27

Energiequelle	Anteil	Herkunft	Preis
Kern	55%	DE	
Wasser	25%	DE	10.30 CHF
Wind	5%	DE	
Solar	15%	DE	

Stromvertrag: 28

Energiequelle	Anteil	Herkunft	Preis
Kern	60%	DE	
Wasser	35%	CH	10.30 CHF
Wind	0%		
Solar	5%	DE	

Stromvertrag: 29

Energiequelle	Anteil	Herkunft	Preis
Kern	25%	DE	
Wasser	65%	DE	10.40 CHF
Wind	0%		
Solar	10%	DE	

Stromvertrag: 30

Energiequelle	Anteil	Herkunft	Preis
Kern	10%	DE	
Wasser	75%	CH	11.90 CHF
Wind	0%		
Solar	15%	DE	

Stromvertrag: 31

Energiequelle	Anteil	Herkunft	Preis
Kern	40%	CH	
Wasser	55%	DE	10.70 CHF
Wind	5%	DE	
Solar	0%		

Stromvertrag: 32

Energiequelle	Anteil	Herkunft	Preis
Kern	0%		
Wasser	80%	DE	11.10 CHF
Wind	5%	DE	
Solar	15%	DE	

Stromvertrag: 33

Energiequelle	Anteil	Herkunft	Preis
Kern	20%	DE	
Wasser	60%	DE	10.80 CHF
Wind	5%	DE	
Solar	15%	DE	

Stromvertrag: 34

Energiequelle	Anteil	Herkunft	Preis
Kern	20%	CH	
Wasser	60%	CH	14.80 CHF
Wind	5%	CH	
Solar	15%	CH	

Stromvertrag: 35

Energiequelle	Anteil	Herkunft	Preis
Kern	15%	DE	
Wasser	70%	CH	11.80 CHF
Wind	5%	DE	
Solar	10%	DE	

Stromvertrag: 36

Energiequelle	Anteil	Herkunft	Preis
Kern	100%	DE	
Wasser	0%		9.00 CHF
Wind	0%		
Solar	0%		

Stromvertrag: 37

Energiequelle	Anteil	Herkunft	Preis
Kern	90%	DE	
Wasser	5%	DE	9.30 CHF
Wind	0%		
Solar	5%	DE	

Stromvertrag: 38

Energiequelle	Anteil	Herkunft	Preis
Kern	0%		
Wasser	95%	CH	12.90 CHF
Wind	0%		
Solar	5%	CH	

Stromvertrag: 39

Energiequelle	Anteil	Herkunft	Preis
Kern	80%	DE	
Wasser	15%	CH	9.70 CHF
Wind	0%		
Solar	5%	DE	

Stromvertrag: 40

Energiequelle	Anteil	Herkunft	Preis
Kern	70%	CH	
Wasser	25%	CH	11.00 CHF
Wind	5%	DE	
Solar	0%		

Stromvertrag: 41

Energiequelle	Anteil	Herkunft	Preis
Kern	55%	CH	
Wasser	25%	CH	11.50 CHF
Wind	5%	DE	
Solar	15%	DE	

Stromvertrag: 42

Energiequelle	Anteil	Herkunft	Preis
Kern	30%	CH	
Wasser	40%	CH	15.40 CHF
Wind	15%	CH	
Solar	15%	CH	

Stromvertrag: 43

Energiequelle	Anteil	Herkunft	Preis
Kern	15%	DE	
Wasser	70%	DE	10.70 CHF
Wind	5%	DE	
Solar	10%	DE	

Stromvertrag: 44

Energiequelle	Anteil	Herkunft	Preis
Kern	0%		
Wasser	75%	CH	15.50 CHF
Wind	10%	CH	
Solar	15%	CH	

Stromvertrag: 45

Energiequelle	Anteil	Herkunft	Preis
Kern	0%		
Wasser	95%	CH	12.10 CHF
Wind	0%		
Solar	5%	DE	

Stromvertrag: 46

Energiequelle	Anteil	Herkunft	Preis
Kern	95%	CH	
Wasser	5%	CH	10.60 CHF
Wind	0%		
Solar	0%		

Stromvertrag: 47

Energiequelle	Anteil	Herkunft	Preis
Kern	55%	CH	
Wasser	25%	CH	14.30 CHF
Wind	5%	CH	
Solar	15%	CH	

Stromvertrag: 48

Energiequelle	Anteil	Herkunft	Preis
Kern	5%	CH	
Wasser	80%	CH	14.10 CHF
Wind	5%	CH	
Solar	10%	CH	

Stromvertrag: 49

Energiequelle	Anteil	Herkunft	Preis
Kern	10%	DE	
Wasser	75%	DE	10.80 CHF
Wind	0%		
Solar	15%	DE	

Stromvertrag: 50

Energiequelle	Anteil	Herkunft	Preis
Kern	0%		
Wasser	80%	CH	12.30 CHF
Wind	5%	DE	
Solar	15%	DE	

Stromvertrag: 51

Energiequelle	Anteil	Herkunft	Preis
Kern	50%	CH	
Wasser	30%	CH	11.60 CHF
Wind	5%	DE	
Solar	15%	DE	

Stromvertrag: 52

Energiequelle	Anteil	Herkunft	Preis
Kern	0%		
Wasser	100%	CH	12.00 CHF
Wind	0%		
Solar	0%		

Stromvertrag: 53

Energiequelle	Anteil	Herkunft	Preis
Kern	0%		
Wasser	75%	CH	12.40 CHF
Wind	10%	DE	
Solar	15%	DE	

Stromvertrag: 54

Energiequelle	Anteil	Herkunft	Preis
Kern	95%	DE	
Wasser	5%	CH	9.20 CHF
Wind	0%		
Solar	0%		

Stromvertrag: 55

Energiequelle	Anteil	Herkunft
Kern	60%	DE
Wasser	35%	DE
Wind	0%	
Solar	5%	DE

Preis

9.80 CHF

Stromvertrag: 56

Energiequelle	Anteil	Herkunft
Kern	70%	DE
Wasser	25%	DE
Wind	5%	DE
Solar	0%	

Preis

9.60 CHF

Stromvertrag: 57

Energiequelle	Anteil	Herkunft
Kern	0%	
Wasser	70%	DE
Wind	10%	DE
Solar	20%	DE

Preis

11.40 CHF

Stromvertrag: 58

Energiequelle	Anteil	Herkunft
Kern	5%	DE
Wasser	80%	DE
Wind	5%	DE
Solar	10%	DE

Preis

10.90 CHF

Stromvertrag: 59

Energiequelle	Anteil	Herkunft
Kern	10%	CH
Wasser	75%	CH
Wind	0%	
Solar	15%	CH

Preis

14.60 CHF

Stromvertrag: 60

Energiequelle	Anteil	Herkunft
Kern	50%	DE
Wasser	30%	DE
Wind	5%	DE
Solar	15%	DE

Preis

10.40 CHF

A.3. German Versions of Prescriptive and Descriptive Norms

Prescriptive Norm

In der Schweiz wird konventioneller Strom vor allem aus Kernenergie hergestellt. Diese Produktion hat den Nachteil, dass der dabei entstehende Abfall sehr gefährlich ist. Zudem hätten mögliche Atomkraftwerkunfälle verheerende Folgen für Mensch und Natur. Ökostrom, hingegen wird aus erneuerbaren Quellen wie Wind, Sonne, Biomasse, Wasser und Erdwärme gewonnen. Erneuerbare Energien haben den Vorteil, dass ihre Nutzung kaum Abfälle oder Schadstoffemissionen erzeugen. Ausserdem regenerieren sich diese Energiequellen immer wieder auf natürliche Art. Das Bundesamt für Energie (BfE) schlägt in der Energiestrategie 2050 deshalb vor, die Produktion und den Konsum von erneuerbaren Energien erheblich zu steigern. Mit Ihrem Entscheid für einen Stromvertrag, der auf erneuerbaren Energien basiert, leisten Sie somit einen wichtigen Beitrag im Kampf gegen die globale Erwärmung, unterstützen die Energiestrategie 2050 des Bundes und helfen dabei, eine grünere Zukunft für Sie und Ihre Mitmenschen zu gestalten.

Descriptive Norm

Die Auswertung der Stromkennzeichnung 2016 zeigt, dass mit 62 % fast zwei Drittel (2015: 58.3%) des in der Schweiz verbrauchten Stroms aus erneuerbaren Quellen (wie zum Beispiel Wind, Sonne, Wasser und Erdwaerme) stammt. 2017 wurden total 15309 GWh/a oder 42.3% des Stroms aus erneuerbaren Quellen (2016: 14’183 GWh/a) in Form von bewusst gewählten Stromprodukten aus erneuerbaren Energien konsumiert. Dies entspricht gut 26% des gesamten Stromverbrauchs. In Bezug auf den privaten Konsum bedeutet dies, dass rund ein Drittel aller Schweizer Haushalte bewusst Stromprodukte aus erneuerbaren Energien bestellt.

A.4. Instructions for Participants

Instruktionen

Die folgenden Instruktionen erklären Ihnen die Entscheidungssituation und die Konsequenzen Ihrer Entscheidung.

In dieser Studie nehmen Sie die Rolle einer Stromkonsumentin beziehungsweise eines Stromkonsumenten ein. Sie haben ein Budget von 22.00 CHF zur Verfügung um einen Stromvertrag zu kaufen.

Sie wählen einen aus mehreren Stromverträgen aus. Die Stromverträge unterscheiden sich in verschiedenen Attributen. Nachfolgend sehen Sie ein Beispiel eines Stromvertrags.

Stromvertrag

Energiequelle	Anteil	Herkunft	Preis
Kern	20%	CH	
Wasser	60%	CH	12.00 CHF
Wind	5%	DE	
Solar	15%	DE	

Ein Stromvertrag entspricht 150 kWh Strom, was in etwa dem Monatsverbrauch zweier Personen entspricht.

Stromanbieter verwenden unterschiedliche Quellen zur Stromproduktion. Konventioneller Strom wird mit atomaren oder fossilen Ressourcen produziert. Ökostrom ist Strom, welcher aus erneuerbaren Quellen wie Wind, Sonne, Wasser und anderen natürlichen Ressourcen produziert wird.

Ihre Wahl eines Stromvertrags hat eine direkte Auswirkung auf die Stromproduktion, da die Experimentatoren auf Grund Ihrer Entscheidung Stromzertifikate (auch Herkunftsnachweise genannt) kaufen, die dem von Ihnen gewählten Stromvertrag entsprechen. Den Kauf der Zertifikate bestätigen wir Ihnen unmittelbar nach dem Experiment mittels einer Bestätigung seitens der ETH Zürich.

Der Kauf eines Stromzertifikats garantiert, dass die entsprechende Menge Strom aus der entsprechenden Energiequelle tatsächlich produziert wird. Mit Ihrer Entscheidung für einen bestimmten Stromvertrag bestimmen Sie also, aus welchen Energiequellen der Strom stammt, den Sie in dieser Studie kaufen müssen. Durch den Kauf von Zertifikaten stellen die Experimentatoren sicher, dass die entsprechende Menge Strom aus den von Ihnen gewählten Energiequellen produziert und ins Stromnetz eingespiesen wird.

Beim Stromvertrag aus dem obigen Beispiel werden also 30 kWh Strom (20% der insgesamt 150 kWh) aus Schweizer Kernquellen gekauft. Dadurch verpflichtet sich der Stromlieferant, dass die Schweizer Kernanlage 30 kWh Strom produziert und diese ins Stromnetz einspeist. Dasselbe geschieht mit den 90 kWh Strom aus Schweizer Wasserkraft, den 7.50 kWh Strom aus deutschen Windquellen und den 22.50 kWh Strom aus Solaranlagen in Deutschland.

Beim Kauf eines Stromproduktes zahlen Sie den angegebenen Preis. Was danach von Ihrem Budget übrig bleibt, wird Ihnen nach der Studie ausbezahlt. Im Beispiel von oben bezahlen Sie für den Vertrag 12.00 CHF. Dieser Betrag wird von Ihrem Budget von 22.00 CHF abgezogen. Sie erhielten in diesem Fall nach der Studie also 10.00 CHF.

Appendix Subproject B.

B.1. Instructions for Individual Decision-Making (Price List) Treatments

Note:

Parts in red only appear in the Base treatment

Parts in blue appear in all three tax treatments

Parts in magenta appear in the Base, the Burnt and the Earmarked Tax treatments

Parts in cyan appear in the Burnt and the Earmarked treatments

Parts in green appear only in the Burnt Tax treatment

Parts in orange appear only in the Redistributed Tax treatment

Parts in purple appear only in the Earmarked Tax treatment

Anleitung für die Teilnehmer

Vielen Dank für die Teilnahme an dieser Studie!

Allgemeine Informationen

Für Ihre Teilnahme erhalten Sie ein fixes Entgelt von 10 CHF. Sie haben die Möglichkeit, während der Studie zusätzliches Geld zu verdienen. Wie viel Geld Sie verdienen, hängt von Ihren Entscheidungen ab. Am Ende der Studie erhalten Sie Ihre Auszahlung in bar. Der Betrag, den Sie verdienen, ist vertraulich, d.h. die anderen Teilnehmer der Studie werden nicht sehen können, wie viel Geld Sie verdient haben.

Bitte beachten Sie: Während der gesamten Studie ist keinerlei Kommunikation zwischen den Teilnehmern erlaubt. Auch die Verwendung von Handys oder Taschenrechnern ist nicht gestattet. Bitte verwenden Sie auf dem Computer nur die für die Studie vorgesehenen Funktionen. Wenn Sie sich nicht an diese Regeln halten, riskieren Sie, alle Ihre Einnahmen zu verlieren. Wenn Sie irgendwelche Fragen haben, heben Sie bitte Ihre Hand. Ihre Fragen werden dann an Ihrem Arbeitsplatz beantwortet.

Alle in dieser Anleitung gemachten Aussagen sind wahr. Ihre Entscheidungen in diesem Experiment werden keinem anderen Teilnehmer bekannt sein, d.h. Ihre Anonymi-

Übersicht über die Studie

In dieser Studie entscheiden Sie (in einer Abfolge von 10 Perioden), ob Sie ein CO_2-intensives Konsumgut kaufen möchten oder nicht (reale Beispiele wären Güter wie Flug- oder Autoreisen, Strom, CO_2-intensive Lebensmittel, etc.). Das Gut, das Sie kaufen können, hat für Sie als Käufer einen Konsumwert von 50 CHF. Wenn Sie das Gut also kaufen, erhalten Sie 50 CHF abzüglich des von Ihnen bezahlten Preises. Wenn Sie sich entscheiden, das Gut nicht zu kaufen, erhalten Sie stattdessen 15 CHF. Der Kauf des Gutes führt zu einem Anstieg der CO_2-Emissionen in die Atmosphäre. Konkret führt jeder Kauf des Gutes im Experiment zur Emission von 0.25t CO_2 in die Atmosphäre, ein Gas, das mit der globalen Erwärmung verbunden wird. Um die Emissionen zu reduzieren, wird eine CO_2-Steuer von 5 CHF auf das Gut erhoben, deren Einnahmen an die Studienteilnehmer/innen zurück verteilt werden die zur Finanzierung von CO_2-Kompensationsprojekten verwendet wird. Wir erklären, wie der Kauf des Gutes in der Studie zu einem Anstieg der CO_2-Emissionen führt und wie die Steuer genau funktioniert im Folgenden.

Wie der Kauf des Gutes in der Studie zu einem Anstieg der CO_2-Emissionen in die Atmosphäre führt

Für jeden möglichen Kauf des Gutes in dieser Studie kaufen wir einen Viertel eines CO_2-Emissions-zertifikats im Schweizerischen CO_2-Emissionshandelsystems und ziehen es vom Markt zurück, so dass es nicht mehr zur Deckung von CO_2-Emissionen verwendet werden kann. Ein CO_2-Zertifikat ermöglicht die Emission von einer Tonne CO_2. Unternehmen, die in energieintensiven Branchen in der Schweiz tätig sind, sind zur Teilnahme am Schweizer Emissionshandelssystem verpflichtet und müssen genügend Zertifikate kaufen, um ihre CO_2-Emissionen zu decken. Im Falle einer Nichteinhaltung droht den Unternehmen eine hohe Geldstrafe. Die Gesamtzahl der auf dem Schweizer Emissionsmarkt verfügbaren Zertifikate bestimmt somit die Gesamtmenge von CO_2, die von den vom Schweizer Emissionshandelssystem erfassten Branchen emittiert werden kann.

Die Gesamtmenge der im Schweizer Emissionshandelssystem verfügbaren Emissionszertifikate wird vom Bundesamt für Umwelt (BAFU) festgelegt und nimmt jährlich ab. Diese Methode stellt sicher, dass die Unternehmen der betroffenen Branchen ihre gesamten CO_2-Emissionen im Vergleich zum aktuellen Niveau reduzieren müssen. Indem wir CO_2-Zertifikate für diese Studie kaufen und zurückziehen (d.h. sie nicht zur Deckung von tatsächlichen CO_2-Emissionen verwenden), reduzieren wir effektiv den Betrag von CO_2, der von den vom Schweizer Emissionshandelssystem erfassten Unternehmen in die globale Atmosphäre abgegeben werden kann.

Für jeden Kauf des Gutes, der im Experiment stattfindet, werden wir jedoch einen Viertel eines Zertifikats (entspricht 0.25 Tonnen CO_2) *weniger* zurückziehen. So erhöht der Kauf des Gutes im Experiment die CO_2-Emissionen innerhalb der vom Schweizer Emissionshandelssystem abgedeckten Branchen und führt somit zu einer Emission von 0.25 Tonnen von CO_2 in die Atmosphäre.

CO_2-Emissionen sind für das globale Klima und die Umwelt problematisch, da sie eine unsichtbare Schicht um die Erde herum bilden. Einfach ausgedrückt, hält diese Schicht die Wärme in der Erdatmosphäre, was dann zu einer globalen Erwärmung führt. Dieser Prozess ist besser bekannt als der „Treibhauseffekt". Der „Treibhauseffekt"führt zu einer Erwärmung der Atmosphäre. Untersuchungen zeigen, dass die Erdtemperatur im Vergleich zum 19. Jahrhundert um 1 Grad Celsius gestiegen ist. Die durchschnittliche Temperatur auf der Erde wird bis zum Ende dieses Jahrhunderts voraussichtlich um 3 Grad Celsius steigen.

Höhere Temperaturen auf der Erde haben Auswirkungen auf Tiere, Pflanzen und Menschen. Einige Tiere verlieren ihren Lebensraum (z.B. durch schmelzende Polarkappen oder steigende Meeresspiegel) oder die Nahrung, auf die sie angewiesen sind, und sterben dadurch aus. In verschiedenen Ländern werden neue Arten von Klimazonen und Temperaturen entstehen. Extreme Witterungsbedingungen werden häufiger auftreten.

Dies wird für den Menschen eine Herausforderung darstellen, da z.B. in Ländern, in denen es bereits sehr heiss ist, mehr Trockengebiete entstehen werden.

Die durch einen Kauf des Gutes in diesem Experiment verursachte Emission von 0.25 Tonnen CO_2 entspricht in etwa den CO_2-Emissionen eines Hin- und Rückfluges von Zürich nach Nizza oder rund 1'000 km Autofahrt in einem Mittelklassefahrzeug.

Detaillierte Informationen zur Kaufentscheidung

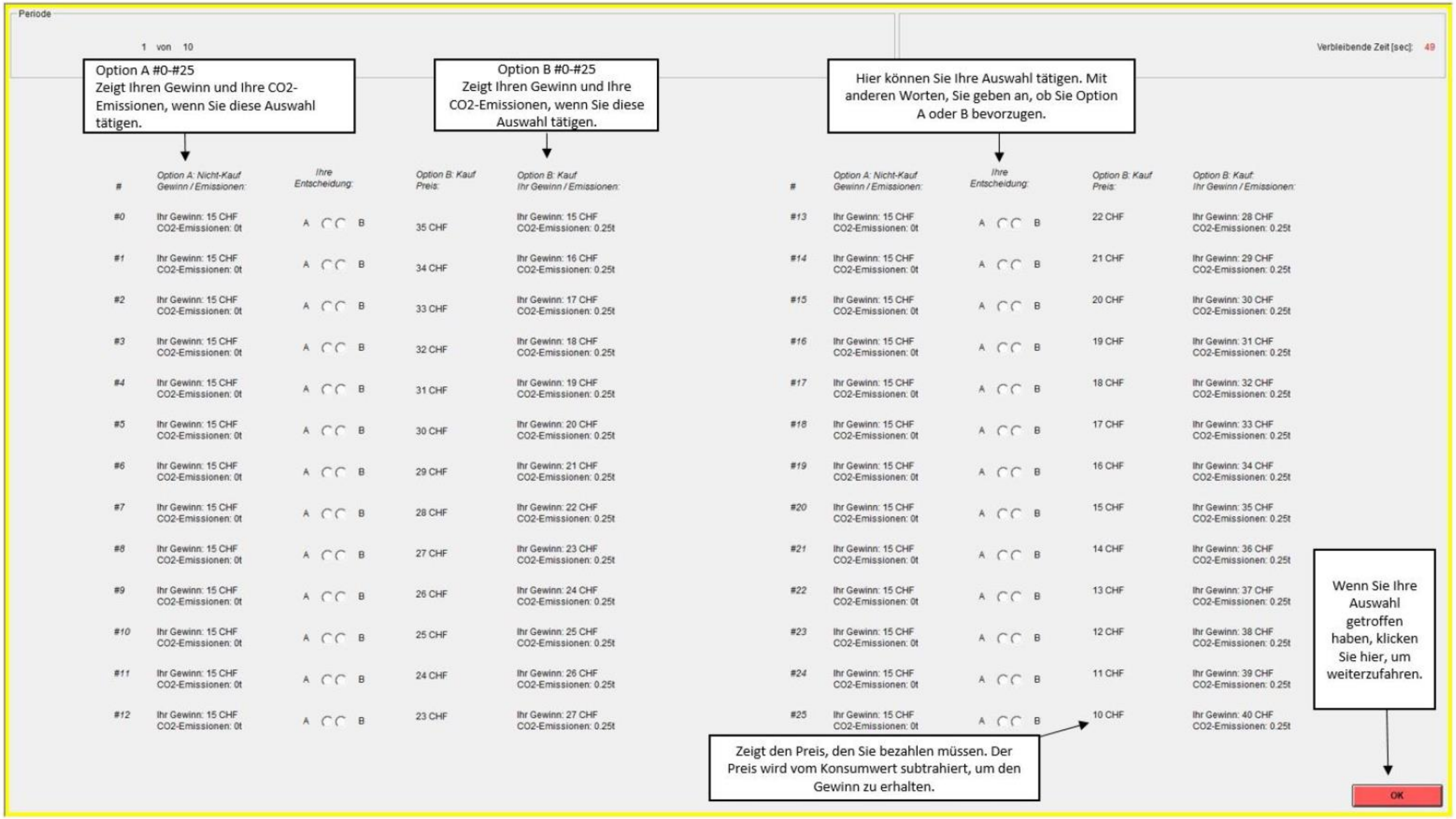
Die Studie dauert 10 Perioden. In jeder Periode haben Sie 3 Minuten Zeit, um Ihre Entscheidung zu treffen. Der Konsumwert des Gutes beträgt 50 CHF. Sie sehen 26 Entscheidungspaare auf dem Bildschirm in jeder Periode. Jedes Entscheidungspaar besteht aus zwei Optionen (Option A und Option B), die im Folgenden genauer erläutert werden.

- Option A ist ein fester Geldbetrag (entspricht 15 CHF), den Sie erhalten, wenn Sie sich entscheiden, das Gut nicht zu kaufen. Dies ist Ihr Nicht-Kaufgewinn. Wenn Sie sich entscheiden, das Gut nicht zu kaufen, wird es auf Grund Ihrer Entscheidung keinen Anstieg der CO_2-Emissionen geben.
- Die Option B besteht aus dem Preis für das Gut, der variiert (er sinkt mit jedem Entscheidungspaar um 1 CHF) und der zusammen mit der Steuer (siehe unten) Ihren Kaufgewinn bestimmt, wenn Sie sich für den Kauf des Gutes entscheiden. Der Konsumwert des Gutes beträgt 50 CHF und Ihr Kaufgewinn entspricht somit 50 CHF abzüglich Preis und Steuer. Der Kauf des Gutes führt zu einer Emission von 0.25 Tonnen CO_2 in die Atmosphäre.
- Zusätzlich zum Preis wird beim Kauf des Gutes eine Einheits- CO_2-Steuer von 5 CHF erhoben, die über die gesamte Preisspanne konstant ist. Die Steuer wird zum Preis hinzugerechnet und somit von Ihrem Kaufgewinn abgezogen, wenn Sie sich für den Kauf des Gutes entscheiden.
- Die Steuereinnahmen werden an die Teilnehmer/innen der Studie zurück verteilt. Sämtliche Steuereinnahmen fliessen in einen Topf, der dann wieder gleichmässig an die Teilnehmer/innen verteilt wird. Das bedeutet, dass jede/r Teilnehmer/in einen gleich hohen Anteil der Steuereinnahmen zurückerhält, egal ob er/sie das Gut konsumiert hat oder nicht. Für die Rückverteilung wurden Sie zufällig einer Gruppe von 9 Personen (8 andere Personen plus Sie) zugeteilt. Die Steuereinnahmen werden innerhalb dieser 9er-Gruppe zurück verteilt. Wenn z.B.

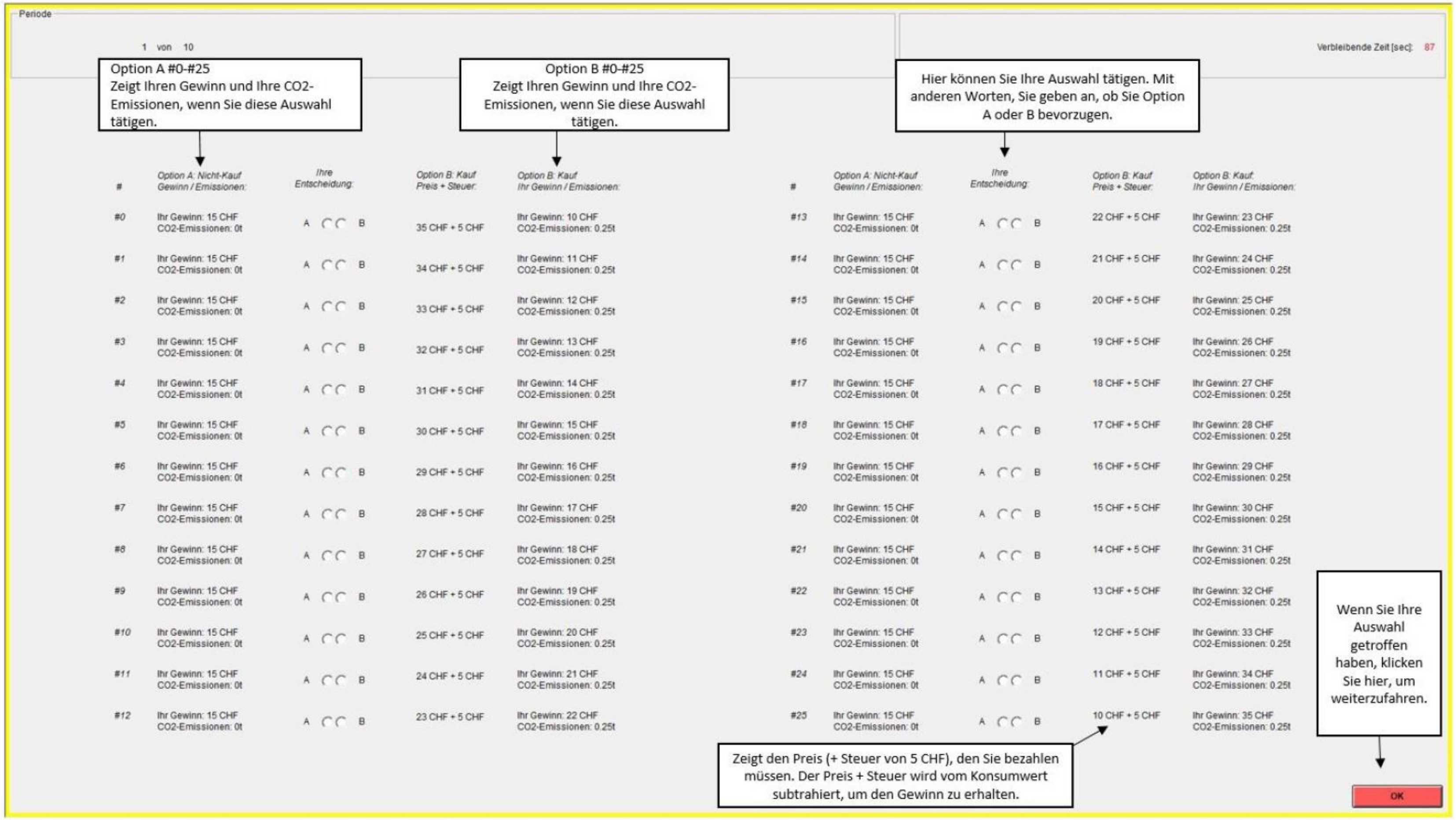
die Steuereinnahmen innerhalb der 9er-Gruppe insgesamt 20 CHF betragen, erhält also jede Person in der Gruppe 2.22 CHF zurück verteilt.

- Die Steuereinnahmen sind für Umweltzwecke bestimmt. Das bedeutet, dass wir die Steuereinnahmen zur Finanzierung bestehender Projekte verwenden werden, die darauf abzielen, die globalen CO_2-Emissionen zu senken. Konkret spenden wir den Steuerertrag an Myclimate, eine Schweizer Stiftung, die über verschiedene Klimaschutzprojekte verfügt (z.B. Renaturierungsprogramme von Mooren in der Schweiz oder die Finanzierung von effizienten Kochern mit weniger CO_2-Emissionen in Kenia, etc.).
- In jeder der 10 Perioden haben Sie 3 Minuten Zeit für Ihre Entscheidung.
- Das Bild auf der nächsten Seite zeigt einen Ausschnitt des Computerbildschirms der Kaufentscheidung. Oben rechts auf dem Bildschirm sehen Sie immer die verbleibende Zeit, um eine Entscheidung zu treffen. Werfen Sie einen Blick auf die Erläuterungen zu den verschiedenen Elementen des Bildschirms.
- Um die Entscheidung zu vereinfachen (zur Reduktion Ihres Klickaufwandes), können Sie einfach auf das letzte Entscheidungspaar klicken, in dem Sie Option A bevorzugen (Nicht-Kauf des Gutes) und das erste Entscheidungspaar, in dem Sie beginnen, Option B zu bevorzugen (Kauf des Gutes). Für alle nachfolgenden Entscheidungspaare wird Option B automatisch markiert. Wenn Sie bereits im ersten Entscheidungspaar auf Option B klicken (d.h. Sie bevorzugen stets den Kauf des Gutes), wird Option B für alle 26 Entscheidungspaare ausgewählt.

Beispiel eines Computerbildschirms der Kaufentscheidung:



Beispiel eines Computerbildschirms der Kaufentscheidung:



Periode

1 von 10

Verbleibende Zeit [sec]: 87

Option A #0-#25
Zeigt Ihren Gewinn und Ihre CO2-Emissionen, wenn Sie diese Auswahl tätigen.

Option B #0-#25
Zeigt Ihren Gewinn und Ihre CO2-Emissionen, wenn Sie diese Auswahl tätigen.

Hier können Sie Ihre Auswahl tätigen. Mit anderen Worten, Sie geben an, ob Sie Option A oder B bevorzugen.

#	Option A: Nicht-Kauf Gewinn / Emissionen:	Ihre Entscheidung:	Option B: Kauf Preis + Steuer:	Option B: Kauf Ihr Gewinn / Emissionen:
#0	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	35 CHF + 5 CHF	Ihr Gewinn: 10 CHF CO2-Emissionen: 0.25t
#1	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	34 CHF + 5 CHF	Ihr Gewinn: 11 CHF CO2-Emissionen: 0.25t
#2	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	33 CHF + 5 CHF	Ihr Gewinn: 12 CHF CO2-Emissionen: 0.25t
#3	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	32 CHF + 5 CHF	Ihr Gewinn: 13 CHF CO2-Emissionen: 0.25t
#4	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	31 CHF + 5 CHF	Ihr Gewinn: 14 CHF CO2-Emissionen: 0.25t
#5	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	30 CHF + 5 CHF	Ihr Gewinn: 15 CHF CO2-Emissionen: 0.25t
#6	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	29 CHF + 5 CHF	Ihr Gewinn: 16 CHF CO2-Emissionen: 0.25t
#7	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	28 CHF + 5 CHF	Ihr Gewinn: 17 CHF CO2-Emissionen: 0.25t
#8	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	27 CHF + 5 CHF	Ihr Gewinn: 18 CHF CO2-Emissionen: 0.25t
#9	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	26 CHF + 5 CHF	Ihr Gewinn: 19 CHF CO2-Emissionen: 0.25t
#10	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	25 CHF + 5 CHF	Ihr Gewinn: 20 CHF CO2-Emissionen: 0.25t
#11	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	24 CHF + 5 CHF	Ihr Gewinn: 21 CHF CO2-Emissionen: 0.25t
#12	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	23 CHF + 5 CHF	Ihr Gewinn: 22 CHF CO2-Emissionen: 0.25t

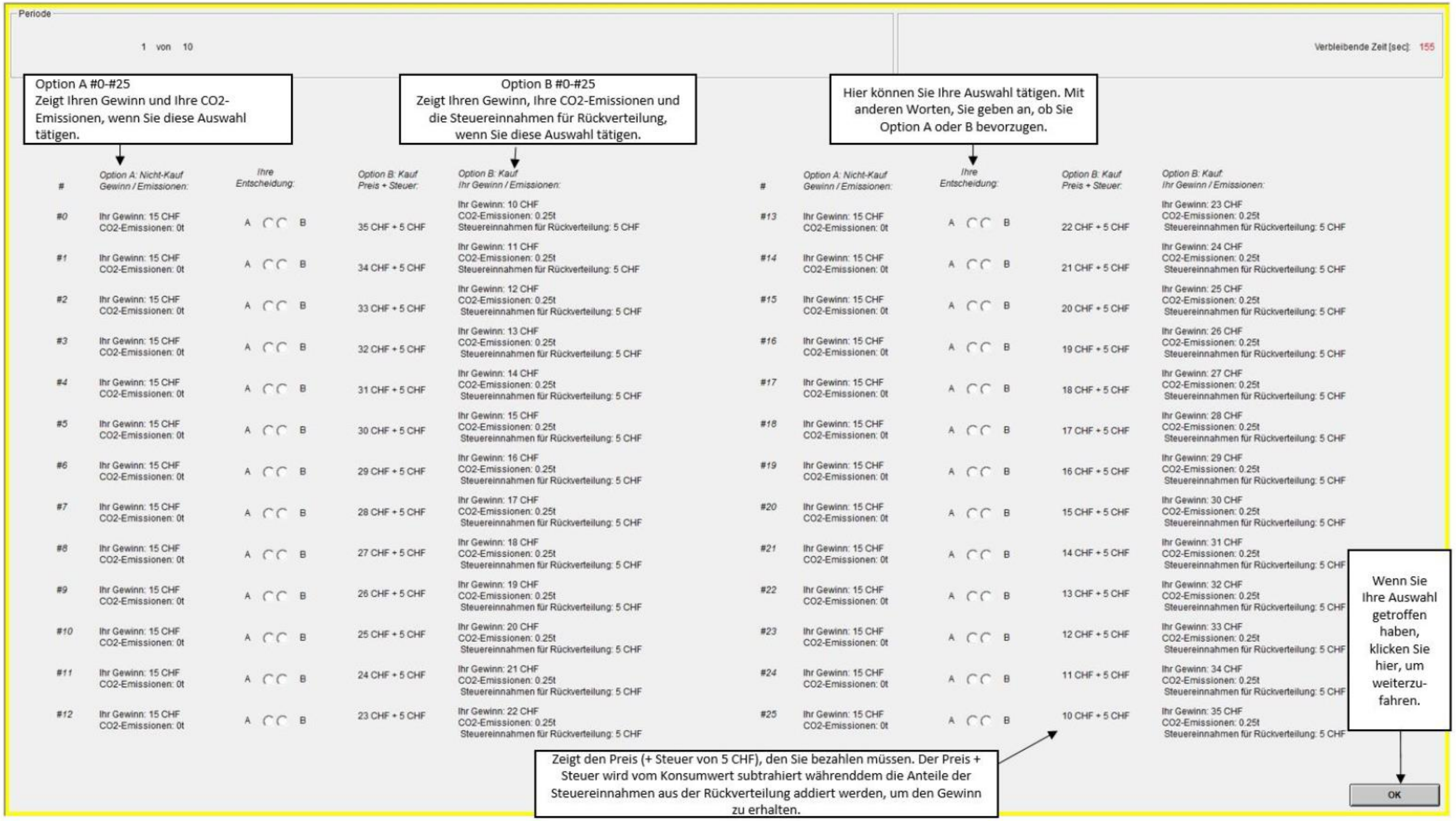
#	Option A: Nicht-Kauf Gewinn / Emissionen:	Ihre Entscheidung:	Option B: Kauf Preis + Steuer:	Option B: Kauf Ihr Gewinn / Emissionen:
#13	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	22 CHF + 5 CHF	Ihr Gewinn: 23 CHF CO2-Emissionen: 0.25t
#14	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	21 CHF + 5 CHF	Ihr Gewinn: 24 CHF CO2-Emissionen: 0.25t
#15	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	20 CHF + 5 CHF	Ihr Gewinn: 25 CHF CO2-Emissionen: 0.25t
#16	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	19 CHF + 5 CHF	Ihr Gewinn: 26 CHF CO2-Emissionen: 0.25t
#17	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	18 CHF + 5 CHF	Ihr Gewinn: 27 CHF CO2-Emissionen: 0.25t
#18	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	17 CHF + 5 CHF	Ihr Gewinn: 28 CHF CO2-Emissionen: 0.25t
#19	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	16 CHF + 5 CHF	Ihr Gewinn: 29 CHF CO2-Emissionen: 0.25t
#20	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	15 CHF + 5 CHF	Ihr Gewinn: 30 CHF CO2-Emissionen: 0.25t
#21	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	14 CHF + 5 CHF	Ihr Gewinn: 31 CHF CO2-Emissionen: 0.25t
#22	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	13 CHF + 5 CHF	Ihr Gewinn: 32 CHF CO2-Emissionen: 0.25t
#23	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	12 CHF + 5 CHF	Ihr Gewinn: 33 CHF CO2-Emissionen: 0.25t
#24	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	11 CHF + 5 CHF	Ihr Gewinn: 34 CHF CO2-Emissionen: 0.25t
#25	Ihr Gewinn: 15 CHF CO2-Emissionen: 0t	A B	10 CHF + 5 CHF	Ihr Gewinn: 35 CHF CO2-Emissionen: 0.25t

Wenn Sie Ihre Auswahl getroffen haben, klicken Sie hier, um weiterzufahren.

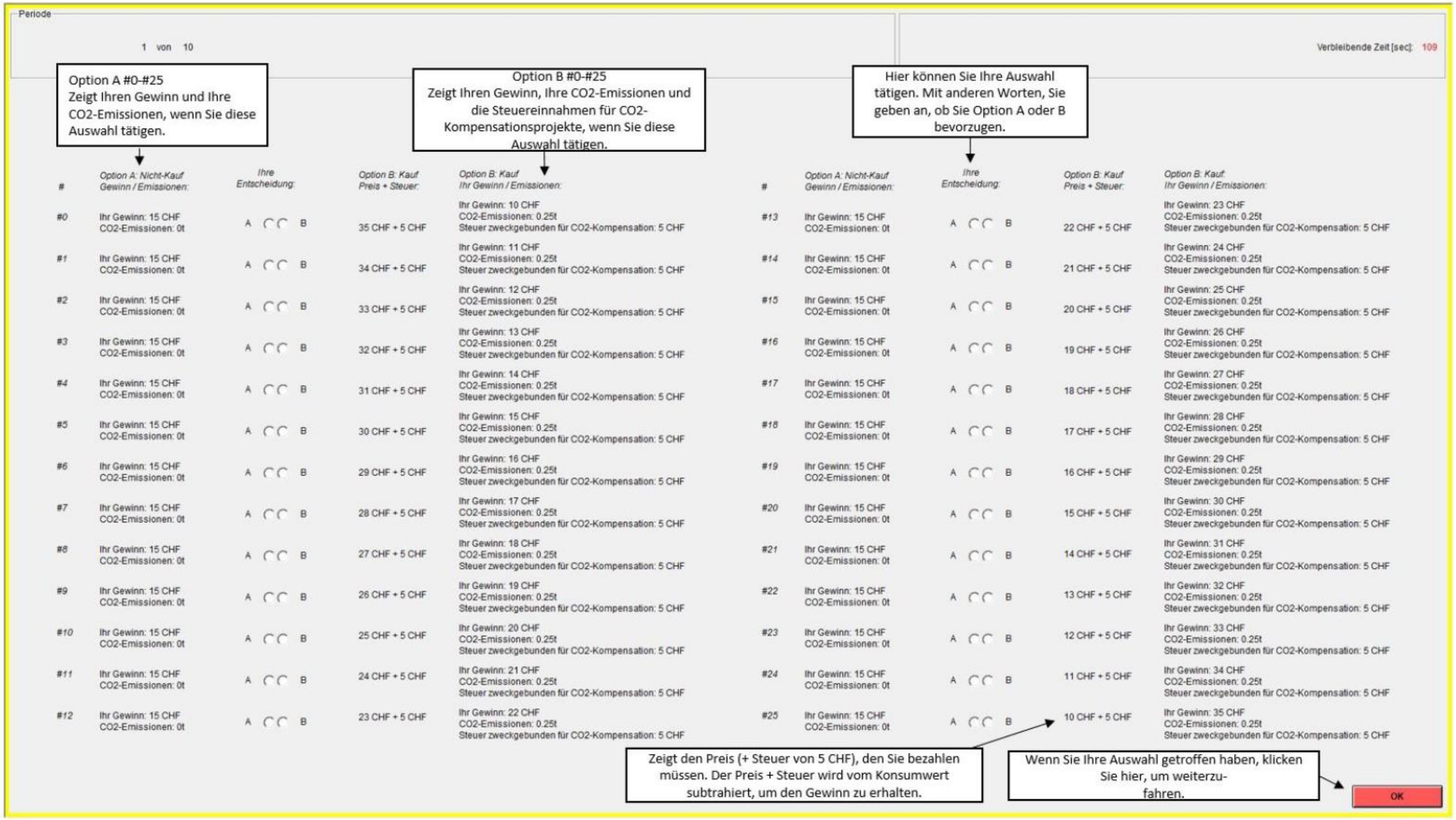
Zeigt den Preis (+ Steuer von 5 CHF), den Sie bezahlen müssen. Der Preis + Steuer wird vom Konsumwert subtrahiert, um den Gewinn zu erhalten.

OK

Beispiel eines Computerbildschirms der Kaufentscheidung:



Beispiel eines Computerbildschirms der Kaufentscheidung:



Auszahlungen

Eine Periode der 10 Perioden wird **zufällig ausgewählt**. Diese Periode ist dann **relevant für Ihre Auszahlung** und für die Bestimmung der CO_2-Emissionen. Ihr Gewinn in dieser zufällig gewählten Periode wird zum fixen Entgelt von 10 CHF hinzugefügt.

Wie wird der Gewinn in der zufällig ausgewähltem Periode berechnet?

Um Ihren Gewinn zu bestimmen, wird in der zufällig ausgewählten zahlungsrelevanten Periode eines der 26 Entscheidungspaare ebenfalls zufällig ausgewählt. Wenn Sie in diesem zufällig ausgewählten Entscheidungspaar für Option A entschieden haben, erhalten Sie den Nicht-Kaufgewinn von 15 CHF. Wenn Sie sich für Option B entschieden haben, erhalten Sie den entsprechenden Kaufgewinn (in CHF) im zufällig ausgewählten Entscheidungspaar. Der Kaufgewinn stellt den Konsumwert des Gutes dar abzüglich des Preises, den Sie für den Kauf zahlen müssen , und abzüglich der auf das Gut erhobenen Steuer. In beiden Fällen wird dieser Gewinn zum fixen Entgelt von 10 CHF addiert. Zudem erhalten Sie zusätzlich noch Ihren Anteil an der Rückverteilung der Steuereinnahmen innerhalb Ihrer 9er-Gruppe.

Beispiele

Im Folgenden präsentieren wir Ihnen zwei Beispiele, die veranschaulichen sollen, wie Gewinne und Auszahlungen berechnet werden. Die Zahlen in den Beispielen wurden willkürlich gewählt.

Beispiel A: Der Computer hat zufällig das Entscheidungspaar 7 ausgewählt. Im Entscheidungspaar 7 entschied sich der/die Teilnehmer/in für die Option B (Kauf des Gutes) zu einem Preis von 28 CHF.

Dies führt in diesem Beispiel zu folgendem Gewinn und CO_2-Emissionen:

Kaufgewinn: 50 CHF (Wert des Gutes) - 28 CHF (Preis) = 22 CHF
CO_2-Emissionen: 0.25t

Wird diese Periode nach dem Zufallsprinzip ausgewählt, beträgt die Auszahlung für das Experiment 32 CHF (22 CHF Kaufgewinn in der zufällig ausgewählten Periode plus 10 CHF fixes Entgelt).

Beispiel A: Der Computer hat zufällig das Entscheidungspaar 7 ausgewählt. Im Entscheidungspaar 7 entschied sich der/die Teilnehmer/in für die Option B (Kauf des Gutes) mit einem Preis von 28 CHF plus einer Steuer von 5 CHF. Zudem betrugen die Steuereinnahmen innerhalb der 9er-Gruppe insgesamt 10 CHF.

Dies führt in diesem Beispiel zu folgendem Gewinn und CO_2-Emissionen:

Kaufgewinn: 50 CHF (Wert des Gutes) - 33 CHF (Preis + Steuer) = 17 CHF
CO_2-Emissionen: 0.25t
Anteil an Rückverteilung der Steuereinnahmen: 10 CHF / 9 = 1.11 CHF
Steuereinnahmen, die an CO_2-Kompensationsprojekte gespendet wurden: 5 CHF

Wenn diese Periode nach dem Zufallsprinzip ausgewählt wird, beträgt die Auszahlung für das Experiment 27 CHF (17 CHF Kaufgewinn in der zufällig ausgewählten Periode plus 10 CHF fixes Entgelt). 28.11 CHF (17 CHF Kaufgewinn in der zufällig ausgewählten Periode plus 1.11 CHF aus der Rückverteilung der Steuereinnahmen und 10 CHF fixes Entgelt).

Beispiel B: Der Computer hat zufällig das Entscheidungspaar 12 ausgewählt. Im Entscheidungspaar 12 entschied sich der/die Teilnehmer/in für die Option A (Nicht-Kauf des Gutes), was einen Nicht-Kaufgewinn von 15 CHF bedeutet.

Dies führt in diesem Beispiel zu folgendem Gewinn und CO_2-Emissionen:

Nicht-Kaufgewinn: 15 CHF
CO_2-Emissionen: 0t
Anteil an Rückverteilung der Steuereinnahmen: 35 CHF / 9 = 3.88 CHF
Steuereinnahmen, die an CO_2-Kompensationsprojekte gespendet wurden: 0 CHF

Wenn diese Periode nach dem Zufallsprinzip ausgewählt wird, beträgt die Auszahlung für das Experiment 25 CHF (15 CHF Nicht-Kaufgewinn in der zufällig ausgewählten Periode plus 10 CHF fixes Entgelt). 28.88 CHF (15 CHF Nicht-Kaufgewinn in der zufällig ausgewählten Periode plus 3.88 CHF aus der Rückverteilung der Steuereinnahmen und 10 CHF fixes Entgelt).

B.2. Instructions for Market (Double Auction) Treatments

Note:

Parts in red only appear in the Base treatment

Parts in blue appear in all three tax treatments

Parts in magenta appear in the Base, the Burnt and the Earmarked Tax treatments

Parts in cyan appear in the Burnt and the Earmarked Tax treatments

Parts in green appear only in the Burnt Tax treatment

Parts in orange appear only in the Redistributed Tax treatment

Parts in purple appear only in the Earmarked Tax treatment

Anleitung für die Teilnehmer

Vielen Dank für die Teilnahme an dieser Studie!

Allgemeine Informationen

Für Ihre Teilnahme erhalten Sie ein fixes Entgelt von 10 CHF. Sie haben die Möglichkeit, während der Studie zusätzliches Geld zu verdienen. Wie viel Geld Sie verdienen, hängt von Ihren Entscheidungen ab. Am Ende der Studie erhalten Sie Ihre Auszahlung in bar. Der Betrag, den Sie verdienen, ist vertraulich, d.h. die anderen Teilnehmer der Studie werden nicht sehen können, wie viel Geld Sie verdient haben.

Bitte beachten Sie: Während der gesamten Studie ist keinerlei Kommunikation zwischen den Teilnehmern erlaubt. Auch die Verwendung von Handys oder Taschenrechnern ist nicht gestattet. Bitte verwenden Sie auf dem Computer nur die für die Studie vorgesehenen Funktionen. Wenn Sie sich nicht an diese Regeln halten, riskieren Sie, alle Ihre Einnahmen zu verlieren. Wenn Sie irgendwelche Fragen haben, heben Sie bitte Ihre Hand. Ihre Fragen werden dann an Ihrem Arbeitsplatz beantwortet.

Alle in dieser Anleitung gemachten Aussagen sind wahr. Ihre Entscheidungen in diesem Experiment werden keinem anderen Teilnehmer bekannt sein, d.h. Ihre Anonymität ist gewährleistet.

Übersicht über die Studie

In dieser Studie agieren Sie entweder als Verkäufer oder Käufer auf einem Markt für ein CO_2-intensives Konsumgut (reale Beispiele wären Güter wie Flug- oder Autoreisen, Strom, CO_2-intensive Lebensmittel, etc.). Das Gut, mit welchem Sie in der Studie handeln können, hat für den Käufer einen Konsumwert und der Verkäufer kann mit dem Verkauf des Gutes Geld verdienen. Konkret hat das Gut in der Studie einen Konsumwert von 50 CHF für den Käufer. Wenn sich der Verkäufer und der Käufer auf einen Handel einigen, erhält der Verkäuferden Preis, den der Käufer bereit ist zu zahlen (abzüglich einer Steuer von 5 CHF, siehe weiter unten). Der Käufer erhält 50 CHF abzüglich des Kaufpreises, den er dem Verkäufer angeboten hat. Gleichzeitig führt ein Handel mit dem Gut zu einem Anstieg der CO_2-Emissionen in die Atmosphäre. Insbesondere führt jeder Handel im Experiment zu einer Emission von 0.25t CO_2 in die Atmosphäre, ein Gas, das mit der globalen Erwärmung verbunden wird. Um die Emissionen zu reduzieren, wird eine CO_2-Steuer von 5 CHF auf das Gut erhoben, deren Einnahmen an die Studienteilnehmer/innen zurück verteilt werden die zur Finanzierung von CO_2-Kompensationsprojekten verwendet wird. Wir erklären, wie der Handel mit dem Gut in der Studie zu einem Anstieg der CO_2-Emissionen führt und wie der Markt und die Steuer genau funktionieren im Folgenden.

Wie der Handel in der Studie zu einem Anstieg der CO_2-Emissionen in die Atmosphäre führt

Für jeden möglichen Handel in dieser Studie kaufen wir einen Viertel eines CO_2-Emissionszertifikats im Schweizerischen CO_2-Emissionshandelsystems und ziehen es vom Markt zurück, so dass es nicht mehr zur Deckung von CO_2-Emissionen verwendet werden kann. Ein CO_2-Zertifikat ermöglicht die Emission von einer Tonne CO_2. Unternehmen, die in energieintensiven Branchen in der Schweiz tätig sind, sind zur Teilnahme am Schweizer Emissionshandelssystem verpflichtet und müssen genügend Zertifikate kaufen, um ihre CO_2-Emissionen zu decken. Im Falle einer Nichteinhaltung droht den Unternehmen eine hohe Geldstrafe. Die Gesamtzahl der auf dem Schweizer Emissionsmarkt verfügbaren Zertifikate bestimmt somit die Gesamtmenge von CO_2, die von den vom Schweizer Emissionshandelssystem erfassten Branchen emittiert werden kann.

Die Gesamtmenge der im Schweizer Emissionshandelssystem verfügbaren Emissionszertifikate wird vom Bundesamt für Umwelt (BAFU) festgelegt und nimmt jährlich ab. Diese Methode stellt sicher, dass die Unternehmen der betroffenen Branchen ihre gesamten CO_2-Emissionen im Vergleich zum aktuellen Niveau reduzieren müssen. Indem wir CO_2-Zertifikate für diese Studie kaufen und zurückziehen (d.h. sie nicht zur Deckung von tatsächlichen CO_2-Emissionen verwenden), reduzieren wir effektiv den Betrag von CO_2, der von den vom Schweizer Emissionshandelssystem erfassten Unternehmen in die globale Atmosphäre abgegeben werden kann.

Für jeden Handel, der im Experiment stattfindet, werden wir jedoch einen Viertel eines Zertifikats (entspricht 0.25 Tonnen CO_2) *weniger* zurückziehen. So erhöht der Handel mit dem Gut im Experiment die CO_2-Emissionen innerhalb der vom Schweizer Emissionshandelssystem abgedeckten Branchen und führt somit zu einer Emission von 0.25 Tonnen von CO_2 in die Atmosphäre.

CO_2-Emissionen sind für das globale Klima und die Umwelt problematisch, da sie eine unsichtbare Schicht um die Erde herum bilden. Einfach ausgedrückt, hält diese Schicht die Wärme in der Erdatmosphäre, was dann zu einer globalen Erwärmung führt. Dieser Prozess ist besser bekannt als der „Treibhauseffekt“. Der „Treibhauseffekt“führt zu einer Erwärmung der Atmosphäre. Untersuchungen zeigen, dass die Erdtemperatur im Vergleich zum 19. Jahrhundert um 1 Grad Celsius gestiegen ist. Die durchschnittliche Temperatur auf der Erde wird bis zum Ende dieses Jahrhunderts voraussichtlich um 3 Grad Celsius steigen.

Höhere Temperaturen auf der Erde haben Auswirkungen auf Tiere, Pflanzen und Menschen. Einige Tiere verlieren ihren Lebensraum (z.B. durch schmelzende Polarkappen oder steigende Meeresspiegel) oder die Nahrung, auf die sie angewiesen sind, und sterben dadurch aus. In verschiedenen Ländern werden neue Arten von Klimazonen und Temperaturen entstehen. Extreme Witterungsbedingungen werden häufiger auftreten. Dies wird für den Menschen eine Herausforderung darstellen, da z.B. in Ländern, in denen es bereits sehr heiss ist, mehr Trockengebiete entstehen werden.

Die durch einen Handel in diesem Experiment verursachte Emission von 0.25 Tonnen CO_2 entspricht in etwa den CO_2-Emissionen eines Hin- und Rückfluges von Zürich nach Nizza oder rund 1'000 km Autofahrt in einem Mittelklassefahrzeug.

Detaillierte Informationen über den Markt

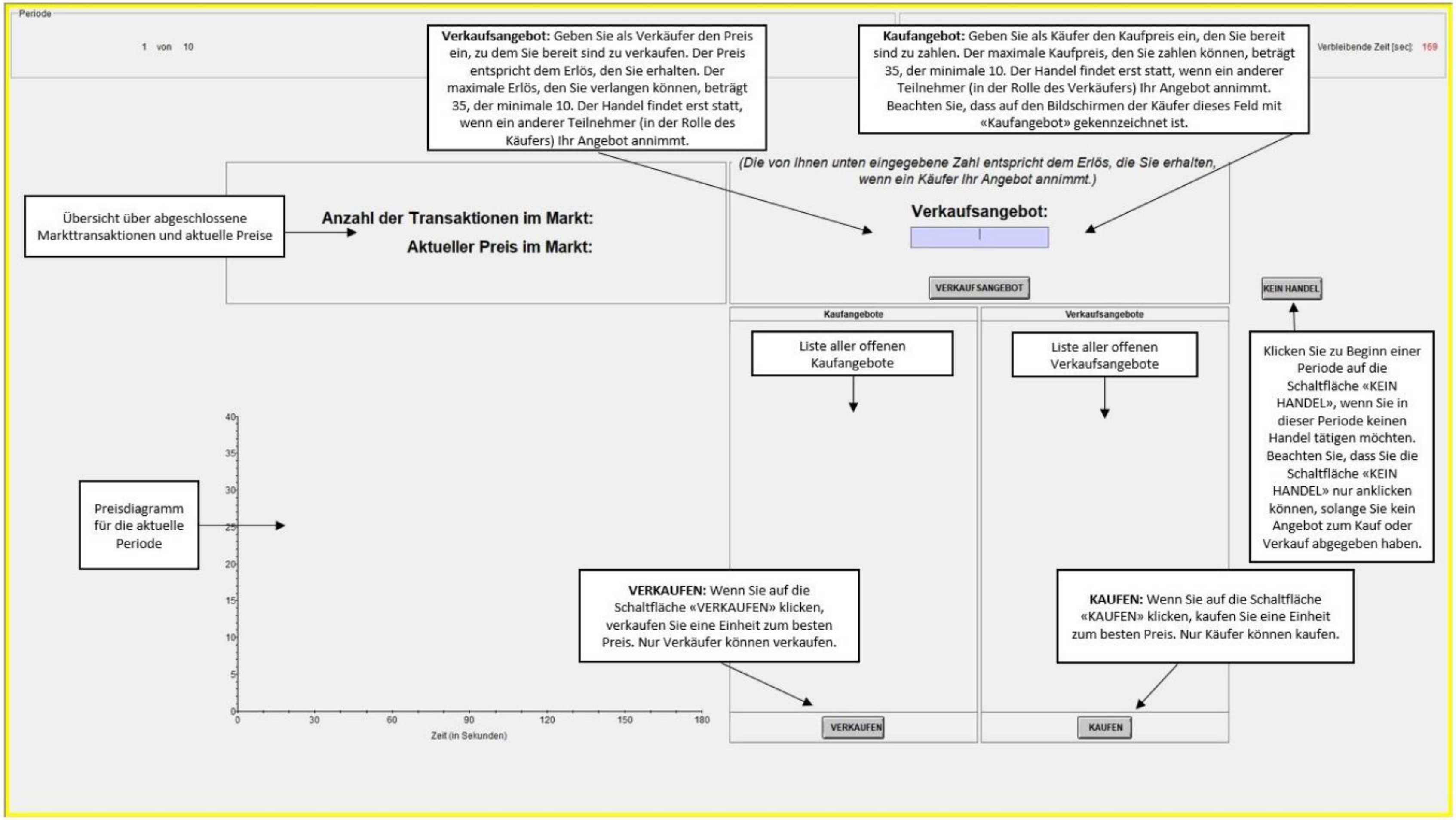
Es gibt insgesamt 9 Händler auf dem Markt, die in einer Sequenz von 10 Perioden handeln. Unter den 9 Händlern gibt es 5 Verkäufer und 4 Käufer, so dass es einen Überschuss an Verkäufern gibt. Jeder Käufer kann in jeder Periode maximal eine Einheit des vorher genannten Gutes kaufen und jeder Verkäufer kann maximal eine Einheit verkaufen. Der Konsumwert des Gutes beträgt 50 CHF.

Zu Beginn der Studie erfahren Sie, ob Sie als Käufer oder Verkäufer auf dem Markt auftreten. Sie werden diese Rolle über alle 10 Perioden behalten. Jede Handelsperiode dauert 3 Minuten. Weitere Informationen über den Markt folgen im Anschluss.

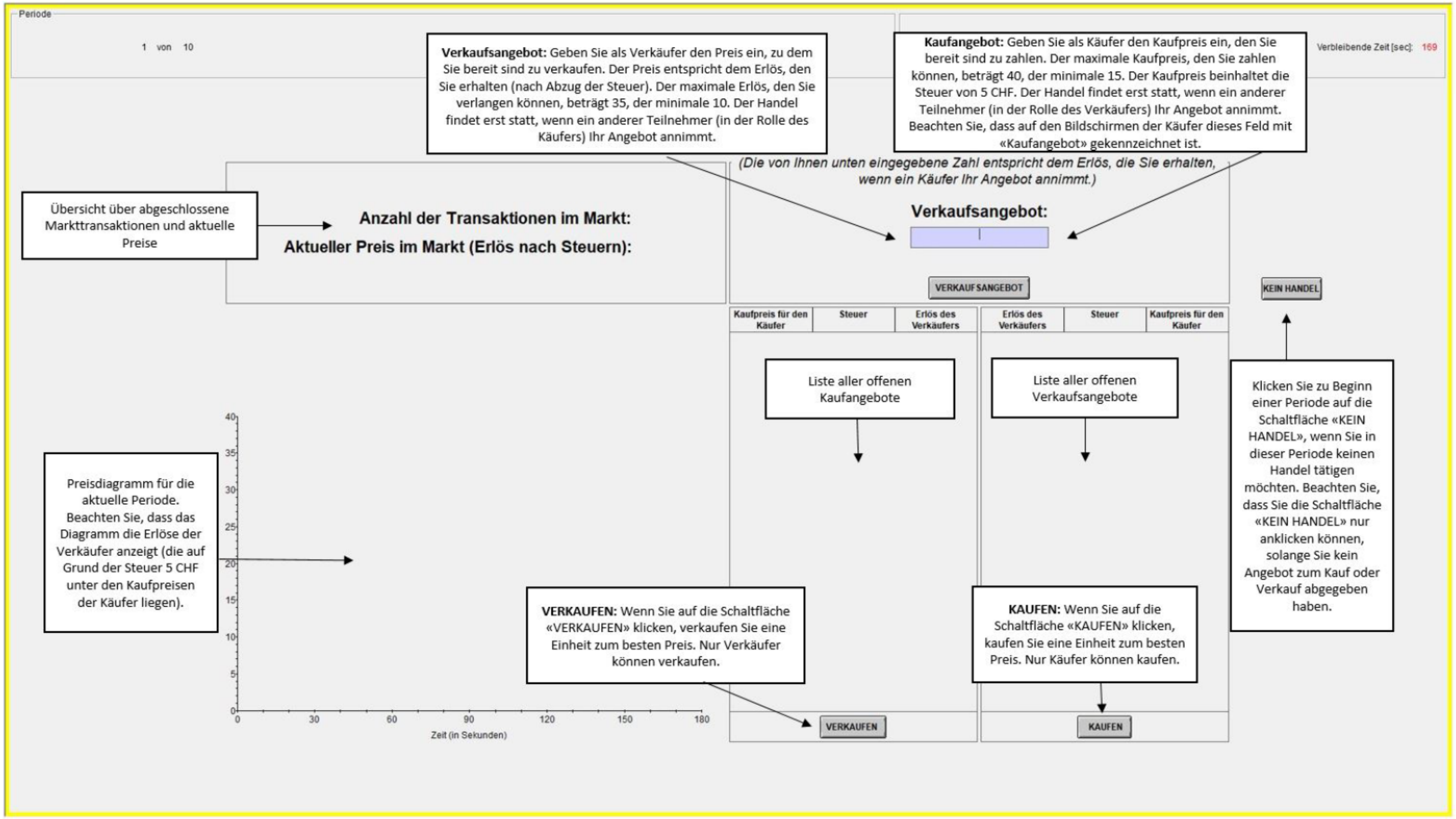
- In jeder Handelsperiode eröffnet der Computer einen neuen Markt. In jeder Periode nehmen die gleichen 9 Personen am Markt teil.
- Ein Käufer kann allen Verkäufern Kaufangebote unterbreiten. Jeder Verkäufer kann allen Käufern Verkaufsangebote unterbreiten. Erlaubt sind alle Angebote zwischen 10 und 35 CHF in Schritten von 1 CHF. Mögliche Angebote sind also 10, 11, 12, 13, ..., 34, 35.
- Ein Käufer kann allen Verkäufern Kaufangebote unterbreiten. Dazu gibt er den Kaufpreis ein, den er bereit ist zu bezahlen. Erlaubt sind alle Kaufangebote zwischen 15 und 40 CHF in Schritten von 1 CHF. Mögliche Kaufangebote sind also 15, 16, 17, 18, ..., 39, 40.
- Jeder Verkäufer kann allen Käufern Verkaufsangebote unterbreiten. Dazu gibt er den Erlös (nach Abzug der Steuer) an, den er bereit ist zu akzeptieren. Erlaubt sind alle Angebote zwischen 10 und 35 CHF in Schritten von 1 CHF. Mögliche Angebote sind also 10, 11, 12, 13, ..., 34, 35.
- Ein Handel wird abgeschlossen, wenn ein Käufer ein Verkaufsangebot von einem Verkäufer annimmt oder wenn ein Verkäufer ein Kaufangebot von einem Käufer annimmt. Eine gesonderte Bestätigung durch den Käufer oder Verkäufer, der das Angebot abgegeben hat, ist nicht erforderlich.

- Ein Käufer kann ein Verkaufsangebot und ein Verkäufer ein Kaufangebot jederzeit annehmen. Es können nur die besten Angebote angenommen werden. Das Bild auf der nächsten Seite zeigt ein Beispiel für den Handelsbildschirm für einen Verkäufer. Werfen Sie einen Blick auf die Erläuterungen zu den verschiedenen Elementen des Bildschirmausschnittes.

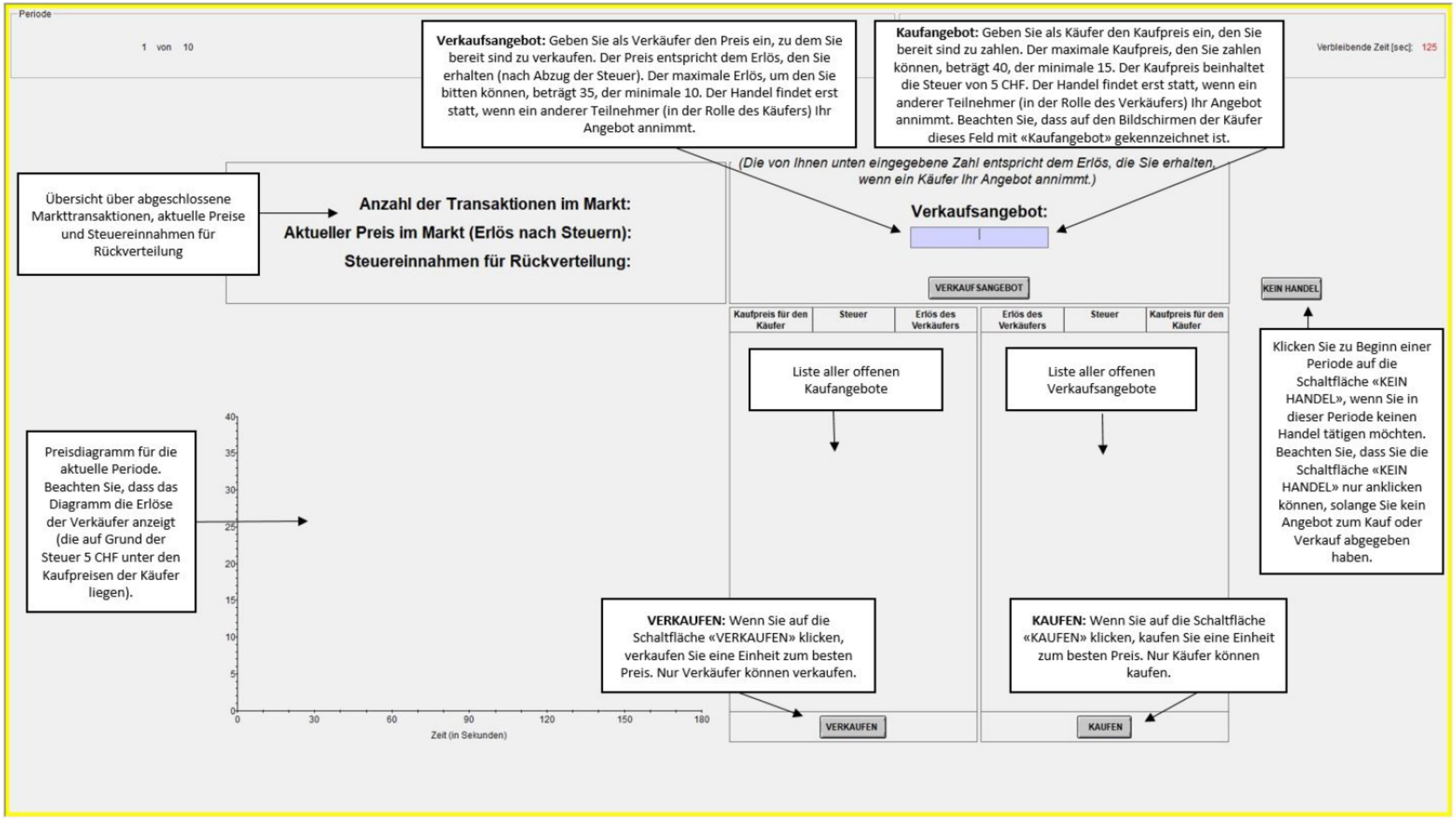
Beispiel für den Handelsbildschirm eines Verkäufers:



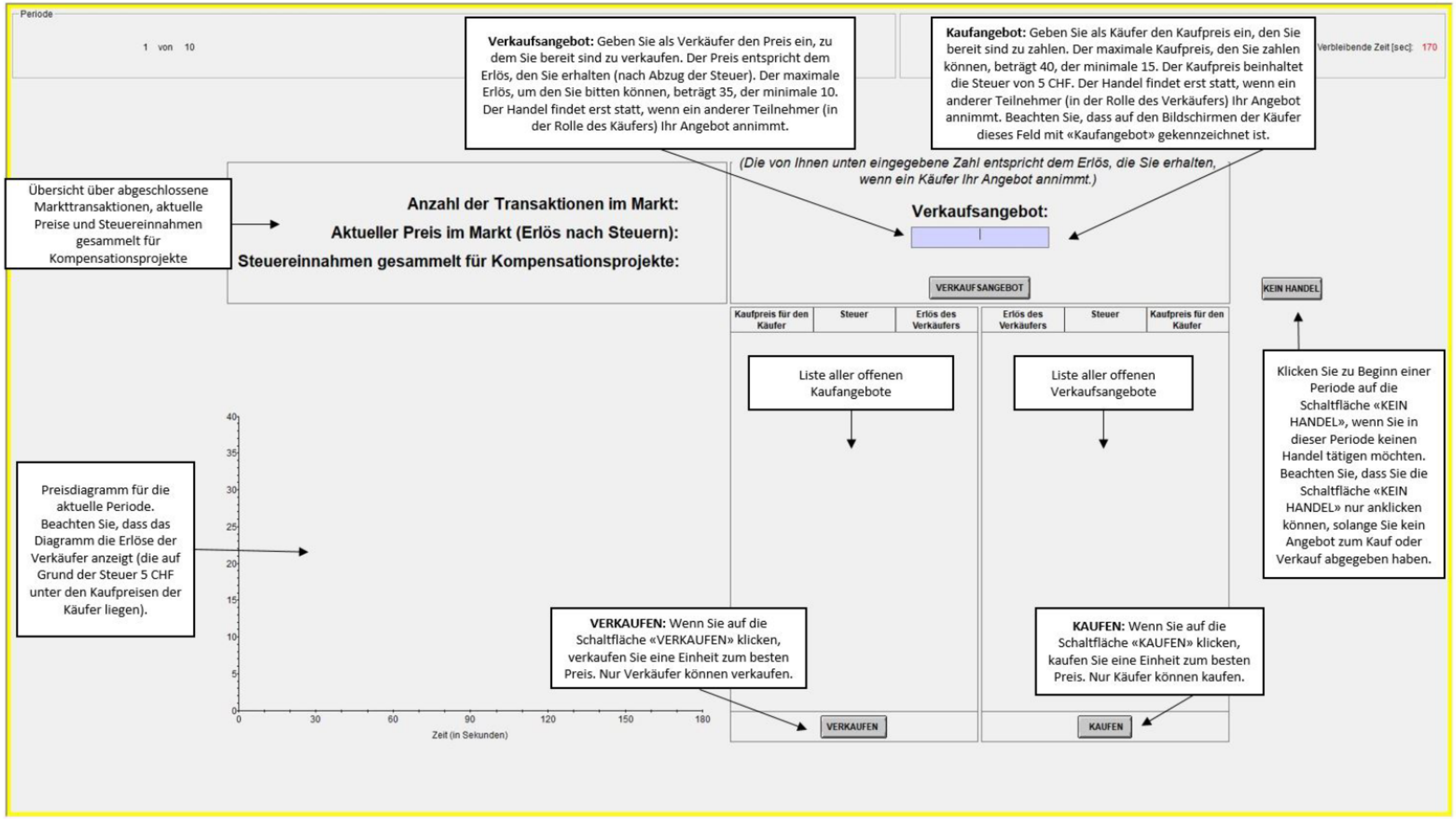
Beispiel für den Handelsbildschirm eines Verkäufers:



Beispiel für den Handelsbildschirm eines Verkäufers:



Beispiel für den Handelsbildschirm eines Verkäufers:



- Die besten Angebote stehen ganz oben auf der Liste aller Kauf- und Verkaufsangebote. Wenn Sie ein Angebot annehmen möchten, klicken Sie auf die Schaltfläche „VERKAUFEN“bzw. „KAUFEN“unten im Handelsbildschirm. Auf diese Weise schliessen Sie einen Handel mit dem Käufer / Verkäufer ab, der das beste Angebot zum Kauf / Verkauf abgegeben hat.

- Es wird eine CO_2-Steuer auf das Gut erhoben: Für jede Transaktion werden 5 CHF vom Kaufpreis abgezogen. Der Kaufpreis für den Käufer ist auf Grund der Steuer um 5 CHF höher als der Erlös des Verkäufers.

- Die Steuereinnahmen werden an die Teilnehmer/innen der Studie zurück verteilt. Sämtliche Steuereinnahmen fliessen in einen Topf, der dann wieder gleichmässig an alle Marktteilnehmer/innen verteilt wird. Das bedeutet, dass jede/r Teilnehmer/in einen gleich hohen Anteil der Steuereinnahmen zurückerhält, egal ob er/sie gehandelt hat oder nicht. Die Steuereinnahmen werden innerhalb der 9 Marktteilnehmer/innen zurück verteilt. Wenn z.B. die Steuereinnahmen 10 CHF betragen, erhält also jede/r Marktteilnehmer/in 1.11 CHF zurück verteilt.

- Die Steuereinnahmen sind für Umweltzwecke bestimmt. Das bedeutet, dass wir die Steuereinnahmen zur Finanzierung bestehender Projekte verwenden werden, die darauf abzielen, die globalen CO_2-Emissionen zu senken. Konkret spenden wir den Steuerertrag an Myclimate, eine Schweizer Stiftung, die über verschiedene Klimaschutzprojekte verfügt (z.B. Renaturierungsprogramme von Mooren in der Schweiz oder die Finanzierung von effizienten Kochern mit weniger CO_2-Emissionen in Kenia, etc.).

- In jeder Handelsperiode können Sie maximal einen Handel durchführen. Das bedeutet, dass Sie in diesem Zeitraum nach Abschluss eines Geschäfts keine Angebote mehr annehmen oder eigene Angebote abgeben können. Sobald ein Händler einen Handel abgeschlossen hat, werden alle seine offenen Angebote aus der Liste der offenen Angebote gelöscht.

- Kein Händler weiss, mit wem er im Raum gehandelt hat, d.h. Ihre Anonymität ist gewährleistet.
- Oben rechts auf dem Handelsbildschirm sehen Sie immer die verbleibende Handelszeit.
- Wenn Sie einen Handel abschliessen, führt der Handel zu einem Anstieg der Emissionen in die Atmosphäre um 0.25t CO_2. Wenn Sie keinen Handel abschliessen, wird es keinen Anstieg der CO_2-Emissionen geben.
- Wenn Sie keinen Handel tätigen möchten, können Sie einfach auf die Schaltfläche „KEIN HANDEL“auf der rechten Seite des Bildschirms klicken (oder Sie können einfach warten, bis die Handelszeit abgelaufen ist). Wenn Sie nicht handeln, können Sie kein Geld mit dem Handel verdienen, aber Sie verdienen einen Nichthandelsgewinn von 15 CHF.

Auszahlungen

Eine Periode der 10 Perioden wird **zufällig ausgewählt**. Diese Periode ist dann **relevant für die Auszahlung** und für die Bestimmung der CO_2-Emissionen und die Höhe der Steuereinnahmen, die an die Marktteilnehmer/innen zurück verteilt werden und die Höhe der Steuereinnahmen, die an CO_2-Kompensationsprojekte zweckgebunden sind. Ihr Gewinn in dieser zufällig gewählten Periode wird zum fixen Entgelt von 10 CHF hinzugefügt. Zudem erhalten Sie zusätzlich noch Ihren Anteil an der Rückverteilung der Steuereinnahmen.

Wie wird der Gewinn für einen Käufer berechnet?

- Wenn ein Käufer handelt, verdient er oder sie den folgenden Handelsgewinn:
  50 CHF - Kaufpreis (zwischen 10 und 35 CHF) (zwischen 15 und 40 CHF; inkl. Steuer von 5 CHF)
- Wenn ein Käufer nicht handelt, erzielt er oder sie folgenden Nichthandelsgewinn:
  15 CHF

In beiden Fällen wird dieser Gewinn zum anfänglichen fixen Entgelt von 10 CHF sowie zum Anteil aus der Rückverteilung der Steuereinnahmen addiert.

Wie wird der Gewinn für einen Verkäufer berechnet?

- Wenn ein Verkäufer handelt, verdient er oder sie den folgenden Handelsgewinn:
  Erlös (in CHF) = Kaufpreis (zwischen 10 und 35 CHF) (zwischen 15 und 40 CHF) - Steuer (5 CHF)
- Wenn ein Verkäufer nicht handelt, verdient erzielt er oder sie folgenden Nichthandelsgewinn:
  15 CHF

In beiden Fällen wird dieser Gewinn zum anfänglichen fixen Entgelt von 10 CHF sowie zum Anteil aus der Rückverteilung der Steuereinnahmen addiert.

Beispiele

Im Folgenden stellen wir Ihnen einige Beispiele vor, die veranschaulichen, wie Gewinne und Auszahlungen berechnet werden. Die Zahlen in den Beispielen wurden willkürlich gewählt.

Beispiel A: Ein Käufer bietet einen Kaufpreis von 30 CHF (inklusive der Steuer von 5 CHF) an, was das derzeit höchste Kaufangebot ist. Ein Verkäufer entscheidet sich, dieses Kaufangebot anzunehmen. Zudem wurden im Markt insgesamt Steuereinnahmen in der Höhe von 10 CHF erzielt. Dies führt in diesem Beispiel zu folgenden Gewinnen und CO_2-Emissionen und Anteilen an der Rückverteilung von Steuereinnahmen und Steuereinnahmen:

Handelsgewinn Käufer: 50 CHF (Wert des Gutes) - 30 CHF (Kaufpreis) = 20 CHF
Handelsgewinn Verkäufer: 30 CHF (Kaufpreis) = 30 CHF
CO_2-Emissionen: 0.25t

Handelsgewinn Käufer: 50 CHF (Wert des Gutes) - 30 CHF (Kaufpreis) = 20 CHF
Handelsgewinn Verkäufer: 30 CHF (Kaufpreis) - 5 CHF (Steuer) = 25 CHF
CO_2-Emissionen: 0.25t
Anteil an Rückverteilung der Steuereinnahmen für jede/n Marktteilnehmer/in: 10 CHF / 9 = 1.11 CHF
Steuereinnahmen, die an CO_2-Kompensationsprojekte gespendet wurden: 5 CHF

Wird diese Periode nach dem Zufallsprinzip ausgewählt, erhält der Käufer eine Auszahlung von 30 CHF für das Experiment (20 CHF Handelsgewinn in der zufällig ausgewählten Periode plus 10 CHF fixes Entgelt). Der Verkäufer erhält eine Auszahlung von 40 CHF (30 CHF Handelsgewinn in der zufällig ausgewählten Periode plus 10 CHF fixes Entgelt).

Wird diese Periode nach dem Zufallsprinzip ausgewählt, erhält der Käufer eine Auszahlung von 30 CHF für das Experiment (20 CHF Handelsgewinn in der zufällig ausgewählten Periode plus 10 CHF fixes Entgelt). Der Verkäufer erhält eine Auszahlung von 35 CHF (25 CHF Handelsgewinn in der zufällig ausgewählten Periode plus 10 CHF fixes Entgelt) 31.11 CHF für das Experiment (20 CHF Handelsgewinn in der zufällig ausgewählten Periode plus 1.11 CHF aus der Rückverteilung der Steuereinnahmen und 10 CHF fixes Entgelt). Der Verkäufer erhält eine Auszahlung von 36.11 CHF (25 CHF Handelsgewinn in der zufällig ausgewählten Periode plus 1.11 CHF aus der Rückverteilung der Steuereinnahmen und 10 CHF fixes Entgelt).

Beispiel B: Ein Verkäufer bietet an, einen Verkaufspreis von 21 CHF zu akzeptieren. Dies ist derzeit das niedrigste Verkaufsangebot und ein Käufer entscheidet sich, es anzunehmen. Zudem wurden im Markt insgesamt Steuereinnahmen in der Höhe von 20 CHF erzielt. Dies führt in diesem Beispiel zu folgenden Gewinnen und CO_2-Emissionen:

Handelsgewinn Käufer: 50 CHF (Wert des Gutes) - 21 CHF (Kaufpreis) = 29 CHF
Handelsgewinn Verkäufer: 21 CHF (Kaufpreis) = 21 CHF
CO_2-Emissionen: 0.25t

Handelsgewinn Käufer: 50 CHF (Wert des Gutes) - 26 CHF (Kaufpreis) = 24 CHF
Handelsgewinn Verkäufer: 26 CHF (Kaufpreis) - 5 CHF (Steuer) = 21 CHF
CO_2-Emissionen: 0.25t
Anteil an Rückverteilung der Steuereinnahmen für jede/n Marktteilnehmer/in: 20 CHF / 9 = 2.22 CHF
Steuereinnahmen, die an CO_2-Kompensationsprojekte gespendet wurden: 5 CHF

Wird diese Periode nach dem Zufallsprinzip ausgewählt, erhält der Käufer eine Auszahlung von 39 CHF für das Experiment (29 CHF Handelsgewinn in der zufällig ausgewählten Periode plus 10 CHF fixes Entgelt). Der Verkäufer erhält eine Auszahlung von 31 CHF (21 CHF Handelsgewinn in der zufällig ausgewählten Periode plus 10 CHF fixes Entgelt).

Wird diese Periode nach dem Zufallsprinzip ausgewählt, erhält der Käufer eine Auszahlung von 34 CHF für das Experiment (24 CHF Handelsgewinn in der zufällig ausgewählten Periode plus 10 CHF fixes Entgelt). Der Verkäufer erhält eine Auszahlung von 31 CHF (21 CHF Handelsgewinn in der zufällig ausgewählten Periode plus 10 CHF fixes Entgelt) 36.22 CHF für das Experiment (24 CHF Handelsgewinn in der zufällig ausgewählten Periode plus 2.22 CHF aus der Rückverteilung der Steuereinnahmen und 10 CHF fixes Entgelt). Der Verkäufer erhält eine Auszahlung von 33.22 CHF (21 CHF Handelsgewinn in der zufällig ausgewählten Periode plus 2.22 CHF aus der Rückverteilung der Steuereinnahmen und 10 CHF fixes Entgelt).

Beispiel C: Ein Verkäufer bietet an, einen Verkaufspreis von 17 CHF zu akzeptieren ,was einem Kaufpreis von 22 CHF für einen Käufer entspricht (17 CHF + Steuer von 5 CHF). Kein Käufer nimmt das Angebot bis zum Ende der Frist an und der Verkäufer macht kein weiteres Angebot oder akzeptiert ein offenes Kaufangebot. Zudem wurden im Markt insgesamt (durch die Transaktionen anderer Marktteilnehmer/innen) Steuereinnahmen in der Höhe von 15 CHF erzielt. Dies führt in diesem Beispiel zu folgenden Gewinnen und CO_2-Emissionen und Anteilen an der Rückverteilung von Steuereinnahmen und Steuereinnahmen:

Nichthandelsgewinn Verkäufer: 15 CHF

CO_2-Emissionen: 0t

Anteil an Rückverteilung der Steuereinnahmen für jede/n Marktteilnehmer/in: 15 CHF / 9 = 1.67 CHF

Steuereinnahmen, die an CO_2-Kompensationsprojekte gespendet wurden: 0 CHF

Wird diese Periode zufällig ausgewählt, erhält der Verkäufer eine Auszahlung von 25 CHF für das Experiment (15 CHF Nichthandelsgewinn in der zufällig ausgewählten Periode plus 10 CHF fixes Entgelt) 26.67 CHF für das Experiment (15 CHF Nichthandelsgewinn in der zufällig ausgewählten Periode plus 1.67 CHF aus der Rückverteilung der Steuereinnahmen und 10 CHF fixes Entgelt).

Beispiel D: Ein Käufer und ein Verkäufer klicken beide auf die Schaltfläche „KEIN HANDEL“. Zudem wurden im Markt insgesamt (durch die Transaktionen anderer Marktteilnehmer/innen) Steuereinnahmen in der Höhe von 5 CHF erzielt. Dies führt in diesem Beispiel zu folgenden Gewinnen und CO_2-Emissionen:

Nichthandelsgewinn Käufer: 15 CHF
Nichthandelsgewinn Verkäufer: 15 CHF
CO_2-Emissionen: 0t
Anteil an Rückverteilung der Steuereinnahmen für jede/n Marktteilnehmer/in: 5 CHF / 9 = 0.56 CHF
Steuereinnahmen, die an CO_2-Kompensationsprojekte gespendet wurden: 0 CHF

Wird diese Periode zufällig ausgewählt, erhalten Käufer und Verkäufer jeweils eine Auszahlung von 25 CHF für das Experiment (15 CHF Nichthandelsgewinn in der zufällig ausgewählten Periode plus 10 CHF fixes Entgelt) 25.56 CHF für das Experiment (15 CHF Nichthandelsgewinn in der zufällig ausgewählten Periode plus 0.56 CHF aus der Rückverteilung der Steuereinnahmen und 10 CHF fixes Entgelt).