

The Opportunity Cost Neglect of Money and Time

– The Role of Mental Budgeting

*Försummelsen av alternativkostnaden för pengar och tid
– Mental budgeterings roll*

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Abstract

Consumers often fail to consider the alternative ways to spend money when making decisions to buy consumer goods, this is called opportunity cost neglect. In this experimental study, our objective was to replicate the previous research of Frederick et al. (2009) showing that reminding individuals about the opportunity cost affects their decisions. Furthermore, we also wanted to extend the knowledge about this behavior by investigating whether individuals neglect the opportunity cost when making financial decisions or decisions about time allocation. In addition, we hypothesized that individuals who conduct mental budgeting (i.e., they categorize-, budget-, and track expenditures to mental accounts), are more likely to neglect the opportunity cost since they do not treat money as fungible.

In an online experiment, we measured how being reminded about the opportunity cost would affect the probability of an individual buying a cheap and an expensive consumer goods, of investing money, and of watching a movie. Furthermore, we measured how being reminded about the opportunity cost affects the decision of those who conduct mental budgeting and those who do not. Our results showed that individuals neglect opportunity cost of the expensive consumer good and time ($p=0.1$). We found a positive relation between conducting mental budgeting and opportunity cost neglect for the expensive consumer good ($p=0.1$) and the deposit account ($p=0.05$), but no such effect in the other three scenarios.

Our results imply that, due to opportunity cost neglect of time, people might be even further from optimal decision making than previously suggested since it extends to decisions about time allocation, and perhaps to investments; and people who conduct mental budgeting sometimes spend less/save more when reminded about the opportunity cost.

Key words: Behavioral Economics; opportunity costs neglect; mental budgeting; time.

Sammanfattning

Konsumenter misslyckas ofta att överväga alternativa sätt att spendera sina pengar när de fattar beslut om att köpa konsumentvaror, detta kallas försummelse av alternativkostnaden. I denna experimentella uppsats var vårt syfte att försöka att replikera den tidigare forskningen av Frederick et al. (2009) som visade att påminna individer om alternativkostnaden påverkar deras beslut. Dessutom så ville försöka att utveckla kunskapen om detta beteende genom att undersöka huruvida individer försummar alternativkostnaden när de tar finansiella beslut eller när de ska allokera sin tid. Vidare så förde vi en hypotes om att individer som gör mental budgeting (d.v.s. kategoriserar-, budgeterar- och registrerar kostnader till mentala konton) är troligare att försumma alternativkostnader då de inte behandlar pengar lika fungibelt.

I ett online-experiment undersökte vi hur påminnelsen av alternativkostnaden i ett scenario skulle påverka sannolikheten att köpa en billig- och en dyr konsumentvara, investera pengar, eller se på en film. Dessutom så undersökte vi hur påminnelsen av alternativkostnaden påverkade beslutet för de som gör mental budgetering. Våra resultat visade att individer försummade alternativkostnaden av den dyra konsumentvaran och av tid ($p=0.1$). Vi upptäckte en positiv effekt mellan att göra mental budgeting och försumma alternativkostnader för den dyra konsumentvaran ($p=0.1$) och för sparkontot ($p=0.05$). Vi fann inte någon sådan effekt av påminnelsen i de andra tre scenarierna.

Våra resultat medför att, på grund av försummelsen av alternativkostnaden av tid, så kan människor vara ännu längre från optimalt beslutsfattande än vad som tidigare har föreslagits eftersom det utsträcker sig till tidsallokering, och kanske investeringar; samt att människor som utövar mental budgetering ibland spenderar mindre/sparar mer när de blir påmind om alternativkostnaden.

Nyckelord: *Beteendekonomi; försummelse av alternativkostnader; mental budgeting; tid*

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1 Introduction

Suppose that a group of friends hesitate whether they want to go to the bar with a free entrance or to the livelier nightclub with an entrance fee of 150 SEK. The conversation is mostly about whether they have the energy to go dancing at the nightclub or if they prefer to just sit and talk at the bar, and at the moment, they feel indifferent between the two alternatives. Then one of friends suddenly realize that they can afford two extra drinks if they choose the bar with no entrance fee. The idea is presented to the group, the choice becomes obvious and they go to the bar. This example may be exaggerated, but it illustrates how people, when making economic decisions, at first tend to fail to account for the opportunity cost when it is not mentioned explicitly. In this case, the group of friends undervalued the alternative ways of spending the 150 SEK entrance fee at the nightclub and therefore they could not realize that going to the bar would maximize their utility.

We can think of similar situations when it comes to the opportunity cost of spending time. Let us go back to the example above, but instead of deciding which place you would prefer, you are now supposed to decide if you want to follow your friends out or not. The opportunity cost of following your friends out is that you are no longer able to spend the evening in your sofa, resting and watching some Netflix or maybe even studying for a difficult exam in microeconomics. With the opportunity cost explicitly stated, do you think that you will be more tempted to stay at home? Standard economics assumes that everyone is taking the opportunity cost into account and therefore would be consistent with their choice irrespectively if the opportunity cost of the two extra drinks or, staying at home and watching Netflix, would be explicitly stated or not. However, previous research suggests that consumers fail to take the opportunity cost into account when it comes to monetary decisions (Frederick et al. 2009). This phenomenon is called opportunity cost neglect.

1.1 Background

1.1.1 The Concept of Opportunity Cost

Opportunity cost is defined as the value of “the opportunities forgone in the choice of one expenditure over others” (Britannica Academic 2018 p.1). Suppose you have a fixed income and choose to buy a new sweater. The opportunity cost of the sweater is the value of the pants you never bought or the concert you did not attend. Since it is taken for granted in standard economic models that individuals do take opportunity costs into consideration to maximize their own utility (Buchanan 1969) it becomes problematic if this assumption does not hold. The implications could be that individuals,

enterprises and perhaps even governments might not put their scarce resources in the best use which would create market inefficiencies and therefore welfare losses.

It is important to consider the opportunity cost when making temporal decisions, and not solely monetary decisions. Suppose you are going to watch a movie on Netflix on a Friday evening and you do not have the time to see all the movies, so you need to decide which one gives you the most utility. Opportunity cost also plays role in more complex decisions, such as where you should live or which job you apply for. To sum up, opportunity cost is important to consider in a lot of situations and is arguably fundamental in economics, since it is about allocating your scarce resources in an effective way, either if it is money or time. Without the consideration of the different alternatives, individuals forego options that could potentially maximize their utility. Economists take the consideration of opportunity costs as granted but empirical research shows that people tend to overlook the opportunity costs leading to potential losses in utility in a lot of contexts (not only economic ones).

1.1.2 The Differences Between Time and Money

Even though the economic research treats all resources (for example, money and time) in the same way, as they all bring utility and can be expressed using utility function, it does not have to be so. There is ample research which supports the argument that time is perceived differently than money. For instance, Soman (2001) explored the differences in how previous temporal- or monetary investments affect subsequent decisions, i.e. whether people fall prey to the sunk cost fallacy. For example, are people more likely to continue investing time/money in a project, if they already incurred great costs in the same project? What he found was that when it came to monetary investments, people fell prey to the sunk cost fallacy, but they did not when it was a temporal investment. His explanation to this finding was that people were unaware of how to value time in terms of money, even though in general people had the tendency to fall for the sunk cost fallacy. This caused a pseudo-rational behavior. Thus, not being able to directly translate time to money made subjects seemingly rational.

The differences between time and money was further explored when Okada and Hosh (2004) presented respondents with different prospects with high risks and high rewards, where the payment was made in either time or money. Participants were asked to buy hypothetical lottery tickets, which had the same expected value but different risk levels, with monetary outcomes. What they observed was a positive relation between spending time to take higher risk for potentially higher return of money, whilst this relation was negative when individuals had to spend money, i.e., people were risk-seeking when it came to time but risk-averse when it came to money. They argued that the difference

in the estimation of the opportunity cost was a possible explanation. Money is more liquid, it can be stored which makes the opportunity cost more time-consistent, and the value is relatively fixed; in contrast time is perishable (if you do not choose how to spend it you will waste it and will not be able to recover it), more ambiguous, context dependent, and has a flexible value (Okada & Hosh 2004).

Moreover, there are differences in how much time and money people expect themselves to have in the future. Zauberman and Lynch (2005) tested the differences in the propensity to discount temporal- and monetary investments. They did this by asking whether people believed that they would have more spare time, or more financial reserves, in exactly one month from now. In addition, they tested the number of usages, of both products and services, needed to become indifferent between an alternative with a high investment cost and a low usage cost. This was compared to an alternative with a low investment cost and a high usage cost. They then compared the responses when the costs were either temporal or monetary. They found that people discounted time higher than money, indicating that there is a larger present bias for time, which can lead to a greater slack in temporal budgets than in monetary budgets. Furthermore, people underestimate how busy they will be in the future. Whillans et al. (2018) tested whether people were more likely to be interested in buying a time-saving purchase by adding information about what they could do with the spare time and when it would be. They found that people were more willing to make such purchases when reminded of the time they would save the same day the following week, rather than how they could spend the time. This indicates that people underestimate their value of future time.

Temporal trade-offs are valued differently when they are traded for money, or for safety. Hess et al. (2012) tested the consistency and fungibility of monetary valuations of transport. To test this, they used three questions of trade-off: sacrificing cost for shorter time; sacrificing safety for lower costs; and sacrificing safety for shorter time. They found that time was valued higher when it is directly compared to cost rather than when time is traded for safety. This is another indication of how time is valued differently from money depending on the context. Duxbury et al. (2005) tested whether people are willing to spend money to save time in the same extent as people are willing to spend time to save money. They tested this by making a reversed form of the calculator jacket problem (see Tversky & Kahneman 1981). Their results showed that, with the classical example, travelling 20 minutes to save 45 SEK on a calculator for 130 SEK is better than traveling 20 minutes to save 45 SEK on a 1100 SEK jacket. However, the reversed example showed that, paying 35 SEK to save 20 minutes on a 60 minutes long journey is not different from paying 35 SEK to save 20 minutes on a 120 minutes long journey. This suggests that people value savings of time and money differently but also that mental accounting of money and time differ from each other. Overall, there is ample research which suggests that people value time and money differently, hence it is important to explore whether there are

differences in how individuals perceive opportunity costs depending on the type of outcome (monetary or temporal).

1.1.3 A New Explanation for Opportunity Cost Neglect

How can opportunity cost neglect be explained? Spiller (2011) showed that people considered opportunity costs if they perceived resource constraints and if the resources could only be spent on specific products (i.e., had limited use). This result implies that poor people, who are more constrained with their resources, should be less likely to fall prey to opportunity cost neglect. However, Plantinga et al. (2018) tested if poor and rich people differ in the negligence of opportunity cost but instead found that both groups neglected opportunity costs equally which is contradictory to what Spiller (2011) found.

Since the results concerning wealth and opportunity costs neglect are inconclusive, we suggest another mechanism stemming from mental accounting, called mental budgeting, which might explain which individuals are more prone to neglect opportunity costs. In short, mental accounting can be described as a system individuals create in their mind to track their financial decisions and to act as a self-control device (Thaler 1999). A part of mental accounting is mental budgeting, which posits that individuals have separate budgets for different consumption and income categories and spend their money accordingly to these budgets (Thaler 1999). However, this can lead to the violation of the assumption of fungibility (i.e., a krona should always have the same value regardless of where it is spent on; Thaler 1999; Heath & Soll 1996; Hess et al. 2012). In other words, money you receive from tax return, paycheck or as a gift might not be treated the same and might be spent (or saved) differently depending on the seriousness of the same source (O'Curry 1997 in Thaler 1999).

We believe that categorizing consumption into different budgets can create restrictions in how people compare outcomes, thus leading to greater opportunity cost neglect. Take as an example, an individual who has one mental account for clothes with a budget of 1000 SEK. She might easily realize that the purchase of a pair of jeans for 1000 SEK limits her possibility to buy a T-shirt for 400 SEK plus a pair of shoes for 600 SEK. However, the comparison of the expense of 1000 SEK on a pair of jeans to a few dinners at a restaurant or a few months subscription to an online streaming service might be difficult and not that straightforward since these expenses are in a different category of expenses. This idea is consistent with the conclusions of Spiller (2011) who states that individuals more commonly consider similar uses of resources when comparing alternatives. However, Frederick et al. (2009) suggested, that those who create narrow budgets might be more likely to feel that they are

giving up something when they decide to buy one thing, hence they are more likely to consider opportunity costs which is the opposite to our suggestion.

1.1.4 Mental Budgeting of Time and Money

It has been observed in several studies that people conduct mental budgeting (Heath & Soll 1996; Rajagopal & Rha 2009; Antonides et al. 2011) and that there are both similarities and differences in the budgeting of time and money. Time is, like money, categorized into different budgets, mainly work and non-work-related activities, and people try to maintain these budgets. A difference is that time has other attributes concerning storage and limited number of hours per day (Rajagopal & Rha 2009). The tracking of benefits and costs is important since it allows individuals to evaluate their mental accounts and consider them positive, negative or blank. This is independent of whether it is a temporal or monetary budget, but the accounting periods tends to differ between these two. Temporal budgets are more often accounted on days, months, seasons whilst monetary are more often accounted dependent on regular cash flows (Soster et al. 2010).

1.1.5 The Research Gap and Our Contributions

To sum up, economic theory assumes that individuals take opportunity costs into account when making decisions about allocating their scarce resources (both money and time). Furthermore, individuals who account for it are more likely to maximize their utility (Woodbury, Hooper 2013). Previous research has shown that individuals both, sometimes neglect opportunity costs but also sometimes consider them (Frederick et al. 2009; Spiller 2011); individuals create both monetary and temporal mental budgets (Antonides et al. 2011; Rajagopal & Rha, 2009; Soster et al. 2010); and that there are differences in how time and money are valued (Soman 2001; Duxbury et al. 2005; Zauberman & Lynch 2005; Soster et al. 2010; Hess et al. 2012; Whillans et al. 2018).

Spiller (2011) suggested that future research on opportunity cost neglect should move beyond money and examine the time dimension. Frederick et al. (2009) also suggested that future opportunity cost neglect research should include time and they believe time might be even more neglected than money because of the greater perceived slack in temporal budgets (Okada & Hosh 2004; Zauberman & Lynch 2005) except for those who commonly convert time to money (e.g., lawyers and consultants). This supports our argument that the neglect of the opportunity cost of time can be pervasive and is important to be investigated. This phenomenon has, to the best of our knowledge, not been empirically investigated. Furthermore, it is important to explore the underlying mechanisms behind opportunity cost neglect to find an explanation to the problem. Plantinga et al. (2018) investigated

whether individuals' wealth can explain opportunity cost neglect and found that wealth was not an explanation. We will expand this by exploring if mental budgeting can be a possible mechanism.

1.2 Objective

Our objective is to experimentally investigate and analyze whether and to what extent people neglect the opportunity cost of money and time. We extend previous research on opportunity cost neglect of consumer goods, by additionally looking at the opportunity cost neglect of financial instruments, as well as time. Furthermore, we explore if mental budgeting can explain opportunity cost neglect.

1.3 Research questions

To help completing our objective we decided to pose the following research questions:

1. Do people neglect the opportunity cost of money?
2. Do people neglect the opportunity cost of time?
3. Can mental budgeting explain opportunity cost neglect?

1.4 Hypothesis

Our first hypothesis is that people neglect the opportunity cost of money. Frederick et al. (2009) and Plantinga et al. (2018) showed that simple reminders about the opportunity cost in connection to a purchase, decrease the likelihood of purchases of consumer goods. This proves that people overlook the alternative ways of spending their money in that context. We extend this hypothesis to also apply in financial scenarios which has, to the best of our knowledge, not been previously studied. By being reminded about the opportunity cost, an individual should be less willing save/invest the money. However, financial decisions can be seen as more complex than decisions for consumer goods. This could imply that the reminder will not affect people's tendency to consider the opportunity cost, since they might not consider it to be an important variable (people might rather consider the interest rate, the time period, the risk level etc.).

Our second hypothesis is that people neglect the opportunity cost of time. On the one hand, consuming time is similar to consuming money, regarding that they are both scarce resources. On the other hand, there are differences between the two considering time is perishable and a more evenly distributed source that everyone constantly consumes. That could imply that people are more used to it and therefore take its alternative uses into account more frequently. There is, to our knowledge, no previous research proving that people would neglect the opportunity cost of time in a lower extent

compared to money. Frederick et al. (2009) even speculated the opposite, that the opportunity cost of time may be more likely to be neglected due to the perceived slack in temporal budgets. Studies from Okada & Hosh (2004), Zauberan and Lynch (2005), and Whillans et al. (2018) showed that time could be more difficult to value, hence they might neglect it more than money.

Our third hypothesis is that people who conduct mental budgeting to a higher degree also tend to neglect opportunity costs more often. Mental budgeting violates the assumption of fungibility of time and money, which means that the perceived outcome for money or time is restricted to a certain budget. This might create difficulties to transfer them between budgets, hence they tend to suffer from opportunity cost neglect. Simultaneously, Frederick et al. (2009) speculated that people who create narrow budgets are more likely to consider opportunity cost since they may feel that they are giving up something when consuming. To sum up, individuals who conduct mental budgeting are more likely to consider alternative uses of their resources within particular budgets but are less likely to consider alternative uses of their resources between different budgets. We believe that the latter effect is stronger, hence they should neglect opportunity costs more.

1.5 Methodological approach

To answer our research questions, we collected data by conducting an economic experiment. The usage of lab experiments has grown remarkably in the past 30 years and laboratory experiments are now accepted as a viable source of knowledge in social sciences including economics (Falk & Heckman 2009). The main advantage of a lab experiment is the possibility to make causal inferences in a controlled environment. In the laboratory environment, researchers can keep the same experimental procedures across different treatments with the only variation in the factor variable of interest (Falk & Heckman 2009). In our case, the controlled environment was reflected in asking identical questions to all participants, with the only difference that the treatment group was reminded of the opportunity cost of consumption, while the control group was not. Lab experiments have been criticized for not having as high external validity as field experiments since the experimental tasks are usually artificial and abstract. However, we believe that scenarios adopted in our experimental design are realistic, and thus have relatively high external validity.

2 Literature Review

To better understand the importance of opportunity costs we took a closer look into economic literature, and behavioral economic research, to see the differences between theory and empirical evidence and to present what is already known and how our study contributes to existing knowledge. By presenting the theory behind mental accounting and mental budgeting and comparing it to the empirical evidence we strengthened our argument why mental budgeting could explain the neglecting of opportunity cost.

2.1 Opportunity Cost

2.1.1 Theoretical Background

Opportunity cost is defined as the perceived benefits a person forgoes when choosing to allocate a resource in one way instead of another. In economics, it is important since it creates the possibility to examine the relative utility of various goods and services (Britannica Academic 2018). For the concept of opportunity cost to emerge it requires limited resources and the existence of an alternative option (Woodbury, Hooper 2013). If these requirements are not met, the opportunity cost of the decision is always zero. However, these requirements frequently occur in economics since its essence is to study the use of scarce resources. This makes opportunity cost a useful tool to facilitate utility-maximizing choice from the available alternatives (Woodbury, Hooper 2013).

Firms and individuals usually have limited resources to spend and invest. If they ignore the opportunity cost and invest their resources in an option only because it is profitable they may forego alternative investments that are even more attractive. Thus, opportunity cost is not a cost per se that you need to pay for but rather measure the potential use. Take as an example a lawyer with an hourly wage of 300 SEK who cleans her apartment for one hour every day but can hire a housekeeper for 100 SEK. In this case the opportunity cost for cleaning is 300 SEK since she could have kept working for one hour instead. When cleaning, she does not need to hire a housekeeper (saving her 100 SEK), thus making her economic loss 200 SEK. Another possible alternative for the lawyer is to hire the housekeeper and work for an additional 20 minutes (earning 100 SEK to pay for the housekeeping) and then having the remaining 40 minutes to spend freely. Thus, by cleaning the apartment by herself she is giving up on 200 SEK or 40 minutes of her time. However, she might consider cleaning as something relaxing and something she values higher than the 200 SEK or the 40 minutes. If that is the case, she could by cleaning the apartment by herself make the decision that maximizes her utility.

This way, the concept of opportunity cost has the possibility to regard for both monetary and non-monetary costs.

The same principle occurs when you consider decisions on how to spend your time. If you go out to see your friends in the evening, you are giving up the alternative to stay at home watching TV. You are always giving up on the alternative ways to spend your time when you are choosing what to do. The consideration of opportunity cost is applicable to all resources that are scarce and generate utility, so not only how to spend your time or money, but also which thoughts to focus on, which impression to make or how to use physical and mental energy. Decisions frequently involve many different types of resources, for example if you try to decide whether you want to attend a yoga class. You will spend time and money, waste some physical energy, but hopefully gain some mental energy weighing it all up. This makes the calculations of the opportunity cost complex and difficult to measure and account for when making decisions. Despite these eventual difficulties, the assumption that the idealized consumer rationally considers opportunity cost is well-established not only in economic textbooks, but it also seems to be an accepted idea about the actual consumers (Frederick et al. 2009).

2.1.2 Empirical Evidence

In reality, individuals tend to neglect the opportunity cost. Psychological research shows that consumers' judgements and preferences tend to be based solely on the pieces of information that are explicitly stated (Kahneman & Frederick 2002 in Frederick et al. 2009; Slovic 1972 in Frederick et al. 2009), which reveals a flaw in our economic decision making. Frederick et al. (2009) conducted an experiment in which they put up hypothetical scenarios whether the participants wanted to buy different kind of products (a DVD, an iPod or a stereo). The question was identical for both control and treatment group with the only difference that the treatment group had the opportunity cost explicitly stated. A simple reminder about the opportunity cost (in this case saving the money for other purchases) led to decrease in purchase decisions in the treatment group, indicating that people neglect the opportunity cost. A similar experiment was conducted by Jones et al. (1998) in which they, instead of using economic terms, asked the two hypothetical questions "Should I move to New York?" or "Should I move to New York or stay in Chicago?" where the treatment group had the opportunity cost (stay in Chicago) stated while the control group did not. The resource to spend in this scenario is time, either in New York or in Chicago, but they found the same results: people tend to neglect the opportunity cost to a bigger extent when it is not explicitly stated (Jones et al. 1998). To conclude, whether it is outcomes concerning money or time, people tend to fail to consider the opportunity cost.

When do people consider the opportunity cost? Spiller (2011) found that consumers consider opportunity costs when they experience resource or limited-use constraints, e.g., having a tight weekly budget or a short pay cycle. Further, consumers with a high propensity to plan for the future were more likely to consider opportunity cost whilst those with a low propensity only did when their budget was constrained. These results suggest that less wealthy individuals (who are budget-constrained) would do better in terms of recognizing opportunity costs. This has also been confirmed by Shah et al. (2015) who show that people facing scarcity are better at recognizing trade-offs. In contrast, Plantinga et al. (2018) tested the hypothesis that poor people neglect opportunity costs less than wealthy people. They conducted an experiment adapted from Frederick et al. (2009) but controlled for socioeconomic background. They concluded that there were no differences between people with high and low income in their ability to consider opportunity costs, which contradicts Spiller's (2011) conclusion that scarcity affects opportunity cost consideration.

2.2 Mental Accounting

2.2.1 Theoretical Background

The principle of fungibility means that a good should have the same worth no matter what form it is in, e.g. one 10 SEK coin for two 5 SEK coins, or that 10 SEK has the same value either if it is spent on money or clothes (BusinessDictionary 2018). This indicates that people should be rational in how they value their money. The source of the money (paycheck, gift, cash, etc.) should be treated equally as well as the intended purpose of the money (rent and bills, entertainment, clothes, etc.) should be. An overconsumption in one category can be compensated by an underspending in another, and the money should be spent where they give as much utility as possible (Thaler 1999).

To improve the normative consumer theory, Thaler (2008) suggested mental accounting to better explain consumer behavior where the principle of fungibility does not hold. "Mental accounting is the set of cognitive operations used by individuals and households to organize, evaluate, and keep track of financial activities." (Thaler 1999 p.183). The three major components of mental accounting are: perceiving outcomes, assigning activities to certain accounts, and choice bracketing (Thaler 1999). The most relevant component for us was the second one, which is also called mental budgeting. Mental budgeting consists of three parts, assigning expenditure to different budgets, categorizing income, and assigning wealth to different accounts (Thaler 1999). We chose to focus on the budgeting of the expenditure because, due to characteristics of time, it is near impossible to have an income or a wealth of time. When consumers spend their time on one activity they give up on other alternative ways, i.e. dealing with opportunity cost. Thaler (1999) argues that the main reasons for categorizing

and budgeting expenditures are to help consumers make trade-offs between comparable uses of money, but also to act as a self-control device to avoid overspending.

Less funds would mean a more explicit budget but can also lead to a shorter time period for the evaluation of a budget, e.g. a weekly setting of budget instead of a monthly or yearly (Thaler 1999). In order to conduct mental budgeting, individuals need to first register their expenses and then assign them to a particular account. If one of the steps is not followed, the expense will not affect the budget (Heath & Soll 1996). It is common that small expenses are not registered and therefore not budgeted (Thaler 1999). A cup of coffee for 5 SEK a day might seem cheap and not worth registering, but over the course of 5 years (bachelor + master thesis), a cup of coffee per day adds up to 5000 SEK¹. This highlights the importance of tracking expenses to conduct mental budgeting.

2.2.2 Empirical Evidence

There have been several studies which show that individuals use mental budgeting. Antonides et al. (2011) measured what factors affects mental budgeting and how they affect it. They asked the participants to report to what extent they agree with various statements, typical for individuals who conduct mental budgeting. The statements focused mainly on the existence of budgets and how rigid the budgets were. Their results showed that people do conduct mental budgeting. In line with Thaler's prediction (1999), individuals who had little wealth were more likely to use mental budgeting. Other factors that positively affected the likeliness to use mental budgeting were lower education, being a male, and being short-term time oriented (Antonides et al. 2011).

Mental accounting affects consumer behavior. Heath and Soll (1996) found that MBA students had mental budgets for different categories (e.g. food, entertainment) and spending in one category also led to an underconsumption in that category. They tested this by comparing how subjects who had previously bought sports tickets for \$20, with subjects who had bought party snacks for \$20, would be likely to buy another entertainment good. Those who had bought sports tickets were more likely to underconsume in entertainment, indicating that they had a mental account for entertainment. One possible explanation for this behavior could be that people impose too rigid budget for self-control (Heath & Soll 1996). Some individuals were not willing to compensate an overconsumption in one category with an underconsumption from another, hence violating the rule of fungibility. This is problematic since a person should overspend in one category (e.g. entertainment) and underspend in

¹ Considering a semester being 20 weeks. If you chose to take a forgone interest rate of 7% per year to account, the sum adds up to 5 942 kr when having an average monthly deposit of 83 SEK. Suddenly a coffee each day during the work week does not sound as cheap.

another category (e.g. clothes) if buying more entertainment (e.g. sports tickets, cinema) gives more utility than additional clothes.

There is empirical evidence of mental budgeting of time, but it slightly differs from mental budgeting of money. Rajagopal and Rha (2009) found that temporal budgets often regulate how much time one should or can spend on an activity. In general, people have two different time budgets: for work-related activities and non-work-related activities. Mental budgeting of time, like money, violates the assumption of fungibility since people usually do not trade-off work-related time for non-work-related time. Unexpectedly gained time (e.g., due to a canceled lecture) is spent differently depending on the planned activity. Mental accounting of time and money includes keeping track of cost and benefits, by seeking a benefit to compensate for a cost in the same account (Soster et al. 2010), e.g., if a person spend 30 min working for a movie ticket (instead of paying 80 SEK) she will try to go and watch a movie. However, there has been observed differences in the accounting periods. Temporal accounts are more likely to close the same day, month or season and are more acceptable to be closed as negative account. Monetary accounts tend to be open longer and are more likely to close as positive or blank. They might also be accounted between the regular monetary flows such as paychecks (Soster et al. 2010). This idea can be related to Soman's (2001) discovery on how sunk costs differs between time and money. If someone has spent a lot of money on a project (the project is an account) it would be more likely to try to close the account with a positive balance and therefore taking sunk cost into consideration; whilst if the same person would have spent time on the project, it would be more acceptable to close the account on a negative and not take sunk cost into consideration.

3 Method

We conducted an online experiment with a between-subject design where we had a treatment and a control condition for the opportunity cost questions. In addition, we measured tendency to conduct mental budgeting. We randomly assigned subjects into conditions to avoid any possible biases and confounds.

3.1 Data Collection

We conducted an economic experiment to collect our data. Lab experiments are seen as an accepted source of knowledge in behavioral economics and give the researcher the advantage of controlling the environment which enables them to only change the factor variable of interest between treatments (Falk & Heckman 2009). We were able to control the environment by only reminding the treatment group about the opportunity cost. Another aspect that contributed to the choice of data collection method was the difficulty of finding similar data in real life. The problem with finding naturally-occurring data by observing consumers is that the process of neglecting the opportunity cost is something that takes place in the brain which is, more or less, impossible to observe. One solution to that problem could have been to remind some of the consumers about the opportunity cost before making a purchase. However, that could also be problematic since we could affect the consumers to not think what they actually prefer but rather to act in the way they think they should act (i.e., induce so-called experimenter demand effect²).

Every data collection method has its own advantages which gives them potential to improve the knowledge in the social science (Falk & Heckman 2009) and we believed that a lab experiment was the most appropriate method of data collection to best answer our research questions. Similarly, both Frederick et al. (2009) and Plantinga et al. (2018) conducted experimental lab studies to explore the existence and the extent of opportunity cost neglect which further supports our choice. Lab experiments can be conducted either in a computer laboratory, in a classroom using a pen and paper, or online. We chose to conduct an online survey since this was the least time demanding alternative which suited us well considering our time limitations. It is also very convenient for the participants who did not need to commute to the physical laboratory which enabled us to get a relatively high participation rate without using any monetary rewards for participants, which additionally made the

² If subjects in an experiment are trying to figure out the appropriate behavior and then changes their behavior to fit their guess, experimenter demand effects refer to the changes in the subjects' behavior (Zizzo 2010)

study cheap. The main disadvantage of online surveys is that there is no possibility to explain any eventual misunderstandings. However, we believed that the questionnaire was simple and easy to understand so we argued that would not become a decisive problem.

We used JEDI-lab's pool of undergraduate students for recruiting our subjects. The software was ORSEE which is a software created to simplify the recruitment process for economic experiments (Greiner 2015). We used ORSEE to e-mail students mainly at Linköping's University who already were in the subject pool. The students had either previously participated in an experiment conducted by JEDI-lab or had recently signed up to be in JEDI-lab's pool. By being able to use generic e-mail templates, the software would help us decrease the experimenter-subject interaction in the recruitment process. In addition, the software guaranteed that a participant would not participate twice in the survey (Greiner 2015). ORSEE can be used to help researchers replicate our results by using the same selection conditions, messages, and timing as our study. Criticism of students not being representative of the population occurs. However, this is not problematic when testing economic theories since most economic theories derive predictions which are independent on the participant pool (Falk & Heckman 2009 p.537).

The questions we had in the survey was only a part of the survey the subjects answered. Since we had the help of JEDI-lab, we believed it was convenient to let other researchers from JEDI-labs add questions which they were interested in. Hence, more data was collected than presented in our study.

3.2 The Experimental Design

The survey was divided into two parts. The first part included different scenarios that aimed to measure opportunity cost neglect of money and time. This part included two conditions, where a subject was either in a control or a treatment condition. The treatment group was reminded about the opportunity cost whilst the control group was not. The respondents were randomized between the two conditions for causal inference. Randomization ensures that there are no significant differences in the individuals' characteristics between different conditions and any difference in behavior can be traced back to the manipulated factor. In the second part of the experiment we measured respondents' tendency to conduct mental budgeting with monetary and temporal outcomes.

3.2.1 Opportunity Cost Neglect

To answer our research questions "do people neglect the opportunity cost of money?" and "do people neglect the opportunity cost of time?" we used five scenarios which differed in the nature of the outcome and involved: a cheap and an expensive consumer goods, savings, investments, and time

(see table 3.1). With the consumer goods, we replicated the design from Frederick et al. (2009) by reminding only the treatment group about the opportunity cost and then comparing the groups probability to buy. However, we also explored the extent of the consequences of opportunity cost neglect by adding similar questions about savings, and time. After a short description of the situation, respondents were asked if they wanted to spend the resource (money or time). In all questions, the main outcome variable was the probability to respond “yes” (to buy, to save, and to watch the movie). The alternative was “no” in the control condition “save money for other purchases, or activities” alternatively “save time for other activities” in the treatment condition We tested whether the respondents’ probability to respond yes depended on what condition they were assigned to, i.e. control or treatment group. This is similar to how previous research interpreted opportunity cost neglect (Frederick et al. 2009; Plantinga et al. 2018).

Table 3.1 - The Five Scenarios

Scenario	Resource	Question	Treatment
1. Smartphone	4 200 SEK	Do you choose to buy the smartphone?	Save the money for other purchases
2. Movie	129 SEK	Do you choose to buy the movie?	Save the money for other purchases
3. Deposit Account	5 000 SEK	Do you choose to save the money?	Use the money for other thing/activity
4. Stocks	4 500 SEK	Do you choose to buy the stocks?	Save the money for other purchases
5. Watch Movie	2.5 hours	Do you choose to watch the movie?	Use the time for other activities

The opportunity cost neglect in the case of the consumer good purchases was tested in two questions, one considering expensive good, and one considering cheap good. Choosing “no” or “save the money for other purchases” gave the same outcome, an individual did not buy the smartphone (movie), but the main difference was if the opportunity cost was explicitly stated. We chose to have two differently priced products to test whether the absolute monetary consumption would affect the probability to consider opportunity cost, but also to replicate the results from Frederick et al. (2009) who used a similar question as the movie scenario.

We added two scenarios involving financial decision making, about savings and investments, as we believed that these two scenarios could test whether opportunity cost neglect is restricted only to decision about consumer goods. We did this by asking the respondents of whether they would like to save (or invest) money they had saved for future expenditures (rather than immediate pleasure expenses). The deposit account would grow from 5000 SEK to 7000 SEK in five years, whilst the stock was expected to grow with 11% in a year. With these scenarios, we were interested to see if opportunity costs neglect can lead to less consumption instead of an increased consumption. By not reminding the consumers that they could use the money for other purchases, they might become more likely to save the money and possibly achieve their long term saving goals.

To examine the opportunity cost of time we presented a scenario in which a person with a busy schedule had some spare leisure time. They now had to decide whether they wanted to watch a new movie in their favorite genre with their favorite actor, or not. This was the question we used to measure if respondents neglect the opportunity costs of time.

3.2.2 Mental Budgeting

To measure how much mental budgeting of money the respondents conduct, we used the same questions as Antonides et al. (2011). The scale was constructed “to capture the idea of mental separation of expenditure categories, allocated budgets for categories of expenses, economizing after spending, and economizing in the next period (month) after spending in the current month” (Antonides et al. 2011 p.550). The scale went from one to five where higher scores indicated a higher tendency to conduct mental budgeting. To measure how much mental budgeting of time the respondents conducted, we modified the mental budgeting scale to measure time instead of money. There were no major changes between the scales (see table 3.2 for comparison).

Table 3.2 Mental Budgeting Questions

The Monetary Scale

1. I have reserved **money** (budget) for different **expenses**, such as **food, clothing, transportation, etc.**
I never spend more than a **fixed amount** on **food, clothing, transportation,**
2. **etc.**
3. If I spend more on one thing, I economize on other **expenses**.
4. If I spend more than normal on one **thing** in 1 month, I spend less on other **things** in the next month.

The Temporal Scale

1. I have reserved **time** (budget) for different **activities**, such as **studies, relaxation sleep, friends etc.**
 2. I never spend more than a **fixed amount of time** on **studies, relaxation sleep, friends etc.**
 3. If I spend more **time** on one activity, I economize on other **activities**.
 4. If I spend more **time** than normal on one **activity** in 1 month, I spend less on other **activities** in the next month.
-

Note: Word marked bold show the difference between the money- and time budgeting scales.

3.3 Statistical Methods

To test opportunity cost neglect, we first used a t-test for mean equality to see if the control and treatment group answered scenario questions differently. Then, we conducted a linear probability model with the probability to spend the resource as the dependent variable. We included the regressors: the condition (dummy variable for a treatment group), and mental budgeting; we added the control variables age, gender, financial situation, and being economics student, for a robustness

analysis. We believed that being an economics student could be interesting since they have more experience in finance and economic decision making. In the time scenario we used the mental budgeting of time scale instead of monetary mental budgeting, as well as ability to plan time instead of financial situation. The linear probability model has a few flaws, such as non-normality and heteroscedastic variances of the disturbance (u_i), non-fulfillment of $0 \leq E(Y_i | X_i) \leq 1$ and it generates low R^2 values (Gujarati & Porter, 2009). However, the method is commonly used in other economic studies, mainly because of its simplicity (see Cappelleri 1969; Cohen, Rea & Lerman 1970) which is why we opted for it. Our alternative was to use a logit model. It would have solved the problem with non-fulfillment (the probability for the logit-model is between zero and one) and it does not assume linear relation in probability (but in the log of the odds ratio) which is more realistic (Gujarati & Porter, 2009).

The first method to test opportunity cost neglect was to make a double-sided test of equality which is similar to how Frederick et al. (2009) measured opportunity cost neglect. The subjects in the control group could alternatively answer “no”, while the subjects in the treatment group were reminded in the alternative choice about the opportunity cost (for example, if an individual does not spend 4200 SEK on this smartphone, it could save it for other purchases). If the treatment group was affected by being reminded about the opportunity cost, it would have affected the proportion of subjects deciding to spend the resource. Hence, if the means were unequal, it would be a sign of opportunity cost neglect.

Then we did ten linear regressions to test opportunity cost neglect of money and time. Two regressions per scenario presented to the subjects, one simplified regression with treatment and mental budgeting as the regressors, and one where we added our control variables to test the robustness of the result. If the coefficient of the treatment dummy variable was significantly different from zero, it might serve as an indication of opportunity cost neglect. In such case, the reminder of the opportunity cost, affects the probability to spend the resource. This is what the tables 4.2 to 4.11 refer to as “treatment”.

To test whether a person conducted mental budgeting we choose to transform it to a binary variable. We did this using a median split. In other words, for every subject we compared a subject’s score on the mental budgeting scale with the median score in the sample. If subject’s score was equal to or higher than median, a subject was classified as conducting mental budgeting. Otherwise, they would be classified as not conducting mental budgeting. We believed that it was more likely that people either conducted mental budgeting or not since it was less probable that there was a linear relation between the different scores on our mental budgeting scale and the probability to conduct mental

budgeting. An advantage of the binary variable is that it also relaxes the assumption that mental budgeting has a linear relationship with the probability to spend the resource. However, people who had the same value as the median had to be seen as either conducting mental budgeting or not. We chose the former, since it is possible that those still, to some extent, conduct mental budgeting. We used mental budgeting as an independent binary variable in the regressions on scenario 1 to 4 since it was one of our main variables. In the regression for the time scenario, we used the mental budgeting time scale (as a binary variable) instead of the monetary as well as we had ability to plan time instead of financial situation.

To test if there was a relation between mental budgeting and opportunity cost neglect we decided to conduct two extra regression for each question. We did this by dividing the sample into two sub-groups, those who conducted mental budgeting and those who did not. The separation was made based on our mental budgeting variable as described above. For each sub-group, we conducted separately a linear regression including the treatment condition, and our control variables (without mental budgeting as an independent variable). We compared how the treatment affected the two groups. The interpretation for the sub-group with those who conduct mental budgeting as “For a person who conducts mental budgeting, being reminded of the opportunity cost affects the probability to buy with X percentage points”. An indication of mental budgeting affecting opportunity cost neglect would be if those who conduct mental budgeting were significantly affected by the treatment whilst those who do not conduct mental budgeting group were to a lesser degree.

4 Results

We begin to present the result from our experiment with descriptive statistics like age, gender, income, work status etc. Secondly, we look at the treatment effect, i.e., the difference in the probability to buy between treatments, and how strong this effect is. This effect enabled us to answer our questions whether individuals neglect the opportunity cost of both money and time. We also present what linear regressions for all of the five different scenarios from the experiment³ and discuss how treatment and mental budgeting, as well as other significant variables, affect the probability to spend the resource. Finally, we present the regressions in which we split the sample into two sub-groups (those who conduct mental budgeting, and who do not conduct mental budgeting) and test how the treatment affected each of the groups separately.

4.1 Descriptive Statistics

Table 4.1 shows the main descriptive statistics of our sample. The total number of subjects participating in our study was 241, where 200 subjects was our goal. We had 121 participants in our control group and 120 in our treatment group. The mean age was 25.8, one respondent did not answer this question, hence that observation was not used in regression where age was an independent variable. The male participants amount to 44.8%. On a scale of 1 to 5, where 5 indicated a very good financial situation, the mean financial situation was 3.2. Using the same scale, the mean ability to plan time was also 3.2. On a scale from 4 to 20, where 20 indicating a high tendency to conduct mental budgeting, the mean was 12.1 for mental budgeting of money, and 9.5 for time. More than 90% of the participants were studying at Linköping's University, but there were participants from other Swedish universities and colleges. The participants were from all major sciences (arts and sciences, medicine and health sciences, science and engineering and educational sciences), where 16% were studying economics, business and administration, or industrial engineering and management. A few participants did not study, or had finished their studies, hence they could be seen as outliers. However, we made the assessment that they would not heavily influence our results. Table 4.1 show us the division between the work situation of our sample with most people being out of work (55%) followed by 32% having part-time jobs and 13% working full-time jobs. Considering that our sample mostly consisted of students it was reasonable that such small proportion have full-time jobs. In line with the work situation, a few participants earned more than 16 000 SEK a month (14%). As much as 45% earned 6000-10 999 which is plausible since this region includes individuals who live from the funding for studying plus the student loan which is a common situation for a student

³ Throughout the study we used a significance level of $p=0.1$

in Sweden. Earning less than 6000 or 11 000-16 000 were almost equally likely among the sample with 20% earning less than 6000 and 21% earning something between 11 000-16 000.

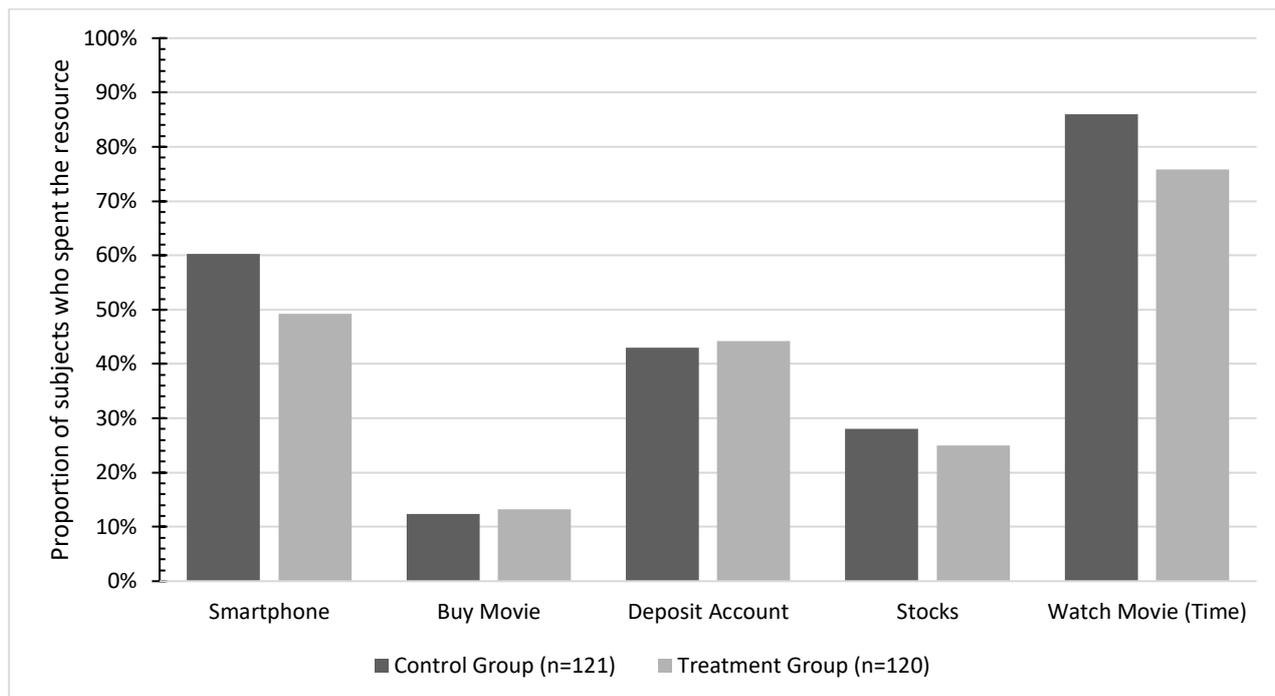
Table 4.1 Descriptive Statistics

Variable (n=241)	Mean	Median	St.Dev	Min	Max
Age	25,8	24	7,1	18	76
Gender (1= Male)	44,8%	0	0,5	0	1
Financial Situation	3,2	3	1,1	1	5
Ability to Plan Time	3,2	3	1,1	1	5
Mental Budgeting Money	12,1	12	3,6	4	20
Mental Budgeting Time	9,5	9	2,9	4	16
Economics Student	16%	0	0,4	0	1
Full Time Employment	13%				
Part Time Employment	32%				
Unemployed	55%				
Monthly Income (SEK)	6000-10999	6000-10999		<6000	>16000

4.2 The Treatment Effect

We tested whether the mean decision to spend the resource (to buy a smartphone, movie, invest in stocks etc.) was equal between control and treatment group for every scenario. The number of respondents who chose to either buy the phone, movie, etc. are shown in figure 4.1. We tested the equality of means using a double-sided t-test where H_0 = the means between the groups are equal. The tests showed a marginally statistically significant difference ($p=0.082$) between the respondents who answered to buy the smartphone, hence reminding about the opportunity cost seemed to affect the responses in these scenarios. We could not reject the null hypothesis in the cheap-movie-scenario, the deposit-money-scenario, or the investment-in-stocks-scenario. In the last scenario, with time as the resource, we rejected the null hypothesis ($p=0.046$) indicating that reminding about the opportunity cost affects temporal decisions. This gave us an indication that people neglect the opportunity cost of time, but also where treatment could be a statistically significant independent variable in the regressions.

Figure 4.1 – T-test of the Treatment Effect



4.3 Regression Framework

In the following section, we will analyze whether and how the willingness to spend the resource is associated with being reminded about the opportunity cost and mental budgeting. We will also comment on statistically significant findings concerning the used control variables. Two regressions are made for each of the five scenarios that our respondents were presented for with in the survey. One regression will only include treatment and mental budgeting binary variables; the other adds the control variables age, being male, being an economics student, and financial situation. When conducting the regression for the scenario in which time was the resource, we used mental budgeting of time and ability to plan time, instead of the monetary mental budgeting scale and financial situation, which was the case for the other scenarios.

4.3.1 Consumer Good - Smartphone

The first scenario was the one where the respondent had to decide between spending 4200 SEK for a smartphone or not. Table 4.2 presents the results from a linear regression of the probability to buy the smartphone with treatment (being reminded about the opportunity cost) and mental budgeting of money as independent variables. Subjects reminded about the opportunity were 11.2 percentage points less likely to buy the smartphone ($p=0.083$). There was no statistically significant relation between mental budgeting and decision to purchase the phone, hence there was no evidence to reject the null hypothesis of mental budgeting not affecting the probability to buy. We tested the robustness

of the results by adding our control variables that might be related with the decision to buy (table 4.2). The results remained similar, i.e., the treatment variable was statistically significant ($p=0.092$) and dummy for mental budgeting was not ($p>0.1$. The null hypothesis could not be rejected). This finding corroborated with hypothesis 1 that people neglect the opportunity cost of money. Interestingly, being a male decreased the probability to buy the smartphone with 12.5 percentages points ($p=0.054$).

Table 4.2 - Probability to Buy the Smartphone

Dependent variable: buy smartphone		
	Regression 1	Regression 2
Variable	Coefficient (n=241)	Coefficient (n=240)
Constant	0,604 ***	0,866 ***
Treatment group	-0,112 *	-0,108 *
Mental Budgeting	-0,001	0,023
Age		-0,007
Male		-0,125 *
Economics student		0,103
Financial Situation		0,023

*Statistical significance: *** = 0.01, ** = 0.05, * = 0.1*

4.3.2 Consumer Good - Movie

In the second scenario respondents had to decide whether they wanted to buy a new movie for 129 SEK or not. The linear regression with the probability to buy as a dependent variable is presented in table 4.3. with treatment and mental budgeting of money as the regressors. We found no evidence that our subjects were affected by the reminder about the opportunity cost. However, those who conduct mental budgeting of money were 7 percentage points more likely to buy the movie ($p=0.07$). When adding the control variables, which can be seen in table 4.3, we could not reject the null hypothesis for treatment variable, hence, we found no evidence for our first hypothesis (presented in table 4.3) in the movie purchasing scenario. Mental budgeting was no longer statistically significant when adding the control variables, implying that the effect of mental budgeting was not robust to regression specification. Lastly, economics students were 7.6 percentages points less likely to buy the movie ($p=0.086$)

Table 4.3 - Probability to Buy the Movie

Dependent variable: buy movie

	Regression 1	Regression 2
Variable	Coefficient (n=241)	Coefficient (n=240)
Constant	0,841 **	0,015
Treatment group	0,008	0,006
Mental Budgeting	0,07 *	0,058
Age		0,002
Male		0,039
Economics student		-0,076 *
Financial Situation		0,005

Statistical significance: *** = 0.01, ** = 0.05, * = 0.1

4.3.3 Financial Instruments - Deposit Account

This was the first scenario which expanded the definition of opportunity cost neglect from consumer good to financial instruments. The respondents had to decide if they wanted to lock their money in a deposit account for five years to make it grow from 5000 SEK to 7000 SEK, or not. In our linear probability regression, presented in table 4.4, we were not able to reject the null hypothesis for treatment or mental budgeting that they do not affect the probability to deposit the money. When testing the robustness of these results we added our control variables, which can be seen in table 4.4. The results remained unchanged. We found no evidence for our first hypothesis. Interestingly, economic students were 14.1 percentage points less likely to deposit the money ($p=0.097$). This might be because of an increased awareness of the opportunity cost or perhaps because economics students have more experience in making financial decisions and are aware of better saving opportunities.

Table 4.4 - Probability to Deposit the Money

Dependent variable: use deposit account

	Regression 1	Regression 2
Variable	Coefficient (n=241)	Coefficient (n=240)
Constant	0,406 ***	0,251
Treatment group	0,012	-0,001
Mental Budgeting	0,041	0,028
Age		0,002
Male		0,078
Economics student		-0,141 *
Financial Situation		0,032

Statistical significance: *** = 0.01, ** = 0.05, * = 0.1

4.3.4 Financial Instruments - Stocks

In the second scenario with financial decision making, respondents had received information that the stock price was expected to rise from 90 SEK to 100 SEK within a year and they had 4500 SEK to buy stocks with. There were no statistically significant effects for being reminded about the opportunity cost or conducting mental budgeting when regressing decision to invest on these two dummy variables (see table 4.5). Together with the results from the deposit account scenario, we found no evidence for our first hypothesis in the financial decision making. The result did not change when we added the control variables (table 4.5). In addition, being male increased the willingness to buy stocks with 13.7 percentage points ($p=0.017$) supporting the argument that men are more risk seeking than women (Byrnes et al. 1999).

Table 4.5 - Probability to Buy the Stocks

Dependent variable: buy stocks

	Regression 1	Regression 2
Variable	Coefficient (n=241)	Coefficient (n=240)
Constant	0,28 ***	0,406 ***
Treatment group	-0,031	-0,030
Mental Budgeting	0,002	0,015
Age		-0,006 *
Male		0,137 **
Economics student		-0,028
Financial Situation		-0,009

*Statistical significance: *** = 0.01, ** = 0.05, * = 0.1*

4.3.5 Time

This was our only scenario which tested our second hypothesis, that people neglect the opportunity cost of time. The scenario was that a new movie had been released and the respondent had to decide whether they wanted to watch it or not, it would have taken them 2.5 hours. Table 4.6 shows a linear regression with the probability to watch the movie as the dependent variable and treatment and mental budgeting of time as the independent variables. Our subjects were 9.9 percentage points less likely to watch the movie by reminding them that they could spend the time on other activities ($p=0.05$). The mental budgeting of time did not seem to affect the probability to watch the movie ($p>0.1$) When we added our control variables to the regression, see table 4.6, our subjects were still affected by the treatment, but it was now statistically significant at the level of $p=0.055$ This supported our second

hypothesis that people neglect the opportunity cost of time. Mental budgeting of time was not statistically associated with the decision to watch the movie. Interestingly, being an economics student increased the probability to watch the movie with 12 percentage points ($p=0.024$).

Table 4.6 - Probability to Watch the Movie

Dependent variable: watch movie

Variable	Regression 1 Coefficient (n=241)	Regression 2 Coefficient (n=240)
Constant	0,82 ***	1,063 ***
Treatment group	-0,099 **	-0,096 *
Mental Budgeting	0,064	0,072
Age		-0,006
Male		-0,08
Economics student		0,12 **
Financial Situation		-0,026

*Statistical significance: *** = 0.01, ** = 0.05, * = 0.1*

4.4 The Role of Mental Budgeting

In this last section of the results we will analyze how two sub-groups were affected by the treatment. The sub-groups were those who conducted more mental budgeting than the median, and those who conducted less mental budgeting than the median. This is how we tested our third hypothesis which is that those who conduct more mental budgeting are more likely to neglect opportunity cost, hence reminding them about the opportunity cost would affect them. The results from each of the five scenarios are presented in table 4.7 where the statistical significant coefficients are bolded.

In the smartphone-scenario, we found that those who conduct more mental budgeting were 15 percentages points less likely to purchase the smartphone when reminded about the opportunity cost ($p=0.1$), whilst we could not reject the null hypothesis for those who conduct less mental budgeting (table 4.7). This indicates that those who conduct mental budgeting might suffer from opportunity cost neglect, whilst those who do not conduct it seem to not neglect the opportunity cost. This was in line with our third hypothesis.

In the movie-scenario, we were not able to reject the null hypothesis in either of the two groups. Regardless of whether someone conducts mental budgeting or not, they were not affected by the reminder of opportunity cost (table 4.7). This did not support our third hypothesis.

Our deposit-account-scenario found two statistical significant results, which is interesting since the regression where we used the whole sample had no statistical significant results. The subjects who conducted mental budgeting were 17 percentages points more likely to deposit the money when reminded about the opportunity cost (not being able to spend the money) with $p=0.047$ (table 4.7). Even though the coefficient is opposite, the treatment decreased the probability to purchase other things and save money instead. However, those who do not conduct mental budgeting became 21 percentage points less likely to deposit the money ($p=0.026$). When reminded about the opportunity cost, they became more likely to spend the money on something else. To sum up, the reminder of an opportunity cost had an opposite effect on individuals depending on whether they conduct mental budgeting or not in the deposit account scenario.

In the stocks-scenario, treatment was not statistical significant, indicating that neither the subjects who conducted more mental budgeting nor those who conducted less mental budgeting were affected by the treatment (table 4.7). Hence, neither group seemed to have suffered from opportunity cost neglect.

In the time-scenario, we used mental budgeting of time instead of money in the regression. We found no statistical significance that the treatment affected either of the two groups (table 4.7). However, treatment was significant when we pooled that data. It is possible that treatment would have affected the sub-groups if we would have increased the sample. Notice that the coefficients for the two groups ($\beta=-0.08$; $\beta=-0.12$) were quite similar, which might indicate that the treatment had the same effect on the two groups.

Table 4. - The Role of Mental Budgeting

Scenario	Mental Budgeting	No Mental Budgeting
	Scenario 1-4 (n=139)	Scenario 1-4 (n=101)
	Scenario 5 (n=146)	Scenario 5 (n=94)
1. Smartphone	$\beta = -0.15$ ($p=0.077$)	$\beta = -0.05$ ($p=0.61$)
2. Movie	$\beta = -0.01$ ($p=0.85$)	$\beta = 0.02$ ($p=0.71$)
3. Deposit Account	$\beta = 0.17$ ($p=0.047$)	$\beta = -0.21$ ($p=0.026$)
4. Stocks	$\beta = -0.02$ ($p=0.75$)	$\beta = -0.04$ ($p=0.54$)
5. Time	$\beta = -0.08$ ($p=0.16$)	$\beta = -0.12$ ($p=0.17$)

5 Discussion

In this chapter, we answer our three research questions based on the results from the survey and try to explain how we interpreted these results. Furthermore, we discuss the strengths and weaknesses of our methodology. In the third sub-section we present our suggestions for possible policy implications that can help decrease the negative consequences of opportunity cost neglect. Lastly, we present ideas for future research that could expand the knowledge about opportunity cost neglect.

5.1 Discussion of Results

Do people neglect the opportunity cost of money?

Our results showed that people neglect the opportunity cost in the smartphone-scenario ($p=0.092$). However, we did not find this effect in the movie-scenario. A reason for not being able to find evidence for our hypothesis in the latter scenario could have been because the price was set too high so there was a general low willingness to buy the movie (only 12.9% of all the respondents chose to buy). Perhaps, changing the good to something students are more likely to consume, for example a cinema ticket, the general willingness to buy would have increased.

We did find a sign of opportunity cost neglect for the deposit account, when we split the sample depending on whether the subjects conducted mental budgeting or not. Both sub-groups were affected by the treatment, but the groups were affected in opposite directions. This could be an indication that some people neglect the opportunity cost of financial instruments, supporting our first hypothesis. Those who conducted mental budgeting might have used it as a self-control device (Thaler 1999). By reminding them that they could spend the money, instead of saving it, could have encouraged them to lock the money on their accounts and avoid purchases. However, those who did not use mental budgeting became less likely to save the money in the deposit account when reminded about the opportunity cost. We do not know if they wanted to spend it on other saving alternatives, but if they prefer to spend it on consumer goods, the treatment would have given them an increased willingness to buy.

Furthermore, we found that the reminder of the opportunity cost had no effect in the stocks scenario. Possible explanations to this could be that people are risk-averse when it comes to spending money (Okada & Hosh 2004), or that people connect stocks as high risks and therefore believe that stocks have low benefits (Slovic et al. 2007). Therefore, people might become more reluctant to buy stocks, rather than considering the opportunity costs. Since financial decisions are often more complex and

more important than consumer goods, people might not treat opportunity cost as an important variable, hence the reminder will not have an effect. Furthermore, it could be that people actually realize that if they decide to save the money, they will not be able to spend it, but have difficulties to realize the opposite (if you decide to not spend the money, you can save it). To exemplify, when getting the questions if they want to buy the smartphone they could think “do I want this phone or not?”; whilst in the stocks question they could think “can I afford to invest my money in a stock for a year, or do I have any other upcoming expenses?”. Another explanation could be that the question was about savings, so due to the nature of the question (by being a more complex and important decision), the effect of reminding of the possibility to save the money for other uses would not be as strong, since people already would have considered the opportunity cost.

Do people neglect the opportunity cost of time?

Our hypothesis was that individuals would also neglect the opportunity cost of time (scenario 5), and we found statistical significance of this in both the t-test but also in the regressions for the time scenario. The conducted analysis points to the fact that our subjects were affected by the treatment, hence, people actually neglect the opportunity costs of time when making decisions. It is conceivable since time, like money, is a scarce resource and a choice to spend your time in one way rather than the other leads to forgone utility. Another possible explanation could be that people have difficulties trying to value time (Soman 2001; Okada & Hosh 2004; Zauberan & Lynch 2005; Hess and al. 2012; Whillans et al. 2018), hence they do not take it into account when making decisions. It is simpler to neglect the opportunity cost than trying to account for it. Perhaps, by becoming more aware of the price of their time, people could change their behavior to more frequently consider the opportunity costs, e.g. by telling people that their hourly wage could be their valuation of one hour. This would be similar to how subjects behaved when Soman (2001) learned them to value their time as their hourly wage, they began to account for the (sunk) cost of time.

Can mental budgeting explain opportunity cost neglect?

Our last hypothesis was that there was a positive relation between mental budgeting and opportunity cost neglect. We found an evidence of opportunity cost neglect in the smartphone-scenario among people who conduct mental budgeting but not among people who do not conduct mental budgeting. This is an indication that this hypothesis might hold. Furthermore, those who conducted more mental budgeting were more likely to deposit the money (scenario 3) when reminded about the opportunity cost. Similar to scenario 1, they showed a decreased willingness to buy (assuming that not saving money would imply spending money). In contrast, those who conducted less mental budgeting

became less likely to use the deposit account when reminded about the opportunity cost. However, we did not find evidence that the reminder of opportunity cost affected individuals who conduct mental budgeting in a different way than individuals who do not conduct mental budgeting. In fact, neither of these subgroups was significantly affected by the reminder for the movie, the stocks nor time.

These complex results make it difficult to draw a general conclusion concerning the relationship between mental budgeting and opportunity cost neglect. However, previous studies showed, behavior differs depending on the decision context (monetary/temporal) (Soman 2001; Okada & Hosh 2004; Duxbury et al. 2005). This can also hold in our study. The neglect of opportunity cost can be context-dependent. Mental budgeting of time and opportunity cost neglect of time might influence each other differently than money. Since we used a mental budgeting of time scale, which was inspired by a scale meant to measure mental budgeting of money, we might not have been able to capture the role of mental budgeting in time-scenarios. As for the financial instruments, there is still a lot of uncertainty since this behavior was not consistent across different financial instruments when we split the sample with respect to mental budgeting.

5.2 Discussion of Methodology

We believe that our major methodological strengths were that we closely followed the experimental procedures outlined in Frederick et al. (2009), but also used the mental budgeting scale of Antonides et al. (2001). Moreover, our subject pool was the same as JEDI-lab use for their behavioral experiments. The use of validated methods in our study, makes our study more reliable. Since we conducted an experiment to get primary data, we were able to thoroughly analyze the causal effect we were investigating with less noise than if we would have relied on secondary data.

One of the main methodological weaknesses was the lack of monetary incentives. This might have made the respondents act differently than in real life scenarios. However, our study is based on Frederick et al. (2009) and Plantinga et al. (2018) who also did not incentivize decisions. It would also have been impossible to incentivize the temporal decisions. Furthermore, the experiment was conducted online, hence if there were any confusions for the respondents we were not able to help them. The decision to use linear probability model instead of logit model could be seen as a weakness since the model assumes the linear probability of Y is constant along all values of X. Our mental budgeting scale of time was simply a transformation of Antonides et al. (2011) scale for money, hence it had not been validated before the experiment and it might not have been an accurate measurement of mental budgeting of time. However, we used it to keep the analysis of money and time as close as

possible to exclude potential reasons for differences in the results. We also believe that the cheap consumer good (the movie) could have been designed differently, by choosing another consumer good or service, to become a more interesting prospect for the subjects. It would have been possible to add another question of time where we increased the time expense to test whether the opportunity cost neglect depends on the length of time to be allocated. However, we believed that 2,5h was sufficient to observe and establish possible neglecting, which was similar to the cheaper consumer good (the movie for 129 SEK).

5.3 Policy Implications

We found that people sometimes neglect the opportunity cost of time and money. This is problematic since individuals may systematically spend their scarce resources without maximizing their utility. If companies want to sell as much as possible, they do not want to remind customers about the opportunity cost, but rather emphasize them to buy their product or service. If you are an employee, the employer probably prefers you to work full time for the company rather than remind you to think about what you could be doing with more leisure time. This can make the problem even worse and strengthen the arguments for policy makers to act. But what can be done and what are the potential consequences of the neglecting of opportunity cost?

A person who neglect the opportunity cost of time is less likely to make the decision that maximize her utility. So, what can these decisions be? According to Rajagopal and Rha (2009) people tend to do mental budgeting by dividing time into work hours and non-work hours, with the standard being working for 8 hours a day, five days a week. We fear that the division between these two budgets may be set based on norms about a workday being 8 hours and that companies prefer it, rather than a calculated decision from the employee with the opportunity costs valued. We believe that it is common that people say that they want to spend more time with their kids rather than working as much as they do, but still do not do anything about it. Friedman (2015) wrote an article in the Business Insider where he argued that people tend to work too much and rather stop when they are beat instead of when they are satisfied with what they can consume. Also, an established question in the Swedish politics is whether a shorter work-day of 6 hours per day should be implemented, with the argument that people work more than they need to. Could an increased ability to consider the opportunity costs solve this problem? We speculate that many people would get a higher utility if they got to choose the amount of work hours that suits their own interest, but the reason that it is not happening is because of a well-established norm to work for 8 hours and that people do not calculate their optimal ways of spending their time, hence neglect the opportunity cost. If this speculation would be true, we think

that policy makers could allow people to decide on their own how many hours they want to work without the set reference point of 8 hours a day.

For a policy maker, it is difficult to force someone to take opportunity cost into consideration. Can a solution instead be to educate and spread information about the phenomenon and what consequences it brings? For example, that people actually tend to neglect the opportunity cost was first brought up during our final year at our education in economics at Linköping's University, even though opportunity costs and managing scarce resources is considered to be the essence of economics. The fact that the failure to consider opportunity costs affects your everyday life could be an argument that it is worth to teach about it at the high school level, so more people will be able to account for it. For this reason, we believe it should have a higher priority, especially in economics, since economists frequently make decisions about how they should allocate resources.

In addition, we speculate that there might exist a learning effect. People may learn from the purchases they have previously done in their lives and therefore more naturally take the opportunity cost into account when deciding how to spend their money and time. If this is the case, it could be an argument that it is not as important to learn it in your education since you eventually will get a grasp of it anyway. However, we did not find this in our study, but we did not have a great variance in age since the majority of our sample were students.

Furthermore, we believe that policies could achieve desirable behavior by using nudges. Nudging is a method presented by Thaler and Sunstein in the book *Nudge* (2009) which is a cheap and easy way to influence people's behavior, in line with their long-term interests, using positive reinforcements or indirect suggestions but still not limiting their freedom of choice. An example of a nudge could be that Netflix add a reminder, after you watched several episodes in a row, that you could spend your time on other activities. Another example could be that the Swedish Systembolaget remind you that you could spend your money on fancy food instead of alcohol. We believe that nudging could be an effective way of helping people achieve the desirable behavior of considering the opportunity cost. In order to do it, we think it may be helpful with some kinds of reminders of some basic rule of thumbs or some kind of standard comparison you can do (for example compare the 100 SEK of buying some food with that you need to work for one additional hour). However, further research is needed to find out which nudges are the most effective in reducing the opportunity cost neglect. Our own experiences with a standard comparison was that as a kid, Fritzell valued every krona as two chewing gums since the cost was 0.5 SEK in the local candy shop; Strand used, around the last year of middle school, buying a Wii (≈ 2000 SEK) as the standard comparison when deciding to buy sports

gear, video games, food etc. Unsurprisingly, both became interested in economics when they began at the university, Fritzell ate a lot of chewing gums, and Strand's parents bought him a Wii.

5.4 Future research

First of all, we believe our results should be replicated with bigger samples. Since opportunity cost neglect can be more difficult to detect in small samples, as shown by our study but also by Plantinga et al. (2018). More specifically, we suggest that the opportunity cost neglect of time should be expanded with both a replication, but also with different values e.g. a day, a weekend, a week etc. instead of the 2.5 hours we had. But also test it for different seasonal scenarios, e.g. New Year's Eve, Christmas, Halloween etc. to see if people are more likely to account for the opportunity cost of time under specific conditions. This would increase the argument for that people neglect the opportunity cost of time and when people possibly take it into account. The relation between mental budgeting and opportunity cost neglect needs more exploration using bigger datasets (higher powered sample).

Furthermore, we suggest that future researchers should test the financial decisions more thoroughly. Our results showed that people were not affected by reminding them about the opportunity cost when deciding to invest their money or deposit them. However, when we split the sample between tendency to conduct mental budgeting, both groups were affected by the treatment in the deposit account scenario. Both age, male, and being an economics student seemed to influence the probability to save, which could suggest that under certain conditions there are other factors than the opportunity cost which affect the decision-making process. We believe that people might not be as comfortable with investing in stocks since it is connected with high risk and might be perceived as low benefit, like the relation Slovic et al. (2007) suggested. Hence, becoming aware of the opportunity cost might not be important, because people do not see investing in stocks as an alternative, rather than deciding not to invest because of becoming aware of the opportunity cost. It is also possible that people actually take the opportunity cost into consideration due to the complexity and importance of the decision.

By investigating how the different mechanisms can affect opportunity cost neglect, policy makers can create more effective nudges since they would know why people neglect the opportunity costs. One possible mechanism could be through learning effect, in other words, when people get more experienced in making financial decisions, e.g., by buying a house, taking a mortgage, decide the retirement plan etc. do they also become better at considering the opportunity costs? If there is a learning effect, a treatment condition, similar to ours, should neither affect the more experienced in both life (the older population) nor those who have studied basic economics. If there is no learning

effect, then it becomes even more important to teach people this kind of thinking, to help making better decisions and increase their welfare.

6 Conclusions

Our objective was to investigate and analyze whether and to what extent people neglect the opportunity cost of money and time, but also extend the consideration of opportunity cost from consumer good to financial instruments, as well as time. Furthermore, we explored if mental budgeting could explain opportunity cost neglect.

We found statistical significant evidence of opportunity cost neglect for the expensive good, hence, it seems to be an indication of an opportunity cost neglect of money. This effect was not found for the cheaper good, but this could have been because of the low willingness to buy rather than because of opportunity cost consideration. However, since previous research did manage to find this relation when using bigger samples (Frederick et al. 2009; Plantinga et al. 2018), our findings can serve as a (weak) evidence for the existence of the opportunity cost neglect of consumer goods. Our extension to financial instruments showed evidence of opportunity cost neglect when we split sample into those who conduct mental budgeting and those who do not. We believe that this could be due to the nature of the question, that people refer the questions as a question of saving money and not consume it, hence it might be easier for them to recognize the opportunity cost. One of our main findings was that some individuals neglect the opportunity cost of time. This is an indication that the extent of opportunity cost neglect is greater than what previous research have shown, and that people might fail with their time-management.

Furthermore, mental budgeting seemed to have a complex role when trying to explain opportunity cost neglect. We found that those who conducted mental budgeting also suffered from opportunity cost neglect in the decisions in the more expensive consumer good-scenario and in the deposit account-scenario. The only scenario where people, who did not conduct mental budgeting, were affected by treatment, was in the deposit account scenario. Such individuals were less likely to deposit their money if they are reminded about the opportunity cost. We find it difficult to draw any confident general conclusions considering the relation between mental budgeting and opportunity cost neglect, but we believe that this relation is complicated and depends on the type of the decision.

The extent of opportunity cost neglect seems to be greater than what previous research suggested. We have found (to the best of our knowledge), the first evidence of an opportunity cost neglect of time as well as for financial decision. More importantly, we have started to explore the complex relation between mental budgeting and opportunity cost of neglect and we believe that there is still much to discover in this area of behavioral economics.

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Appendix - The Survey

This are the questions we have presented and analyzed in our study. There were more questions in the whole survey, but we choose not to show them since they were not relevant for our study

Suppose you have saved some extra money for enjoyment and spontaneous purchases. The electronic store in your local mall have an offer on a smartphone. You have wanted to replace your current cell phone for a longer period of time and there is a reduced price of a phone that you are interested in buying. The smartphone is available at 4200 SEK.

Do you choose to buy the smartphone?

* Yes

* No / Save the money for other purchases

Suppose you have saved some extra money for enjoyment and spontaneous purchases. You have received an email from iTunes with a special offer on a new movie. The movie is from one of your favorite genre (e.g. comedy, drama, thriller etc.) and starring your favorite actor. You have been considering buying the movie and watch it during a long period of time. It is now available at a special price at 129 SEK.

Do you choose to buy the movie?

* Yes

* No / Save the money for other purchases

Suppose you have saved some extra money for future expenditure (e.g. accommodation, ideal vacation, wedding). An employee at your bank just called you to tell you about a new type of deposit account. The offer seems lucrative. You need to put in 5000 SEK at the account for five years. After the five years you will get 7000 SEK. If you place the money you will not be able to withdraw them during the five years.

Do you choose to save the money?

* Yes

* No / Use the money for other thing/activity

Suppose you have saved some extra money for future expenditure (e.g. accommodation, ideal vacation, wedding). You read this morning in the newspaper Dagens Industri about an attractive possibility to invest in stocks. The analysts evaluate that a company that you know about have been performing remarkably during the last year and that their stocks are undervalued at the moment. The analysts recommend you to buy the stocks with a price target of 100 SEK with one year term. The current price is 90 SEK per stock so for 4500 SEK you would be able to buy 50 stocks.

Do you choose to buy the stocks?

* Yes

* No / Save the money for other purchases

Suppose you have been busy lately. You have been trying to plan your schedule more carefully and tonight you have been able to get the evening unoccupied. You noticed that a new movie recently has been available at Netflix. The movie is from one of your favorite genre (e.g. comedy, drama, thriller etc.) and starring your favorite actor. The movie is 2.5 hours.

Do you choose to watch the movie?

* Yes

* No / Use the time for other activities

How well does following statement apply you:

(Answers: 1 = totally disagree; 5 = totally agree)

* I have reserved money (budget) for different expenses, such as food, clothing, transportation, etc.

1	2	3	4	5
()	()	()	()	()

* I never spend more than a fixed amount on food, clothing, transportation, etc.

1	2	3	4	5
()	()	()	()	()

* If I spend more on one thing, I economize on other expenses.

1	2	3	4	5
()	()	()	()	()

* If I spend more than normal on one thing in 1 month, I spend less on other things in the next month.

1 2 3 4 5
() () () () ()

How well does following statement apply you:

(Answers: 1 = totally disagree; 5 = totally agree)

* I have reserved time (budget) for different activities, such as studies, relaxation sleep, friends etc.

1 2 3 4 5
() () () () ()

* I never spend more than a fixed amount of time on studies, relaxation sleep, friends etc.

1 2 3 4 5
() () () () ()

* If I spend more time on one activity, I economize on other activities.

1 2 3 4 5
() () () () ()

* If I spend more time than normal on one activity in 1 month, I spend less on other activities in the next month.

1 2 3 4 5
() () () () ()

What is your gender?

* Man

* Woman

How old are you?

What do you study?

At what university do you study?

How is your work situation?

- * I work full time
- * I work part time
- * I do not work at the moment

What is your income (after taxes)?

- * Below 6000 SEK
- * 6000 - 10999 SEK
- * 11000 - 16000 SEK
- * More than 16000 SEK

How would you evaluate your financial situation?

Rank from 1 (really bad) to 5 (really good)

1	2	3	4	5
()	()	()	()	()

How would you evaluate your ability to plan for your time?

Rank from 1 (really bad) to 5 (really good)

1	2	3	4	5
()	()	()	()	()