Nudges in a bachelor course

ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

Department of Applied Economics

Supervisor: Tong Wang MSc

Department of Applied economics/Tinbergen Institute

Erasmus School of Economics

Felix Jansen

350346

felixcasperjansen@gmail.com

Table of Contents

Abstract

In this thesis the effects of a nudge on students in a bachelor course is studied. The effects of the nudge on grades for a small assignment, final exam grades, and the effects on the moment of handing in the assignment are studied. We found that nudging people towards choosing earlier deadlines did not improve their grades. Nudging people towards an earlier deadline made them hand in their work closer to a deadline compared to a reference group.

Keywords: Nudges, Behavioural economics, Deadlines.

Abstract

Preface

This thesis is everything you want from a thesis, a relevant subject, interesting data, a supportive thesis supervisor, and the last hurdle of my bachelor's degree. I would like to thank Tong Wang in particular for her support and help in writing this thesis. Furthermore I want to thanks Julia Schmidt for her criticism and support in general.

Introduction

Late 2013 students of the Bachelor-3 elective course Behavioural Economics (Erasmus School of Economics) were presented with the following case:

Imagine that the vice-dean of the ESE notices that each block, students start working too late on the exam, and consequently, that they have lower grades than they could have.

What are possible reasons for this behaviour?

What are possible solutions?

Are they consistent with libertarian paternalism?

The proposed solution by the students was to let students decide when to hand in two small assignments and to implement this measure consistent with nudges. This would entice students to start working on the course material earlier in the course and subsequently, this would lead to higher exam and course grades. This plan was carried out late 2014. The results for this study were collected and administrated by Tong Wang, a PhD candidate at the Department of Applied Economics at the Erasmus School of Economics (ESE) and lecturer at the course Behavioural Economics.

First we will look at the theoretical background for these solutions. Then data from the experiment is analysed and conclusions are drawn. After this the limitations of this study and possible follow-up studies are discussed.

Literature

Self-control and procrastination

One of the most daunting tasks in life is to do the assignments we have to finish before a certain deadline. Almost everyone has to find way to structure simple tasks, like e-mail, chores, (work-) assignments, and so on. Knowing more about how we handle these tasks might help us influence and enhance our efficiency.

When thinking of difficult tasks whose execution is often postponed, the mind of a student quickly runs to papers, assignments, essays, studying for exams, and their thesis. Working too close to a deadline is not beneficial to your results. Writing an essay at 3 AM, staying awake by drinking a lot of coffee, while you'd rather be in bed sleeping is not preferable to writing it way before the assignment is due, during the day, in a well-lit room, with enough time to rest and eat. It has been found that procrastinators achieve worse results when put under pressure (Ferrari, 2001). How can we help students, to achieve a better result?

The best option for them might be to start on time with the tasks on hand. When you have more time for a task, logically that assignment's quality will be higher and it will be finished earlier. So we should help students to make a realistic planning and stick to it. I myself think that most students try to do this, but people in general are bad at sticking to a planning (Strotz, 1956). Students are not an exception to this when finishing/handing in academic assignments (Watson, Howell, Powell, & Buro, 2006). People have a tendency to value immediate rewards, like going to the beach or partying, over rewards in the future, like finishing an assignment (O'Donoghue & Rabin, 1999). This is called hyperbolic discounting. Most people realize they are prone to failure when keeping to deadlines and they might change their own behaviour accordingly. Apart from those few people who have time consistent behaviour e.g. people who have consistent, unchanging preferences at every point in time, more recently behavioural economists assume that people look more like the bad-planners and immediate reward seekers described above (Akerlof, 1991). Between these 'normal' people there is another distinction to be made. We can differentiate

between sophisticated and naïve people. Naïve people have a time inconsistent (hyperbolic) discounting function. 'Sophisticated' people have a utility function which is not different from normal 'naïve' people, but they recognize that their preferences will be different in the future due to hyperbolic discounting. A sophisticated person will want to take action to ensure that they do not change their choice when time passes (O'Donoghue & Rabin, 2000). A famous example is that of Ulysses and the Sirens as first analysed by Strotz (1956). A direct quote from Homer's Odyssey:

"But you must bind me hard and fast, so that I cannot stir from the spot where you will stand me . . . and if I beg you to release me, you must tighten and add to my bonds."-The Odyssey

Here Odysseus realizes that even though he will want to hear and go to the Sirens at a time in the future, He knows now that he does not want to succumb to their singing and makes the choice to ask his men to bind him to the mast of their ship and to not untie him until they have sailed past the Sirens.

A naïve person would not have recognized the fact that he would want to hear and go to the Sirens in the future. He would make the choice not to go with them once they sing, not realizing the truth that his preferences are time inconsistent.

So we see that naïve persons need help. But what about sophisticated people? While it seems that sophisticated people don't need help, they often put costly measures in place to help them success in their control (Ariely & Wertenbroch, 2002). A time-inconsistent person who likes to smoke lightly, will not control himself when he starts smoking lightly and smoke heavily in the future. While a naïve person would just smoke lightly and then become a heavy smoker, a sophisticated person would recognize this and overcorrect by not smoking at all, which yields lower utility than smoking lightly. There are a few ways to help these people, whether they are naïve or sophisticated.

Helping people overcome a time inconsistency bias

Assuming that preferences are time inconsistent among students as described above, there are a few ways to counter this problem. Michael Bond (2009) distinguishes two schools of thought. The first one is advocating education concerning biases. They advocate an educational system in which we help people recognizing and learning about their biases. (Gigerenzer, Gaissmaier, Kurz-Milcke, Schwartz, & Woloshin, 2009). On the other hand there is a group of academics proposing to help people by carefully planning the environments in which they make choices. These behavioural economists advocate 'libertarian paternalism', which is composed of two words. Paternalism is defined in the Oxford Dictionary as '*the system in which a government or an employer protects the people who are governed or employed by providing them with what they need, but does not give them any responsibility or freedom of choice*' (Hornsby, Wehmeier, Mcintosh, Turnbull, & Ashby, 2005). Libertarian in the same dictionary is defined as: '*A person who strongly believes that people should have the freedom to do and think as they like*' (Hornsby, Wehmeier, Mcintosh, Turnbull, & Ashby, 2005). Thaler and Sunstein (2003) believe that they can combine these two words into a system which uses measures to help people decide what's best for them (measured as objectively as possible). They think that people who design choice systems are not able to avoid a certain amount of paternalism. In their example of the manager of a cafeteria, this manager has to lay out the products. It's found that those products which are first in line were sold in higher quantities. He now has to make a choice which product to put first. The healthy ones, the expensive ones, the cheap ones, or put something first at random. Either way he has to make a choice which will influence the choice of his customers. The first one may be preferred on paternalistic grounds. After all who doesn't want people to eat healthier? Thaler and Sunstein (2003) propose that you can be paternalistic without diminishing freedom of choice in a case like this. By putting healthy food as the first (default) option people still have the freedom to decide on their food, while there are being nudged in the ('right') healthy direction. This may help the naïve people who would otherwise maybe go for the deep-fried snacks over healthy food. The sophisticated

person may be helped by this as well, making the healthy choice easier. Not putting the un-healthy option at the front may reduce the need for overcorrection.

Nudging students into making choices

Having established that students, like normal people, are prone to biases that make them start working on important assignments late, we want to find out if they can be nudged into good behaviour and if this behaviour actually yields results. Results mean we want to have students start their work earlier and, consequently, achieve higher grade by doing so. Furthermore we want to achieve this result by adhering to the principles of libertarian paternalism. Thus we end up with the main question:

Is giving students the choice, in accordance with libertarian paternalism, to set early deadlines for an assignment an effective method to enhance their grades and make them hand in their work earlier?

This was done in December 2014 in a behavioural economics undergraduate course. The students received a questionnaire which tested simple behavioural and cognitive measures. Then they were able to choose between two deadline options. One group got default 'early deadlines' and had the option to opt out choosing 'late deadlines'. The other group was allowed to choose between early and late deadlines. Students were allowed to miss the early deadlines if they chose them, without incurring a penalty.

A similar experiment was carried out by Ariely and Wertenbroch (2002). When able to choose deadlines the rational choice is to give yourself the largest amount of time to finish the task, e.g. to choose the latest deadline. The only reason to choose an earlier deadline, with less time to finish the task, is to discipline yourself into working towards that earlier deadline and thus finishing your work in a timely manner. According to theory, a naïve student may not recognize his own bias and choose late deadlines, a sophisticated student may recognize his own bias and choose early deadlines.

All the data was gathered using the questionnaires in Appendix A. These questionnaires were handed out to each of the students who were in the first day class of the course Behavioural Economics on Tuesday October the 28th 2014. The students received no further explanation prior to filling in the questionnaires. The also did not get monetary or other compensation. There were 95 students enlisted in the course. Of these 95 student 71 students filled in the questionnaire. Of these 71, 36 students received questionnaire A, with the 'choose' option, the rest of the students, 35, received the questionnaire with the 'default' option (where 'early' was the default option). The 24 students who were absent and thus did not fill in the questionnaire were sent an e-mail about the deadlines (Appendix B). In this e-mail they got a choice with late deadlines as the default, with the option to send an e-mail to either select early deadlines or confirm the late ones. 5 people responded to this e-mail, with 4 people saying they want early deadlines and 1 person sticking with the late deadlines. This means that 19 students did not fill in a questionnaire or respond to the e-mails. There was no penalty for a student if they could not hand in the assignment before the first set of deadlines in November. All students had to hand in the two assignments before the deadline in December. It was registered when a student who initially chose early deadlines chose to switch to late deadlines and when he or she e-mailed so.

In the questionnaire there were also questions about characteristics, biases, motivation and personality traits. Out of these questions 2, 6, 13 and 16 were used. Q13 and Q16 are questions concerning motivation and Q2 and Q6 question past attitudes to and issues with assignments and deadlines.

After the questionnaires were taken in, the students were e-mailed the day before their chosen deadline (Appendix B). The students who chose early deadlines had two separate deadlines and thus received two e-mail reminders.

When the finished assignments from the students were handed in, it was registered what time they were handed in. After the assignments were graded, the grades and word counts for each assignment were registered. After the course had finished the exam grades were registered and the data was anonymized.

Results and methodology

Average assignment grades

We see in that the average assignment grades are 6.9 for assignment one and 7.9 for assignment two. When doing a paired samples t-test (T(86)=-14.826, p<0.000) we see that there is a significant difference between these two grades, suggesting that students scored lower on assignment 1 than on assignment 2. We have to account for this difference while analysing. (Table 1)

Table 1

Overview of Continuous Variables

Variable	N	Mean	Std. Dev.	Min.	Max.
Grade assignment 1 (0-10)	88	6.875	0.6124	4.0	8.0
Grade assignment 2 (0-10)	88	7.898	0.6440	5.5	9.5
Time before deadline 1 (hours)	77	15.1708	14.14887	0.00	57.90
Time before deadline 2 (hours)	82	21.1474	34.92931	0.02	199.58
Exam grades	86	6.564	1.4187	1.0	9.0
Grade aimed for (Q13)	71	7.754	0.8374	5.5	10.0

Note: Assignment grades and Grade aimed for were measured on a 0.5 step basis. Time was measured to the nearest minute and converted to a decimal number.

Table 2

Overview of Categorical Variables

Variable	N	#1	#2	#3	#4	Meaning of answers.
Preferred grade (Q16)	71	44	98	N/A	N/A	1 = A decent grade (6) but many friends of yours also get the same 2 = A good grade (7) but many friends of yours get higher (9)
Treatment received	71	72	70	N/A	N/A	1= Choose 2= Default
Student choices	71	94	48	N/A	N/A	1 = Early 2= Late
Normal writing start (Q2)	71	44	96	2	N/A	1 = As early as possible 2 = A day before the deadline 3 = Some hours before the deadline
Past struggles with deadlines (Q6)	71	44	90	6	2	1 = No (past struggles) 2 = A little bit but I mostly hand in on time 3 = Severely and sometimes I hand in late 4 = Very severely so that I always miss deadlines

Note: #1 is 'times answer one is given' and so forth

Regression methodology

For the regression the assignment grades were pooled into one regression. This makes for an easier comparison of the regression effects. A dummy variable is added to distinguish between the average grades differences of the assignments. The students in the absent treatment were not included in the studies concerning the assignments. These students could have very different motivations from the attending students (After all, they didn't come to class)

Treatment effect

Before we can look at the self-disciplining effect of choosing an early deadline we must first see if this choice can be influence by choice architecture (e.g. the 'treatment'). When looking at the literature concerning nudges we see that choosing a default is important. (Thaler & Sunstein, 2003) This is because we know people suffer from status quo bias (Kahneman, Knetsch, & Thaler, 1991, Samuelson & Zeckhauser, 1988).

Proposition 1: Treatment matters when choosing deadlines. Students assigned to the default group are more likely to choose early deadlines

In table 3 the choices and treatments are set out against each other. This 2x2 table will be used for a Pearson chi square test.

Table 3

Cross-tabulation of treatment vs. choices

		Student's choices		
		Early	Late	Total
Treatment received	Choose	21	15	36
	Default	26	9	35
Total		47	24	71

Note: Absent group not included as stated earlier

The assumption for this test is a large enough sample size. If the expected count for each cell is below 5 or the sample size for a 2x2 table is below 20 then we do the non-parametric fisher test. As the expected count is above 11 for all cells and the sample size is 71 we do the Pearson chi square test. Even though 74% of students in the default treatment choose early deadlines compared to 58% of students in the choose treatment, the null-hypothesis 'no relationship between

the treatment of the students and the choice the students made' cannot be rejected with a chi-square test ($\chi(1) = 2.018$, p=0.155).

We can see that even though there is no significant relation between the treatment and choices. There is a trend towards people in the default group picking earlier more often. This is in line with the expected result, as we've seen that 'defaults matter'.

Relation between choices and assignment grades

We've seen that sophisticated people will try to discipline themselves to achieve a better result. In this case we nudge students towards earlier deadlines. Earlier deadlines would mean students would think about the assignments and the other course material earlier, subsequently achieving higher grades. First the relation between assignment grades and choices is discussed. We will talk about exam grades later in this thesis.

Proposition 2: Choosing early deadlines enhances grades. A student who chooses early deadlines will have significantly higher grades compared to a student chooses late deadlines

Only assignment grades are considered here because the treatment choices were about assignment deadlines.

To compare the grade between the different groups we have to compare these groups. We have to do Mann-Whitney U tests to determine if there is a difference in grades between the two treatment groups and between the two choice groups. This test has to be used because the dependent variables are not normally

distributed.[1] The assumptions for this test are not fully met, but because these are already non-parametric tests we will continue anyway.[2]

For the first test the null hypothesis is 'the distribution of 'grade for assignments' is the same across categories of 'treatment received'', this null hypothesis cannot be rejected (p=0.845). It seems that there is no difference between grades in different treatment groups.

For the second test the null hypothesis is 'the distribution of 'grade for assignments' is the same across categories of 'student choices'', this null hypothesis cannot be rejected (p=0.205). It seems that there is no difference between grades in different choice groups.

To test if there is an interaction effect between treatment and choices we will execute a factorial ANOVA.

From this we see that treatment does not significantly explain the grades differences, like above (F(1)=0.095, p=0.758). Furthermore we see that 'student choices' do significantly explain the grade differences, like above (F(1)=2.323,

---

[1] We test the dependent variable 'grades for assignments' on normality. These test are done twice, once for treatment and one for choice. The grades are not normally distributed, when split in two possible manners.

First the groups are split by choice. For these groups the null hypothesis of normality is tested for each treatment. For both treatments the Kolmogorov Smirnov, 'early' F(85)=0.184, p=0.000), 'late' F(45)=0.230, p=0.000) , and for both treatments the Shapiro-Wilk, 'early' F(85)=0.929, p=0.000), 'late' F(45)=0.883, p=0.000) tests rejected the null hypothesis. Secondly the groups are split by treatment. For these groups the null hypothesis of normality is tested for each treatment. For both treatments the Kolmogorov Smirnov, 'choose' F(69)=0.241, p=0.000), 'default' F(61)=0.182, p=0.000) , and for both treatments the Shapiro-Wilk, 'choose' F(69)=0.882, p=0.000), 'default' F(61)=0.918, p=0.000) tests rejected the null hypothesis.

[2] The dependent variable 'grades' has to be ordinal or continuous, it is ordinal. The independent variable should consist of two categorical, independent groups. These groups were randomly selected, so the treatment was random. You could only either choose early or late deadlines, not both, so the choices are not dependent on each other. The observations are independent too, as no one is in both groups at once. For the last assumption the distribution of grades has to have the same shape. This is hard to tell visually, but they look similar to an extent.

p=0.130). The interaction effect is not significant (F(1)=0.955, p=0.330). While choosing late deadlines yield slightly higher grades when the treatment is 'choice', this effect is much larger when the treatment is default. So deviating from the default option yields higher grades.

The last variables we want to control for are the answers given to questions 13 and 16 of the summary. These concern the grade aimed for in the course and the grade one would like as compared to others. We also control for exam grades as these may signal ability. To include these three factors we run a regression, controlling also for the higher mean of the second assignment. The results can be seen in table 4.

Table 4

Regression using Assignment Grades as the Dependent Variable

Assignment grades	B (t)	B (t)
Dummy assignment number	0.981 (11.552)***	0.994 (12.634)***
Treatment received	-0.134 (-1.244)	-0.055 (-0.544)
Student choices	0.024 (0.200)	-0.012 (-0.112)
Interaction between treatment and choices	0.266 (1.461)	0.261 (1.551)
Grade aimed for	-0.010 (-0.204)	-0.044 (0.363
Preferred grade	0.201 (2.080)**	0.119 (1.308
Exam grade		0.145 (4.580)***
Constant	5.886 (12.090)***	5.229 (11.053)***
R^2	0.544	0.613
N	126	126

Note: Significance levels used: *= p<0.10; **= p<0.05; ***=0.01

We see here that the treatment and choices do not have a significant or large effect on grades as seen in earlier test. Even though the interaction effect is slightly larger this is not significant. Those that choose late while being in the default group got higher grades by 0.261 on average. As expected higher exam grades predict higher grades for the assignment, but this is most likely signalling ability.

Relation between choices and procrastination

When a student is working with a deadline it is beneficial to complete the assignment earlier as discussed earlier. Students with an early deadline may even start working on the assignment earlier (compared to their deadline). To see if nudging those students towards earlier deadlines does indeed make them hand in their assignments earlier compared to their own deadlines, we will study this relation.

Proposition 3: Choices have an enhancing effect on the moment students hand in their assignments. A student who chooses early deadlines will hand in their assignments significantly earlier than a student who chooses late deadlines.

To compare the time left before the deadline ('time left' in the rest of the text) between the different groups we have to compare these groups. We have to do Mann-Whitney U tests to determine if the time left of the two treatment groups and the time left of the two choice groups differ from each other. This test has to be used because the dependent variables are not normally distributed.[3] The assumptions for this test are not fully met, but because these are already non-parametric tests we will continue anyway.[4]

---

[3] We test the dependent variable 'time left before deadline' on normality. These test are done twice, once for treatment and one for choice. The time left before the deadlines is not normally distributed, when split in two possible manners.

First the groups are split by treatment. For these groups the null hypothesis of normality is tested for each treatment. For both treatments the Kolmogorov Smirnov, 'choose' $F_{(57)}=0.197$, $p=0.000$), 'default' $F_{(59)}=0.198$, $p=0.000$) , and for both treatments the Shapiro-Wilk, 'choose' $F_{(57)}=0.665$, $p=0.000$), 'default' $F_{(59)}=0.835$, $p=0.000$) tests rejected the null hypothesis. Secondly the groups are split by choice. For these groups the null hypothesis of normality is tested for each treatment. For both treatments the Kolmogorov Smirnov, 'early' $F_{(71)}=0.221$, $p=0.000$), 'late' $F_{(45)}=0.231$, $p=0.000$) , and for both treatments the Shapiro-Wilk, 'early' $F_{(71)}=0.852$, $p=0.000$), 'late' $F_{(61)}=0.635$, $p=0.000$) tests rejected the null hypothesis.

[4] The dependent variable 'Time before deadline has to be ordinal or continuous, it is ordinal, so this is the case. The independent variable should consist of two categorical, independent groups. This is also the case, as these

For the first test the null hypothesis is 'the distribution of 'hours between deadlines and time handed in' is the same across categories of 'treatment received'', this null hypothesis can be rejected. ($p=0.000$). The amount of time left before an assignment is handed in differs between treatment groups.

For the second test the null hypothesis is 'the distribution of 'hours between deadlines and time handed in' is the same across categories of 'student choices'', this null hypothesis can also be rejected ($p=0.006$). The amount of time left before an assignment is handed in also differs between choice groups.

To test if there is an interaction effect between treatment and choices we will execute a factorial ANOVA.

From this we see that treatment does indeed significantly explain time left, like found above during the Mann-Whitney U tests ($F(1)=18.253$, $p=0.000$) Furthermore we see that 'student choices' do also significantly explain grades, like above ($F(1)=5.362$, $p=0.022$) The interaction effect is also significant ($F(1)=4.989$, $p=0.027$). When treatment is default, choices do not seem to influence the time left, but students who were given a free choice and chose late deadlines over early ones handed in their assignments earlier.

The last we want to control for are the answers given to questions 13 and 16 of the summary. These concern the grade aimed for in the course and the grade one would like as compared to others. We furthermore again control for ability, because students who achieve higher grades may be just better at studying and have an easier task complete the assignment, therefore they may need less time.

---

groups were randomly selected, so the treatment was random. You could only either choose early or late deadlines, not both, so the choices are not dependent on each other. The observations are independent too, as no one is in both groups at once. For the last assumption the distribution of time left before deadline has to have the same shape. This is hard to tell visually, but they look similar to an extent.

To include these three factors we run a regression, controlling for the different means between the two assignments with a dummy variable. The results can be seen in table 5

Table 5

Regression using Time Left Before Deadlines as the Dependent Variable

Time left before deadlines	B (t)	B (t)
Dummy assignment number	3.507 (0.888)	3.764 (0.970)
Treatment received	-8.352 (-1.620)	-7.510 (-1.478)
Student choices	18.810 (3.317***	18.570 (3.332)***
Interaction between treatment and choices	-18.692 (-2.234)**	-18.968 (-2.307)**
Normal writing start	3.474 (0.827)	4.984 (1.190)
Past struggles with deadlines	-2.550 (-0.679)	-0.438 (-0.115)
Exam grade		3.344 (2.199)**
Constant	0.788 (0.045)	-28.961 (-1.328)
R^2	0.231	0.264
N	113	113

Note: Significance levels used: *= $p<0.10$; **= $p<0.05$; ***=0.01

There are some clear relations. First, students in the default group hand in their assignment ±8 hours later than students in the choice group. Students who chose early deadline hand in their assignment much later (±18 hours) than students who chose late deadlines. Students who chose late in the default group hand in their assignments ±19 hours later. There seems to be a double effect here. For clarification see table 6. Note that the effect of treatment is non-significant. Furthermore, as expected, students with a higher exam grade will, on average, hand in their assignments earlier.

Table 6

Average differences in time left between choices and treatments

Treatments	Choices	
	Early (1)	Late (2)
Choose (1)	0	+18.570
Default (2)	-7.510	-7.908

Note: Choice group who chose early deadlines is benchmark (0)

Relation between choices and exam grades

When nudged towards making assignments earlier students are forced to think about the course material earlier in the course than they would maybe normally do. This might influence the grade they receive for their final exam. We will study this further.

Proposition 4: Choosing earlier deadlines relates to higher grades. A student who chooses early deadlines will, on average have a higher exam grade.

To compare the exam grades between the different groups we have to compare these groups. We have to do Mann-Whitney U tests to determine if the exam grades of the two treatment groups and exam grades of the two choice groups differ from each other. This test has to be used because the dependent variables are not normally distributed.[5] The assumptions for this test are not fully met, but because these are already non-parametric tests we will continue anyway.[6]

---

[5] We test the dependent variable 'time left before deadline' on normality. These test are done twice, once for treatment and one for choice. The time left before the deadlines is not normally distributed, when split in two possible manners.

First the groups are split by treatment. For these groups the null hypothesis of normality is tested for each treatment. For both treatments the Kolmogorov Smirnov, 'choose' $F(68)=0.136$, $p=0.003$), 'default' $F(60)=0.125$, $p=0.021$) , and for both treatments the Shapiro-Wilk, 'choose' $F(68)=0.994$, $p=0.004$), 'default' $F(60)=0.910$, $p=0.000$) tests rejected the null hypothesis. Secondly the groups are split by choice. For these groups the null hypothesis of normality is tested for each treatment. For both treatments the Kolmogorov Smirnov, 'early' $F(82)=0.108$, $p=0.020$), 'late' $F(46)=0.176$, $p=0.001$) , and for both treatments the Shapiro-Wilk, 'early' $F(82)=0.954$, $p=0.005$), 'late' $F(46)=0.801$, $p=0.000$) tests rejected the null hypothesis.

[6] The dependent variable 'Exam grades' has to be ordinal or continuous, it is continuous, so this is the case. The independent variable should consist of two categorical, independent groups. This is also the case, as these groups were randomly selected, so the treatment was random. You could only either choose early or late deadlines, not both, so the choices are not dependent on each other. The observations are independent too, as no one is in both groups at once. For the last assumption the distribution of time left before deadline has to have the same shape. This is hard to tell visually, but they look similar to an extent.

For the first test the null hypothesis is 'the distribution of 'exam grades' is the same across categories of 'treatment received'', this null hypothesis cannot be rejected. (p=0.113). Exam grades are not related across different treatment groups.

For the second test the null hypothesis is 'the distribution of 'exam grades' is the same across categories of 'student choices'', this null hypothesis can also not be rejected (p=0.214). Exam grades are not related across different choice groups.

To test if there is an interaction effect between treatment and choices we will execute a factorial ANOVA.

From this we see that treatment does significantly explain exam grades, In contrast to the Mann Whitney U test above ($F(1)=5.056$, $p=0.026$). We see that 'student choices' do not significantly explain exam grades, like above ($F(1)=0.077$, $p=0.781$). The interaction effect is not significant ($F(1)=0.648$, $p=0.422$). Students who choose late deadlines will on average have higher grades for the exam compared to the free choice group who chose early deadlines. For the default choice groups the students who chose late deadlines will have lower grades on average than the early deadline choosers.

The last we want to control for are the answers given to questions 13 and 16 of the summary. These concern the grade aimed for in the course and the grade one would like as compared to others. To include these two factors we run a regression, controlling also for the higher mean of the second assignment. The results can be seen in table 7

There are no relevant significant effects here. But seeing as treatment received was marginally significant (p=0.083) we can at least interpret it. It seems that students from the default treatment on average had grades lower by about 0.54 points than students from the choice treatment. This can be because of the students in the default treatment choosing early deadlines more often and having a lower grade because of that. But seeing as this is non-significant this conclusion can't be safely drawn.

Table 7

Regression using Exam Grades as the Dependent Variable

Exam grades	B (t)
Treatment received	-0.535 (-1.746)*
Student choices	0.256 (0.759)
Interaction between treatment and choices	0.293 (-0.574)
Grade aimed for	0.237 (1.626)
Preferred grade	0.509 (1.857)
Constant	4.399 (3.296)***
R^2	0.544
N	126

Note: Significance levels used: *= $p<0.10$; **= $p<0.05$; ***=0.01

Conclusion and discussion

This thesis set out to see if 'giving students the choice, in accordance with libertarian paternalism, to set early deadlines for an assignment' is 'an effective method to enhance their grades and make them hand in their work earlier?'. We have seen a few different things. There was a non-significant relation between the treatment students received and the choices they made. In percentage more students from the 'default' group chose early deadlines than students from the 'choose' group. Even though in this case the effect is non-significant, the trend is in accordance with the theory on libertarian paternalism. Defaults do matter in structuring choice architecture.

When looking at the relation between choices and grades there are no relevant significant effects. The trend is that people who received the 'choice' treatment will have higher grades. There is a very insignificant increase in grade between the two choices in general. But students who choose late deadlines have a higher grade on average when their treatment is default compared to when their treatment is choice. There are two explanation for this. Deviating from the default (early) deadline might give students more time to finish the assignment and with more time they receive a higher grade. The other explanation might be that better/smarter students pick the later deadlines over the earlier ones to give themselves more time, confident in their ability to discipline themselves. They have higher grades on average anyway. I think the second option seems more

likely, because in the first option student who were not subject to a default option and chose late deadlines did not receive higher grades. This would be a strange distinction.

When looking at the relation between choices and the time left before the assignments are handed in there is a significant relation between choices and the time and a significant relation between treatments and the time. The trend is that people who choose late deadlines hand in their assignments earlier. Students who were given a free choice and chose late deadlines over early ones handed in their assignments earlier. This effect is significant. The interaction effect is also significant too. When treatment is default and students choose late deadlines they will hand in their assignments later.

When looking at the influence of our nudges on exam grades we see that there are no significant effects. Nudging people with a default option yield (insignificantly) lower grades for the students in the default group.

In most cases we see that handing in assignments later yields better results in both grades and time. This would mean that nudging people towards handing in their assignments earlier and helping them to self-control themselves could actually have been counter-productive. Like the sophisticated smoker who tries to discipline himself into not getting addicted and overcorrecting, students might have overcorrected by choosing early deadlines.

The reverse causality could also be applicable here. Students who choose late deadlines do so willingly because they know they do not need to discipline themselves. They can choose late deadlines safely because they found another way of making sure they make the assignments on time.

The effect is ambiguous and therefore not certain. A causal effect cannot be determined with certainty. Even though treatments and choice had no significant effect on deadlines, they had an effect on the timing of handing in assignments. This did not lead to different grades.

There are a lot of way to increase the quality of this research. Increasing the sample size and the number of students tested is always one of the more easy way to increase the quality of the research, but this is not always possible due to practicality.

In this case you could include data about assignments made in other courses. Especially in the first two years of the economics bachelor students all usually take the same courses. You could extend the same experiment throughout the other courses and study the effect on a larger scale. This could also help in eliminating effect like general ability. Student's ability in general won't be a disturbing factor in determining of treatment by nudges is an effective way to increase grades. There could also be a difference in the way students treat deadlines. When they don't deviate from the default deadline set in class this may seem less important to them than if they actively choose their own deadline. The default may make people 'lazy' about keeping deadlines.

One other limitation of the study is precise response to being nudged. If students know they are being nudged this may lead to problems with its effectiveness. But transparency is an important aspect of a nudge. (Bovens, 2009, p. 216)

The risk of nudging students, and especially those in a behavioural economics course, is that they will recognize the measure and react differently to it than students in unrelated courses. Even though nudges are all around us in marketing, advertising and other aspects in life. We cannot see through them all.

The method used was largely consistent with Thaler and Sunstein's theory on using nudges (Thaler & Sunstein, 2003). Students had the freedom to choose both options without consequence if they wanted to change choices in the first weeks. Nevertheless there was one part where the used method deviated from an ideal nudge. Choice architecture has to make sure people choose so that they are better off. In this case it could be argued that, even though nudging people towards an early deadline, they might find that there is not enough time, compared to late deadlines, to finish the assignment. They could also have missed knowledge gained later in the course, enabling students with late deadlines to achieve a

higher grade. As apparent from the fact that 4 people switched their choice from early to late deadlines, they might not have been comfortable with their choice on the first day of the course.

In the end when asking 'Is giving students the choice, in accordance with libertarian paternalism, to set early deadlines for an assignment an effective method to enhance their grades and make them hand in their work earlier?' I cannot give a conclusive answer. I can however say that there is a clear effect on students concerning the time when they hand in their assignments. This at least can be influenced. I myself think that learning more about these nudges and their effect on students may help using them to actually improve student's grades in the future.

References

Akerlof, G. A. (1991). Procrastination and obedience. *The American Economic Review*, 1-19.

Ariely, D., & Wertenbroch, K. (2002). Procrastination, deadlines, and performance: Self-control by precommitment. *Psychological Science*, 219-224.

Bond, M. (2009, October 29). Risk School. *Nature*, pp. 1189-1192.

Bovens, L. (2009). *Preference Change.* Springer Netherlands.

Ferrari, J. R. (2001). Procrastination as Self-regulation Failure of Performance: Effects of Cognitive Load, Self-awareness, and Time Limits on 'Working Best Under Pressure'. *European Journal of Personality*, 391-406.

Frederick, S. (2005). Cognitive Reflection and Decision Making. *The Journal of Economic Perspectives*, 25-42.

Gigerenzer, G., Gaissmaier, W., Kurz-Milcke, E., Schwartz, L. M., & Woloshin, S. (2009, April). Knowing your chances. *Scientific American Mind*, pp. 44-51.

Hornsby, A. S., Wehmeier, S., Mcintosh, C., Turnbull, J., & Ashby, M. (2005). *Oxford Advanced Learner's Dictionary of Current English.* Oxford: Oxford university press.

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1991). Anomalies: The endowment effect, loss aversion, and status quo bias. *The Journal of Economic Perspectives*, 193-206.

O'Donoghue, T., & Rabin, M. (1999). Doing it now or later. *The American Economic Review*, 103-124.

O'Donoghue, T., & Rabin, M. (2000). The economics of immediate gratification. *Journal of Behavioral Decision Making*, 233-250.

Samuelson, W., & Zeckhauser, R. (1988). Status quo bias in decision making. *Journal of Risk and Uncertainty*, 7-59.

Strotz, R. (1956). Myopia and inconsistency in dynamic utility maximization. *The Review of Economic Studies*, 165-180.

Thaler, R. H., & Sunstein, C. R. (2003). Libertarian paternalism. *The American Economic Review*, 175-179.

Watson, D. C., Howell, A. J., Powell, R. A., & Buro, K. (2006). Academic procrastination: The pattern and correlates of behavioural postponement. *Elsevier*, 1519-1530.

Appendix A Questionnaires

Questionnaire from the 'choose' treatment

Note that your answers to the following questions will NOT be used to determine your final grade in any way; and they will NOT be revealed to anyone that can link back to you personally. Please do not communicate. Raise your hand quietly if you have a question. Please answer all questions and do not skip around.

1. Imagine that you have to choose one option out of A and B. Which would you choose?
A. €50 for sure
B. 0.5 probability €100 or nothing
C. really doesn't matter

2. Imagine that you were to write a 400-word essay individually. Normally when do you start thinking and writing?
A. as early as possible
B. a day before the deadline
C. some hours before the deadline
D. 1 hour before the deadline
E. after the deadline

3. Do you smoke?
A. routinely
B. occasionally or socially
C. no

4. If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? _____

5. Imagine that you have to choose one option out of the following two. Which would you choose?
A. €80 in 5 years
B. €100 in 6 years

6. Did you struggle with meeting deadlines when you did assignments in the past?
A. no
B. a little bit but I mostly hand in on time
C. severely and sometimes I hand in late
D. very severely so that I always miss deadlines

7. Do you play the lottery?
A. routinely
B. occasionally
C. no

8. In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? _____

9. Imagine that you have to choose one option out of the following two. Which would you choose?

A. you have to pay a fine of €250 for sure
B. with 0.06 probability you have to pay a fine of €750, 0.87 probability pay a fine of €250, otherwise nothing happens

10. Are you on a diet?
A. no
B. yes, a casual one
C. yes, a strict one
D. want to but cannot do it

11. A bat and a ball cost €1.10 in total. The bat costs €1.00 more than the ball. How much does the ball cost? _____

12. Imagine that you have to choose one option out of the following two. Which would you choose?
A. with 0.13 probability you have to pay a fine of €250, otherwise nothing happens
B. with 0.06 probability you have to pay a fine of €750, otherwise nothing happens

13. What is the grade you are aiming for in this course? _____

14. Imagine that you have to choose one option out of the following two. Which would you choose?
A. €80 now
B. €100 a year later

15. Do you have a bike insurance?
A. yes
B. no

16. Which outcome would you rather get?
A. a decent grade (6) but many friends of yours also get the same
B. a good grade (7) but many friends of yours get higher (9)

17. Gender?
A. male
B. female

Regarding assignments:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
October	27	28 today	29	30	31	1	2
November	3	4	5	6	7	8	9
	10	**11 assignment 1**	12	13	14	15	16
	17	18	19	20	21	22	23
	24	**25 assignment 2**	26	27	28	29	30
December	1	**2 deadline**	3	4	5	6	7
	8	**9 feedback**	10	11	12	13	14
	15	16	**17 exam**	18	19	20	21

There will be 2 individual assignments (short 400-word essays). You can choose to hand them in (tick one box below):

□ on November 11th and November 25th respectively
□ both on December 2nd

You will receive a reminder email about the dates after class and reminder emails one day before the assignment deadlines. Any assignments handed in after December 2nd will not be graded. You will receive your grade and feedback on December 9th.

Student Number:	Name:

Questionnaire from the 'default' treatment

Up until here the questionnaire is exactly the same as the 'choice' version shown above.

Regarding assignments:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
October	27	28 today	29	30	31	1	2
November	3	4	5	6	7	8	9
	10	**11 assignment 1**	12	13	14	15	16
	17	18	19	20	21	22	23
	24	**25 assignment 2**	26	27	28	29	30
December	1	**2 deadline**	3	4	5	6	7
	8	**9 feedback**	10	11	12	13	14
	15	16	**17 exam**	18	19	20	21

There will be 2 individual assignments (short 400-word essays). You are expected to hand them in:

□ on November 11th and November 25th respectively,

unless you request here that you want to hand them in both on December 2nd, by ticking the box below.

□ I request to hand in both assignments on December 2nd

You will receive a reminder email about the dates after class and reminder emails one day before the assignment deadlines. Any assignments handed in after December 2nd will not be graded. You will receive your grade and feedback on December 9th.

Student Number:	Name:

Appendix B E-mails

Deadline e-mails

Procedures of Emails

Email title:

[FEB13061-14 Behavioural Economics] Assignments

Early deadlines

Assignment overview: immediately after the first lecture

Dear student,

There are 2 individual assignments for the course "FEB13061-14 Behavioural Economics". You can find them on Blackboard under "Assignments".

You are expected to hand in assignment 1 on **November 11th** and assignment 2 on **November 25th**. You will receive reminder emails one day before these dates. Any assignments handed in after December 2nd will not be graded. You will receive your grades and feedback on December 9th.

To hand in your assignments, upload them on Blackboard under "Assignments".

Best   regards,
Tong Wang

Reminder 1: 1 day before the first early deadline

Dear   student,

This is a reminder that you are expected to hand in assignment 1 this Tuesday November 11th.

To hand in your assignments, upload them on Blackboard under "Assignments".

Best   regards,
Tong Wang

Reminder 2: 1 day before the second early deadline

Dear   student,

This is a reminder that you are expected to hand in assignment 2 this Tuesday November 25th.

To hand in your assignments, upload them on Blackboard under "Assignments".

Best   regards,
Tong Wang

Late deadlines

Assignment overview: immediately after the first lecture

Dear student,

There are 2 individual assignments for the course "FEB13061-14 Behavioural Economics". You can find them on Blackboard under "Assignments".

You are expected to hand in assignment 1 and assignment 2 both on **December 2nd**. You will receive a reminder email one day before. Any assignments handed in after December 2nd will not be graded. You will receive your grades and feedback on December 9th.

To hand in your assignments, upload them on Blackboard under "Assignments".

Best regards,
Tong Wang

Reminder: 1 day before the deadline

Dear   student,

This is a reminder that you are expected to hand in both assignment 1 and assignment 2 this Tuesday December 2nd. Any assignments handed in after December 2nd will not be graded.

To hand in your assignments, upload them on Blackboard under "Assignments".

Best   regards,
Tong Wang

Absent

Assignment overview: immediately after the first lecture or after students subscribed on SIN-online

---

Dear student,

There are 2 individual assignments for the course "FEB13061-14 Behavioural Economics". You can find them on Blackboard under "Assignments".

The final deadline to hand in these assignments is **December 2nd**. You will receive a reminder email one day before. Any assignments handed in after December 2nd will not be graded. You will receive your grades and feedback on December 9th.

Some of your classmates chose to hand in assignment 1 on **November 11th** and assignment 2 on **November 25th**. You can also do that; reply to this email and I'll send you reminder emails one day before these dates.
To hand in your assignments, upload them on Blackboard under "Assignments".

Best regards,
Tong Wang

Reminders were the same as before