

## Pre-analysis plan of the project:

# The effects of self-chosen incentivized goals on academic performance

Pol Campos-Mercade\* and Erik Wengström\*

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### Abstract

We incentivize university students conditional on attaining a goal grade in a full-time course. Students are divided into three groups: control, endogenous goals, and exogenous goals. In the endogenous goals treatment, students choose whether to have a high goal (they are paid SEK4000 if their course grade is an A) or a low goal (they are paid SEK2000 if their course grade is C or higher). In the exogenous goals treatment, students are randomly allocated to one of both goals. In the first part the analysis, we will explore what determines whether a student chooses to pursue a high goal. In the second part of the analysis, we will study whether receiving a goal improves students' grades. We will further explore whether there are any differences between receiving a high or a low goal, and whether there are any differences on whether the goal is assigned endogenously or exogenously. Finally, we will investigate heterogeneities in the treatment effects by using data from both a baseline survey and a final survey at the end of the experiment.

**Keywords:** Incentives, pay for performance, goals, self-chosen goals, education, peer-effects.

**JEL classification:** C93, I22.

*This document was uploaded on the AEA RCT Registry on October 29, 2018, the first day in which the survey was administered to the students (and before collection of final grades). We chose to upload it as a document, instead of written directly on the website, to prevent the study participants from learning about the design and purpose of this experiment.*

### ***Primary Outcome***

*Macroeconomics grade in points:* final macroeconomics grade, including both the exam and the written homework.

*Probability of choosing a high goal:* as answered in the baseline survey.

### ***Secondary Outcomes to study the treatment effects on academic performance***

Secondary variables used as outcomes to further study the treatment effects on students' academic performance:

- *Macroeconomics grade in scale 0-5.*
- *Macro final exam grade.*
- *Macro written homework grade.*
- *Pass rate.*
- *Grades in sub-subsequent courses (International economics and Finance).*
- *Course dropouts.*
- *Probability of studying economics in the following semesters.*

### ***Secondary Outcomes to study the mechanisms of the treatment effect***

Variables used as outcomes to study the channels through which the treatment has an effect on students' preferences and behavior. All of those come from the final survey (goal, self-reported study time, and self-reported probability of studying economics also come from the mid surveys).

- *Interest in studies.*
- *Percentage of time studying with friends.*
- *Self-reported study time.*
- *Goal grade for the semester.*
- *Self-reported study time.*
- *Whether during this course they had more fun, were more focused, followed better their study plans, or were more stressed.*

### ***Secondary Outcomes to study how students perceive the treatment***

Variable used as outcomes to study how students perceive the incentivized goals and make their decisions on which goal to choose:

- *Perceived improvement if they are assigned each goal.*
- *Perceived probability of attaining each of the goals.*

### ***Experimental Design***

The student body that we recruit our participants from consists of students who study the course Nationalekonomi: Grundkurs. The course lasts one semester, is worth 30 ECTS (it is a full-time course), and consists of: Micro, Macro, International economics and Finance. During the first weeks, students study full-time Micro. During the next following weeks, they study full-time

Macro. The intervention takes place during this course. During the final weeks of the course, students study at the same time International economics and Finance.

We will approach students in class during the second week of the course Macro. We will hand them a sheet of paper where we explain them that if they participate in this study they will have to fill out a total of 5 surveys. They will be compensated with SEK250. Furthermore, some of them will be randomly chosen to receive a goal. Students who participate fill out a Qualtrics survey on their smartphones.

The survey asks questions about their background (gender, spending, ...), study patterns (hours they study per week, lectures attendance rate, ...), preferences (self-control, self-reported time preferences, self-reported risk preferences,...), beliefs about their own grades, and an incentivized question about whether they prefer Goal A (they are paid SEK4000 if their Macro grade is A) or Goal C (they are paid SEK2000 if their Macro grade is C or higher).

Finally, we will send an e-mail to all the students of the cohort inviting them to participate by coming to a last session the following day. This enables students who did not attend the lectures to participate in the study.

The survey is available in a separate document at the AEA RCT Registry site.

Once we have a list of all the study participants, we will randomize students into control (40%), endogenous (30%) or exogenous (30%). Those in the endogenous treatment will receive the goal that they chose in the survey and those in the exogenous treatment will randomly receive one of both goals with 50% probability.

Two days after the beginning of the experiment, we will send an e-mail to all the study participants informing them about their goal (if any), and about whether the goal was assigned endogenously or exogenously. During the following three weeks, we will send one survey per week. Students have their final exam on the fourth week. On the fifth week, we will send the final survey.<sup>1</sup>

The final survey is available in a separate document at the AEA RCT Registry site.

### ***Randomization Method***

Randomization will be done in office in Stata using the program *randtreat* to stratify. It will be done using a simple 3x2x2 stratification, based on Micro grade (in a scale of 3 grades), gender, and self-chosen goal.

### ***Planned Number of Clusters***

3 class groups.

### ***Planned Number of Observations***

About 400 students, 200 in each experiment.

This number does however depend on the number of students who decide to participate. We expect the number of participants to be any number from 350 to 450.

### ***Sample size (or number of clusters) by treatment arms***

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<sup>1</sup> Our intention is to repeat the experiment twice, once in fall and once in spring. However, this is subject to our budget of SEK400,000. If the first experiment costs more than expected (SEK150.000-SEK200.000), we might have to reduce the percentage of students treated in the second one to accommodate the budget.

If the sample size is 400 students, there will be about 160 students in the control group, 120 in the endogenous group and 120 in the exogenous group.

### ***Power calculation: Minimum Detectable Effect Size for Main Outcomes***

To perform the power analysis, we use simulations over a data set consisting of a pilot study that we did with 177 students who took the same course in spring 2017.<sup>2</sup> First, we bootstrap the data to obtain a sample of 400 students. Second, we create a treatment variable using the same stratification program that we will use in our experiment. Third, we perform regressions where we explain students' macroeconomics grade using the students' grade in the microeconomics course, the students' grade in the microeconomics exam (also squared), and the students' homework grade (also squared), in addition to self-reported measures in the questionnaire (gender, class, motivation, spending, friends and study hours).

We estimate that we have 80% power to find a treatment effect of the incentives on the students' macroeconomics grade of 0.22 standard deviations.

### ***Analyses and hypotheses***

#### ***Part one***

We will use parametric regressions to explain whether a student chooses a high goal. This analysis will be carried out mostly in an exploratory way. First, we would like to understand whether students who choose a high goal do so not only because they believe that they are likely to reach it, but also because they will improve their grade thanks to the high goal. Second, we want to explore what other potential sources of heterogeneity (gender, self-control, optimism...) explain such willingness to choose high goals. Third, we would like to explore the same issues using the secondary outcome variables: perceived probability to attain each goal, and perceived grade improvement with each goal.

#### ***Part two***

We will use parametric regressions to explain the students' outcome depending on the students' treatment, controlling for all the administrative and survey baseline variables (microeconomics grade, gender, study time, program, spending, motivation, class, friends, study hours, etc). We will perform the following main analyses on the outcome variables described in the first two sections of this document [in brackets we report the result of our power analysis: for each given test, how many standard deviations we have 80% power to detect].

- *Treatment effect of the incentives (both treatments pooled).* [0.22]
- *Treatment effect of each of the treatments separately (exogenous and endogenous).* [0.27]
- *Treatment effect between the treatments (comparison of exogenous vs endogenous).* [0.29]
- *Treatment effect of receiving the high vs the low goal.* [0.29, assuming that 50% choose the high goal (although this percentage will very likely be much lower)]
- *Treatment effect between treatments conditioned on students with the same preferences (e.g., given that students chose the same goal, whether there is a difference if the student is in the exogenous or in the endogenous treatment).* [0.37]

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<sup>2</sup> We follow the method explained in: <https://sites.google.com/site/polcamposmercade/resources>.

We hypothesize that:

- Incentives will have a positive impact on the outcome variables related to academic achievement.
- Students assigned to their preferred goal will perform better than students not assigned to their preferred goal.
- The endogenous treatment will increase performance more than the exogenous treatment.

We have a lower prior about whether the high goal will be more effective than the low one in general and about whether goals allocated through the endogenous treatment will be more effective than goals allocated through the exogenous treatment (given the same goal).

These analyses will be complemented with exploratory analyses in three different ways:

1. Study heterogeneities in treatment effects based on the different baseline measures. For example, we will perform exploratory analyses to study whether the effects differ by baseline ability (previous grades), gender, friends, motivation, attendance, grade satisfaction, self-control, optimism, beliefs, or loss aversion.
2. Study the treatment effects on the variables collected in three follow-up surveys before the final exam.
3. Study treatment effects on the composition of the students' study friends.