

Pre-analysis plan: WEN Mentoring Program

Notes: This trial launched in August 2018. We pre-registered the trial, along with this pre-analysis plan on the American Economic Association RCT Registry (AEARCTR-0003396) on 9 October 2018. We also pre-registered on the Open Science Framework (OSF) on 12 October 2018 (<https://osf.io/pt89y>). Both pre-registrations occurred after the trial launch but before any data (other than baseline data) was collected. The main OSF project page (<https://osf.io/a57vh/>) also includes this pre-analysis plan, all survey questionnaires and code used for analysis.

A previous version of this plan was submitted to the ANU Human Research Ethics Committee on 3 August 2018, prior to the trial's launch. Changes to that version: The 'sample size and power' section has been updated to reflect the baseline data collection. Other changes were minor edits only and did not change the substance of the plan.

The pre-registered plan did not specify whether we would conduct a one-tailed test for our hypotheses however we did pre-specify this in our OSF pre-registration (<https://osf.io/pt89y>).

Intervention

Participation in mentoring program. The aim of the program is to increase the propensity for mentees to complete economic studies. (Note: the program is intended to comprise 4 meetings over 12 months but is likely to vary. We will measure differences in 'dosage' through surveys of mentors and/or mentees.)

Theory of change and hypotheses

The intent of the mentoring program is that it will provide students with:

- a role model that makes economics studies (and/or career) seem more tangible and attractive,
- a broader perspective on career options for economics graduates that makes economics studies more attractive, and
- an insight into the practical applications of economics that makes economics studies more interesting and relevant to the students.

Thus, our mediator hypotheses are that, compared to control, more students who receive the mentoring program:

- a) will find economics studies more interesting and relevant
- b) will have a broader perspective on the available career options for economics graduates, and
- c) will find a career based on economics studies more attractive.

It is also likely that the mentoring program will have a positive impact on various subjective outcomes such as confidence, knowledge and satisfaction with economics as a study or career choice so these may also act as mediators.

Through these mediator effects, our ultimate hypotheses are that, compared to control:

- d) more students who receive mentoring program will intend to continue with and complete an economics major, and
- e) more will actually continue and complete.

Outcome measures

Primary outcomes: We will use four closely related primary outcome variables to detect the propensity for students to complete economic studies.

- Intention to proceed to next year of econ studies (survey data, 5-point Likert scale)
- Intention to complete an economics major (survey data, 5-point Likert scale)
- Proportion who proceed to next year of econ studies in 2020 (admin data, based on enrolments in compulsory 2nd or 3rd year economics courses)
- Proportion who complete an economics major (admin data)

Secondary outcomes: We will also analyse results for the following mediator variables that, we assume, should drive the ultimate (primary) outcomes sought by the mentoring program:

- Attractiveness of a career based on economics qualifications (ie, at least an economics major),
- Perceived breadth of career options available to economics graduates, and
- Perceived level of interest and relevance of economics studies.

As noted above, we will also capture various subjective outcomes including confidence, knowledge and satisfaction with economics.

See the draft baseline survey – attached – for details of how survey based outcomes will be measured.

Study population

All women (or 'other' sex) students at ANU who are enrolled in a compulsory 1st- or 2nd-year economics subject (ie, micro 1, micro 2, macro 1, macro 2) in first semester 2018 were eligible to apply for the mentoring program. The study population comprised those students who submitted an application by the closing date and who met the eligibility requirements. The mentoring program is voluntary so we can only study its impact on those who are willing to participate.

Stratification and randomisation

Prior to randomisation, we stratified the study population on three binary variables:

- Year group (ie, we separated 1st year and 2nd year students),
- Domestic/international student status, and
- Degree of study (enrolled in a BEc or not).

Stratification allowed us to impose balance on these three potential predictors of our outcome variables. It will also allow us to conduct subgroup analysis.

We randomised within each stratum using simple randomisation. That is, we used a random number generator to assign – within each stratum – a fixed proportion (5/8) of students to the program. (The fixed proportion was determined by the number of available mentors (55) divided by the number of applicants (88).)

Sample size and power calculations

The sample size was determined by the number of eligible applicants for the mentoring program (N=88) and the split between treatment and control was determined by the number of mentors available (NT=55; NC=33).

This study is unlikely to be powered to detect an effect of the mentoring program, if there is one (see discussion of power analysis in the following paragraph).

Therefore, this study will be primarily conducted as a pilot to inform a future, fully powered trial of the mentoring program. The pilot can inform, for example:

- The likely effect sizes, for future power analysis,
- The survey response rates,
- The sample size (number of applicants), and
- Possible covariates to be used in the analysis.

Prior to trial enrolment, we calculated statistical power analysis for a range of scenarios for both the primary and secondary outcome variables. These scenarios suggested that this study is unlikely to be powered to detect an effect of the mentoring program, if there is one. This analysis used conventional thresholds (alpha = 5% and beta = 20%), various scenarios for the likely sample size (N=100 to

400, NT=50 to 80), and plausible, conservative effect sizes (eg, Cohen's $d = 0.2$ to 0.4).

Data collection

We will use a mix of admin and survey data. We will conduct surveys to assess intent to continue with or complete an economics major, and various related questions (see draft baseline survey for details). We will use ANU admin data for actual enrolments and GPA. For example, we envisage data in a format similar to that shown in the table below.

Student ID	Enrolment: micro 1 (Y/N)	Enrolment: micro 2 (Y/N)	Enrolment: micro 3 (Y/N)	Economics major (Y/N)	GPA
123456	Y	Y	Y	Y	3.2
654321	Y	Y	N	N	2.5
246810	Y	N	N	N	4.0

Analysis

We will conduct intent-to-treat analysis. For all outcomes, we will use simple OLS regression and include dummies for each stratum. As a covariate, we will include the answers – from the baseline survey – on intent to continue economics studies, since we expect this is a likely predictor of future intentions and therefore will increase the precision of our estimates. This covariate will be demeaned and interacted with treatment.

Multiple comparisons: We will not apply corrections for multiple comparisons. We will include a note in any report that this has the potential to increase our family-wise error rate.

Robustness checks: For robustness, we will run the same analysis:

- without covariates; and
- using logistic regression for any binary outcome variables.

Subgroup and exploratory analysis: We will do subgroup analysis for each of the strata variables (1st/2nd year students, BEc/not, domestic/international students). We may also explore variation in mentoring 'dosage' if we are able to collect the necessary data. Any such subgroup or related analysis will be exploratory only.

Trial threats – attrition: There is a risk of attrition (and thus selection bias) for the survey data so we will track response rates and assess any patterns of missingness (ie, non random effects) based on the baseline survey. We do not expect any serious

attrition or missing data issues for the administrative data but, if they emerge, we will take a similar approach (ie, assess patterns of missingness).

Trial threats – spillovers: Based on our theory of change, we think the risk of spillover from mentees to non-mentees is likely to be small because it is actual exposure to the mentor that we expect to change intentions and behaviour.

ATTACHMENT: Baseline survey

Eligibility and consent

- Are you a woman ANU student enrolled in first-year or second-year economics subject? (Y/N)
- Since there are limited places for the mentoring program, we may not be able to match you with a mentor. Please indicate that you understand that you are being asked to participate in the research project even if you are not matched to a mentor. (Yes I understand/No)
- I agree to the Australian National University providing access to my administrative data (GPA and details on course enrolment) as described in the Information Sheet above. (Yes, I agree/No, I do not agree)
- I have read and understood the Information Sheet about the research project (above) and I agree to participate in the research project. (Yes, I agree/No, I do not agree)

Contact information

- Name
- Student number
- Mobile number
- University email
- Personal email
- Preferred email (university/personal)

Demographic information

- Age (at today's date)
- Sex (female/other)
- Please select your father or mother's highest educational qualification (whichever is highest) (postgraduate, bachelors, year 12, high school (but not to Year 12), did not complete high school)
- School where year 12 was completed (public/independent/catholic)
- Studied economics in Year 11 or Year 12 (or both)? (Y/N)

Studies

- What year of full-time studies are you in? (If you are studying part-time, please provide your best approximation): [1st, 2nd, ..., 5th or later]

- Are you enrolled in a Bachelor of Economics (either as a single or combined degree) (Y/N)
- Please enter the degree/s in which you are enrolled
- Are you an international student or domestic student (Domestic/International)
- Are you currently studying full-time or part-time (Full-time/Part-time)
- What is your level of paid-work (Not undertaking paid work/Part-time work/Full-time work)

Study intentions and aspirations

- Please indicate how likely you are to ... (1-5 scale from very unlikely to very likely)
- Continue studying economics next year
- Complete an economics major
- Complete an economics degree
- Pursue a career in economics
- Please indicate how satisfied you are with your economics studies (0-10 scale from completely dissatisfied to completely satisfied)
- Please indicate how confident you are with your economic studies (0-10 scale from not confident at all to extremely confident)
- Please indicate how much you feel you know about the potential career pathways for economics graduates (A great deal/A lot/A moderate amount/A little/None at all)
- How many hours per week do you spend on economics studies on average (outside of class time)?
- What is your current (average) grade in your studies overall (HD/D/C/P/F/Non-award/Don't know)
- What is your current (average) grade in economics (HD/D/C/P/F/Non-award/Don't know)