Behavioural Nudges and Income Bunching below Tax Thresholds: Evidence from Randomised Controlled Trials in Indonesia

Pre-Analysis Plan

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Abstract

The aim of this trial is to investigate how behvioural nudges affect income reporting behaviour around statutory tax threshold, with a particular focus on income bunching among individual taxpayers in Indonesia. Using a large-scale randomised controlled trials, the intervention delivers targeted informational (norms and public goods provision), and deterrence-based emails to around 850,000 taxpayers whose reported income lies close to the threshold that triggers higher tax obligations. The analysis evaluates whether these nudges influence both the likelihood and magnitude of income bunching below the threshold, and whether observed responses persist over time.

JEL-Classification: C93, H25, H26

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1 Overview

1.1 Timing of Intervention and Data Collection

The randomised controlled trial was designed and implemented in collaboration with the Directorate General of Taxes (DGT) of Indonesia. The intervention was initiated in February 2026, during which approximately 850,000 email communications were delivered to eligible taxpayers. Outcome data are collected using administrative tax records. The long-term data collection period concludes in April 2026. De-identified administrative data will be made available to the research team following the registration of the study in the AEA RCT Registry, subject to applicable data access protocols.

1.2 Interventions

The intervention consists of behaviourally informed email communications sent to individual taxpayers whose reported income lies within a predefined bandwidth around a statutory tax threshold that triggers higher tax obligations. The objective of the intervention is to influence income reporting behaviour, particularly the propensity to report income just below the threshold.

Eligible taxpayers are randomly assigned to one of three treatment arms, each receiving a single email conveying a distinct behavioural message:

1. **Deterrence email**: This message emphasises statutory filing obligations and reporting deadlines, the administrative penalty for late or incorrect filing. It also highlights the possibility of further enforcement actions in cases of non-compliance.

2. **Localised peers norms email**: This message provides information on income reporting behaviour among geographically proximate or economically similar taxpayers. Specifically, it highlights the proportion of comparable taxpayers in the recipient's local area or peer group who report income above the statutory threshold, with the aim of conveying prevailing compliance norms.

3. **Public goods provision email**: This message highlights the role of individual income tax contributions in financing public expenditure, with particular emphasis on government spending related to education.

All messages are delivered through official Directorate General of Taxes email communication channels. Visual elements, including colours and graphical layout, are designed to enhance message salience and readability, drawing on established findings in the behavioural and colour psychology literature.

2 Randomisation

Randomisation is conducted at the individual taxpayer level using a stratified design to ensure balance across treatment and control groups. Assignment is not clustered; each taxpayer constitutes a single unit of randomisation.

2.1 Stratification Variables

Taxpayers are grouped into strata based on the following pre-treatment characteristics:

- **Baseline reported income bins**, defined using discrete intervals around the statutory tax threshold.
- **Gender**, as recorded in administrative tax records, by converting NIK to gender assignment.
- **Economic sector**, based on the taxpayer's primary reported activity.
- **Geographic location (island)**, indicating the taxpayer's registered island of residence.
- **Prior compliance history**, including indicators for timely filing and accurate reporting in the previous tax period.

These stratification variables are chosen to account for heterogeneity in income reporting behaviour, compliance incentives, and enforcement exposure that may influence responses to the interventions.

2.2 Assignment Procedure and Reproducibility

Within each stratum, taxpayers are randomly assigned to one of the treatment groups or the control group using a computer-generated random number process. The randomisation procedure is implemented using a fixed random seed to ensure reproducibility. The seed value and code used to generate the assignment will be archived and made available alongside the de-identified analysis data, subject to applicable data access restrictions.

2.3 Treatment Allocation

The stratified randomisation yields the following allocation of observations across experimental arms:

- **Treatment Group 1 (Deterrence email)**: 223,150 observations
- **Treatment Group 2 (Public goods provision email)**: 223,150 observations
- **Treatment Group 3 (Localised peer norms email)**: 223,150 observations
- **Control Group**: 77,721 observations

2.4 Balance Assessment

Covariate balance across treatment and control groups will be assessed using pre-treatment characteristics employed in the stratification, as well as additional baseline variables where available. Balance checks will be conducted by comparing means across groups and reporting standardised differences. No re-randomisation or adjustment to treatment assignment will be performed based on balance test results. Any imbalances observed will be documented and, where appropriate, addressed through covariate adjustment in the analysis phase.

3 Research Questions and Hypotheses

Let i index taxpayers and t index tax periods. Let y_{it} denote reported taxable income, and let τ denote the statutory tax threshold. Define an indicator for income bunching below the threshold as:

$$B_{it} = \mathbb{1}\left(\tau - \delta \leq y_{it} < \tau\right),$$

where $\delta > 0$ defines a narrow bandwidth below the threshold.

Let D_i^{Det}, D_i^{Norm}, and D_i^{Peer} denote indicators for assignment to the deterrence, public goods provision, and localised peer norms treatments, respectively, with the control group as the omitted category.

3.1 Behavioural Nudges and Income Bunching

To assess whether behavioural nudges affect income bunching below the threshold, the following intention-to-treat specification is considered:

$$B_{it} = \alpha + \beta_1 D_i^{\text{Det}} + \beta_2 D_i^{\text{Pub}} + \beta_3 D_i^{\text{Peer}} + \gamma X_i + \varepsilon_{it},$$

where X_i is a vector of pre-treatment covariates.

$$\textbf{H1}: \quad \beta_1, \beta_2, \beta_3 < 0.$$

3.2 Deterrence versus Non-Deterrence Effects

To compare deterrence-based messages with non-deterrence nudges, the analysis focuses on differences in treatment coefficients:

$$\textbf{H2}: \quad \beta_1 < \beta_2, \beta_3,$$

indicating that deterrence messages produce larger short-run changes in income reporting behaviour.

3.3 Persistence of Effects

To examine whether treatment effects persist over time, treatment indicators are interacted with post-intervention period indicators:

$$B_{it} = \alpha + \sum_k \beta_{1k} \left(D_i^{\text{Det}} \times \mathbb{1}[t = k]\right) + \sum_k \beta_{2k} \left(D_i^{\text{Pub}} \times \mathbb{1}[t = k]\right) + \sum_k \beta_{3k} \left(D_i^{\text{Peer}} \times \mathbb{1}[t = k]\right) + \gamma X_i + \varepsilon_{it}.$$

Persistence is evaluated by testing whether treatment effects remain statistically different from zero in later post-intervention periods.

3.4 Reference Dependence and Prior Enforcement Exposure

Let E_i denote an indicator for prior exposure to enforcement actions. Heterogeneous treatment effects are examined using interaction terms:

$$B_{it} = \alpha + \sum_j \beta_j D_i^j + \sum_j \theta_j \left(D_i^j \times E_i \right) + \gamma X_i + \varepsilon_{it}, \quad j \in \{\text{Det}, \text{Info}, \text{Peer}\}.$$

$$\textbf{H3}: \quad \theta_j < 0,$$

indicating stronger behavioural responses among taxpayers with prior enforcement exposure.

4 Outcome Measures

4.1 Primary Outcomes

The primary outcomes are:

- Reported taxable income relative to the threshold.
- Reported taxable income compared to previous period.

Income bunching is defined as reported income falling within a narrow interval immediately below the threshold.

4.2 Secondary Outcomes

Secondary outcomes include:

- Total tax liability reported.
- Filing timeliness.
- Subsequent compliance in later tax periods.

5 Empirical Strategy

Treatment effects are estimated using an intention-to-treat (ITT) framework, whereby taxpayers are analysed according to their original random assignment, regardless of actual exposure or engagement with the intervention. This approach preserves the validity of the randomisation and yields policy-relevant estimates of assignment effects.

Let i index taxpayers and t index tax periods. The baseline empirical specification is:

$$Y_{it} = \alpha + \beta_1 \text{Deterrence}_i + \beta_2 \text{Literacy}_i + \beta_3 \text{PeerNorm}_i + \gamma X_i + \varepsilon_{it},$$

where Y_{it} denotes the outcome of interest. Primary outcomes include an indicator for income bunching below the statutory tax threshold, as well as reported taxable income relative to the threshold. The variables Deterrence_i, Literacy_i, and PeerNorm_i are binary indicators for assignment to the deterrence, tax literacy, and localised peer norms treatment arms, respectively. Taxpayers assigned to the control group constitute the omitted category.

The vector X_i includes pre-treatment covariates such as baseline income, distance to the tax threshold, prior compliance history, sector, gender, and geographic location. Inclusion of these covariates is intended to improve estimation precision and does not affect the unbiasedness of the treatment effect estimates.

5.1 Inference

Standard errors will be clustered at the individual taxpayer level to account for serial correlation in outcomes across tax periods. Statistical inference will be conducted using two-sided hypothesis tests at conventional significance levels.

5.2 Multiple Hypothesis Testing

Given the presence of multiple treatment arms and outcome measures, adjustments for multiple hypothesis testing will be applied where appropriate. In particular, family-wise error rate or false discovery rate corrections will be used for related sets of outcomes and treatment comparisons, with the choice of adjustment method specified prior to analysis.

5.3 Dynamic and Persistence Analysis

To examine the persistence of treatment effects over time, the baseline specification will be extended by interacting treatment indicators with post-intervention period indicators:

$$Y_{it} = \alpha + \sum_k \beta_{1k} \left(\text{Deterrence}_i \times \mathbb{1}[t = k]\right) + \sum_k \beta_{2k} \left(\text{Literacy}_i \times \mathbb{1}[t = k]\right) + \sum_k \beta_{3k} \left(\text{PeerNorm}_i \times \mathbb{1}[t = k]\right) +$$

This specification allows treatment effects to vary across post-intervention periods and facilitates an assessment of whether behavioural responses persist or attenuate over time.

5.4 Heterogeneous Treatment Effects

Pre-specified heterogeneity analyses will be conducted by interacting treatment indicators with baseline characteristics, including prior enforcement exposure and distance to the tax threshold. These analyses are exploratory and intended to provide insight into potential mechanisms underlying behavioural responses.

6 Power Considerations

Sample size and minimum detectable effects are calculated based on historical administrative data on income reporting and bunching patterns. The study is powered to detect economically meaningful changes in bunching behaviour at conventional significance levels.

7 Data Sources

The analysis relies on administrative tax records maintained by the Ministry of Finance of Indonesia. All data are anonymised prior to analysis and accessed in secure environments.

8 Ethical Considerations

The intervention involves standard administrative communications and poses minimal risk to participants from the Public Relations Directorate DGT. The study complies with applicable data protection regulations and institutional ethical guidelines.

9 Deviations from the Pre-Analysis Plan

Any deviations from this pre-analysis plan will be transparently documented and justified in subsequent analyses or publications.

Appendix

Deterrence Letter Format


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Hai, NAMA WP
Isi SPT Sesuai Fakta, Pajak Anda Mendanai Fasilitas Publik di Seluruh Indonesia.
Panduan Lapor SPT
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