The Effects of Compliance Reminders on Tax Payments in Greece
Evidence from a Regression-Discontinuity Design

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Research Question

What motivates individuals to pay their taxes?

- **Deterrence**: Pr(audit), penalties; Allingham & Sandmo, 1972
  Do not explain taxpayer behavior fully; Alm et al., 1992
  Pr(tax debt collection enforcement); Paramonova, 2016

- **Voluntary Compliance**: information imperfections, intrinsic motivation, vertical and horizontal tax reciprocity, culture (Luttmer & Singhal, 2014)

Do behavioral strategies of information provision or does tax debt collection enforcement matter for compliance in a context of low tax morale?
Importance

Significant "tax gap"

- US: $450bn in 2006, 85.5% compliance
- UK: $48bn in 2013, 93.6% compliance
- Greece: $68bn in 2013 $\approx \frac{1}{5}$ of govt debt of $361bn (174.9% 2013 GDP), 75% compliance
Tax Debt Collection Enforcement in Greece in 2012

- €13.1bn of new tax debt (25% of total assessed taxes)
- Of this, only €1.4bn were collected (10.6% of new tax debt)
- Inadequate instruments for tax debt collection enforcement (IMF, 2013)

Figure: Outstanding Undisputed Tax Debt
Preview of Results

Effect of neutral information nudges on payments of overdue PIT

1. Reject with certainty a positive effect
2. Nudging can backfire under certain conditions
3. Tax Debt Collection Enforcement > Information Provision
4. Suggestive evidence that effects may persist over short time
5. Larger behavioral responses to more salient delivery devices
Behavioral Tax Compliance Literature

Pecuniary Factors
Perceived Audit Probability and Sanction Threats
  ▶ Positive effects: Slemrod et al., 2001; Kleven et al., 2011; Pomeranz, 2013; Castro & Scartascini, 2015;
  ▶ Null effects: Ariel, 2012; Chirico, et al. 2015; Doerrenberg & Schmitz, 2015

Non-pecuniary Factors
Moral Costs
  ▶ Positive effects: Hallsworth et al., 2014; Perez-Truglia & Troiano, 2016

Moral Suasion
  ▶ Positive effects: Dwenger et al., 2014; Hallsworth et al., 2014;
  ▶ Null effects: Blumenthal et al., 2001; Fellner et al., 2009; Doerrenberg & Schmitz, 2015;
  ▶ Negative Effects: Ariel, 2012

Information Provision
  ▶ Positive and Persistent Effects: Hallsworth et al., 2014; Perez-Truglia & Troiano, 2016
  ▶ Two-way but Ephemeral Effects: Guyton et al., 2016
Questions that Remain

Nature of Effects & Delivery Device

1. Context-specific findings or generalizable?
2. Under what conditions can neutral nudges of information provision reduce tax revenues?
3. One-shot interventions or policies with persistent effects?
4. Does the salience of the nudge influence its effectiveness?
Study Contributions

1. Neutral nudges of information provision cannot increase tax payments in a context of low tax morale

2. Information nudging may backfire in a context of weak tax debt collection enforcement

3. Suggestive evidence that effects may persist over short time

4. Behavioral response is increasing in the salience of the nudging technologies (phone call > email)
Setup

- 2-period economy following Snow and Warren (2007)
- Continuum of taxpayers $i$ with tax debt equal to 1, income $y_i$
- Taxpayer and tax agency discount rates are $R_i > 1$ and $R_g > 1$
- $k \in \{e, n\}$ states of the world of tax debt collection enforcement
- Tax agency observes, does not fully control objective $Pr(e) = p$
- Taxpayers form subjective beliefs $q_i \sim F(q_i)$ about $p$
- Tax agency can influence $q_i$ by this communication strategy $\alpha$ such that effective subjective beliefs given by $q_i^\alpha$, $\pi_i = \int_0^1 q_i^\alpha dF(q_i)$
- Communication strategy $\alpha \leq 1$, decreasing in salience of medium
- Payment decision $x_i$ based on mean prior expectation about $Pr(e)$

$$x_i(R_i, \pi_i) = \begin{cases} 0, & \text{full compliance} \\ 1, & \text{full non-compliance} \end{cases}$$ (1)

- Tax agency imposes financial penalty $\theta > 1$ to non-compliers
- Period one income $s_i$ is saved for period two.
The Taxpayer’s Problem - Period 1

\[
\max_{x_i^1, s_i \in [0,1]} \quad EU(x_i^1; s_i) = (1 - \pi_i) [u(y_i + x_i^1 - s_i) + R_i \cdot V(s_i, \pi^n_i)] + \pi_i \cdot [u(y_i - \theta x_i^1 - s_i) + R_i \cdot V(s_i, \pi^e_i)]
\]  

(2)

\[
\text{FOC}
\]

\[
\frac{\partial EU}{\partial x_i^1} = (1 - \pi_i) \cdot \frac{\partial u(c_i^n)}{\partial x_i^1} - \theta \cdot \pi_i \cdot \frac{\partial u(c_i^e)}{\partial x_i^1} = 0
\]

(3)

\[
\frac{\partial EU}{\partial s_i} = -(1 - \pi_i) \cdot \left[ \frac{\partial u(c_i^n)}{\partial s_i} - \delta \frac{\partial V(s, \pi^n)}{\partial s_i} \right] - \pi_i \cdot \left[ \frac{\partial u(c_i^e)}{\partial s_i} - \delta \frac{\partial V(s, \pi^e)}{\partial s_i} \right] = 0
\]

(4)
The Taxpayer’s Problem - Period 2

\[
\max_{x_i^2 \in [0,1], \pi_i^k \in [0,1]} V(x_i^2; \pi_i^k) = (1 - \pi_i^k) u((1 + r)s_i + x_i^2) + \pi_i^k u((1 + r)s_i - \theta \cdot x_i^2)
\]  

(5)

FOC

\[
\frac{\partial V}{\partial x_i^2} = (1 - \pi_i^k) \frac{\partial u(c_{i}^{kn})}{\partial x_i^2} - \pi_i^k \theta \frac{\partial u(c_{i}^{ke})}{\partial x_i^2} = 0
\]  

(6)

Theoretical Prediction:

- If \( k = n, p < \pi_i^k \) then Bayesian updating leads to tax revenue losses, inclusive of penalties.

Policy Implication:

- Reducing uncertainty about tax debt collection enforcement may enhance tax compliance.

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The Government’s Problem

\[ T(\theta, \alpha) = (1 - p)[1 - x_i^*] \cdot R_g + p \cdot \theta \cdot x_i^*(R_i, q_i^\alpha) \] (7)

\[ PW(\theta, \alpha) = -\{(1 - p)[1 - x_i^*(R_i, q_i^\alpha)] \cdot R_i + p \cdot \theta \cdot x_i^*(R_i, q_i^\alpha)\} \] (8)

\[ \max_{\theta > 1, \alpha \leq 1} SW(\theta, \alpha) = \psi \cdot T(\theta, \alpha) + (1 - \psi) \cdot PW(\theta, \alpha) \] (9)

where \( \psi \in [\frac{1}{2}, 1] \) is government preference for an extra tax dollar in its coffers to the taxpayer.

Policy Implications:

- Eliminate (preserve) information asymmetries about \( p \) when the government is indifferent or favors private welfare (tax revenues) over tax revenues (private welfare).
- Amplify \( \pi_i \) by \( \alpha < 1 \) only when \( k = e \).
Taxation in Greece

- $31.6bn of 2009 income went unreported by self-employed; Artavanis et al., *QJE*, 2016
- 10% income tax under-reporting; Matsaganis et al., 2010
- 2nd largest shadow economy in OECD; Schneider et al., 2008
- Ever-changing tax code; 2 PIT code changes in 2013
Eroding Trust in the National Government

Figure: Trust in Government, Greece 11/2003 - 05/2015; Eurobarometer

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2013 Tax Compliance Campaign in Greece

Targeted €1.039bn in PIT delinquencies by 517,943 individuals.

Neutral nudges of information provision by e-mail and phone call:
- Reminded about upcoming payment deadlines
- Warned about tax liens in the case of non-compliance
## Study Population

<table>
<thead>
<tr>
<th></th>
<th>Phone</th>
<th>Call</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-mail</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>40,159</td>
<td>1,340</td>
</tr>
<tr>
<td>1</td>
<td>472,132</td>
<td>4,312</td>
</tr>
<tr>
<td>Total</td>
<td>512,291</td>
<td>5,652</td>
</tr>
</tbody>
</table>

**Estimands:**

- Intensive Margin: Effect on Levels of Tax Payments
- Extensive Margin: Effect on Rate of Tax Payments
- Inverse Hyperbolic Sine Transformation of Outcome:
  
  $$g(Y_i) = \log(Y_i + (Y_i^2 + 1)^{0.5}) = sinh^{-1}(Y_i)$$

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Identification: OLS

- Tax delinquents who received a phone call reminder were selected by a tax repayment risk-analysis.

- Raw, unadjusted difference in group means: €1199.81 (per tax delinquent) / €6.279mil. (in total)

- Adjusted with controls difference in group means: €310.68 (per tax delinquent) / €1.626mil. (in total): NAIVE ESTIMATES

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Identification: Matching

In the presence of cross-overs, use matching:

**Figure:** Propensity Score Histograms by Treatment
Identification: Fuzzy-Regression Discontinuity Design

- Arbitrarily, tax agency contacted only those with tax liabilities greater or equal to €500, giving rise to a natural experiment.
- Exploit discontinuity in probability of treatment at cutoff conditional on debt level to instrument treatment assignment
- Identify local average treatment effect (LATE) of the compliance reminders on payments of overdue tax liabilities
- Inference comes from the complier population, taxpayers just above and below the €500 cutoff which are assumed to be exchangeable.
Adherence to the Treatment Assignment Rule

Only 0.004% with total income tax liabilities under €500 received a reminder phone call.

Figure: Histogram of Forcing Variable (Total Individual Income Tax Liabilities) by Treatment (Phone Call)
McCrary’s Density Test

Even over irrelevant to assignment rule regions, sharp increase in density just above €400 due to rounding.

Cattaneo et al., 2016

OVERSMOOTHED DENSITY
McCrary’s Density Test: Non-rounders Sample

Figure: McCrary’s Density Test of Manipulation of Forcing Variable - Non-rounders Sample

Smooth density in the absence of rounding.
Estimation: Fuzzy Regression Discontinuity

Local linear regression on both sides of cutoff using a triangular kernel. Following Imbens and Kalaynaraman (2009), the optimal bandwidth minimizes Mean Squared Error.

\[
\rho = \frac{\lim_{c \to 500^+} E[Y|X = c] - \lim_{c \to 500^-} E[Y|X = c]}{\lim_{c \to 500^+} P[D = 1|X = c] - \lim_{c \to 500^-} P[D = 1|X = c]}
\] (10)

Equivalent to a local linear IV model estimated via 2SLS

\[
D_i = \gamma_{00} + \gamma_{01}x_i + \gamma^*_0 T_i + \gamma^*_1 x_i T_i + \xi_{1i}
\] (11)

\[
g(Y_i) = \alpha + \beta_{01}x_i + \rho D_i + \beta^*_1 D_i x_i + \xi_{2i}
\] (12)
RD Estimates - Intensive Margin

Large (24%-41%) and significant (10%-5% levels) reduction in payments, robust to polynomial order.

![Graph showing payments vs. Total PIT Liability Margin to €500 Cutoff (in €) with sample average within bin and 2nd order global polynomial as trend line.]

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Distribution of LATEs over Range of Bandwidths

Figure: Incremental Effect of Phone Calls Relative to E-mails:
RD Estimates - Extensive Margin

Substantial (9%) drop in repayment rate, significance robust to pol. order.

Figure: Discontinuity in Average Repayment Rate
Heterogeneity Analysis of PIT by Debt Vintage

Table 19: 2SLS Estimates of Compliance Reminders’ LATEs on Payments of Total PIT Liabilities

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliance Reminder(s)</td>
<td>0.97</td>
<td>-28.05*</td>
</tr>
<tr>
<td></td>
<td>(4.39)</td>
<td>(16.23)</td>
</tr>
<tr>
<td>Debt Vintage</td>
<td>New</td>
<td>Old</td>
</tr>
<tr>
<td>Polynomial Order</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>11.67</td>
<td>250</td>
</tr>
<tr>
<td># Treated Observations</td>
<td>41</td>
<td>117</td>
</tr>
<tr>
<td>Observations</td>
<td>1,415</td>
<td>121,037</td>
</tr>
</tbody>
</table>

*** p < 0.01; ** p < 0.05; * p < 0.1.

Standard errors in parentheses, clustered at the zip code level.
Table: 2SLS Estimates of Compliance Reminders’ LATEs on Payments of Total PIT Liabilities

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1) Levels</th>
<th>(2) Per Cent</th>
<th>(3) Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Debtor</td>
<td>−49.62***</td>
<td>−0.13</td>
<td>−0.01</td>
</tr>
<tr>
<td></td>
<td>(15.58)</td>
<td>(0.24)</td>
<td>(0.03)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>2.34</td>
<td>0.03</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(17.41)</td>
<td>(0.30)</td>
<td>(0.03)</td>
</tr>
<tr>
<td>Self-Employed</td>
<td>10.69</td>
<td>0.17</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>(17.16)</td>
<td>(0.31)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>Distance to Cutoff</td>
<td>0.87*</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(0.49)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>Distance to Cutoff Squared</td>
<td>−0.05</td>
<td>−0.01</td>
<td>−0.01</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.01)</td>
<td>(0.01)</td>
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<tr>
<td>Age</td>
<td>1.85</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(2.13)</td>
<td>(0.03)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>Age Squared</td>
<td>−0.01</td>
<td>−0.01</td>
<td>−0.01</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>Male</td>
<td>18.32</td>
<td>0.34</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>(11.97)</td>
<td>(0.22)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>Bandwidth (in €)</td>
<td>10.90</td>
<td>21.38</td>
<td>35.12</td>
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<tr>
<td>Observations</td>
<td>703</td>
<td>1,277</td>
<td>2,106</td>
</tr>
</tbody>
</table>

*** p < 0.01; ** p < 0.05; * p < 0.1. SEs clustered at the zip code level.
Tax Policy Design

Latest Developments in Tax Debt Collection Enforcement:

- Current goal for 100k tax liens/month
- Up from 30k tax liens/month in Jul 2016
- Substantially higher than 17k tax liens/month in Jan 2014
Conclusions

- Neutral nudges of information provision via phone calls ill-advised in a context of low tax morale and weak tax collection enforcement.

- Effects may persist over short time.

- Salience of nudging technology matters but does not necessarily guarantee better outcomes for the tax agency.
Hellenic Republic
Ministry of Finance
General Directorate of Tax and Customs Affairs
General Directorate of Tax Audits and Public Revenues Collection
Tax Compliance Unit
1 Thessaloniki & Chandri
Moschato

Recipient: XXXXXX    Username: XXXXXXX

Dear Sir/Madame,

Following an inspection of the electronic records of the General Directorate of Information Systems of the Ministry of Finance on 10/26/2012, due, and potentially overdue, tax delinquencies were determined. Especially, for the cases of overdue tax delinquencies we urge you to settle your outstanding debt.

If you have a counterclaim against the State on this outstanding debt, you are required to submit the necessary application at your local Tax Clearing House.

Warning: With regards to the tax delinquencies that have become overdue, the supervisor of your local Tax Clearing House reserves the right to enforce collection using all provisions in the legislation including non-negotiable administrative and financial measures to protect the State’s interest.

Tax Compliance Unit Supervisor
Hara Mavridou

Note: Every electronic message we send you from the General Directorate of Information Systems, insofar it is not a response to one of yours, includes at the upper part your name and username. If you received a message suggesting it was sent from the General Directorate of Information Systems without the inclusion of this information and is not a reply to previous message of yours should be deleted since it is counterfeit and of possibly malicious content.

Figure: 2013 Compliance Reminder E-mail (translated from Greek by the author)
Non-normal Residuals

Figure: Evidence of Heteroskedasticity
Inverse Hyperbolic Sine Transformation

Figure: Normalized Residuals
Figure: Effect of Phone Call: Distribution of LATEs over a Range of Bandwidths
**Figure**: Test of Manipulation of Forcing Variable PIT Liability Level over [€483,€517] range
Figure: Combined Effect of E-mails and Phone Calls on PIT Payments: Distribution of LATEs over a Range of Bandwidths
Figure: Test of Manipulation of Forcing Variable PIT Liability Level over [€483, €517] range
Figure: Smooth Density over a Large Window of the Running Variable
**Figure:** Combined Effect of E-mails and Phone Calls on VAT Payments: Distribution of LATEs over a Range of Bandwidths
**Figure**: Test of Manipulation of Forcing Variable PIT Liability Level over [€446,€564] range
Figure: Incremental Effect of Phone Call relative to E-mail on VAT Payments: Distribution of LATEs over a Range of Bandwidths
Figure: Test of Manipulation of Forcing Variable PIT Liability Level over [€468,€532] range
Figure: Incremental Effect of Phone Call relative to E-mail on VAT Payments: Distribution of LATEs over a Range of Bandwidths
Figure: Test of Manipulation of Forcing Variable PIT Liability Level over [€468,€532] range
Table 19: 2SLS Estimates of Compliance Reminders’ LATEs on Payments of Total PIT Liabilities

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<tbody>
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<td></td>
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Standard errors in parentheses, clustered at the zip code level.
Cattaneo et al. (2016) Density Test

Novel local polynomial density estimation technique

▶ Avoids pre-binning of the data which improves size properties
▶ Allows for restrictions on other features of the model which improves power properties
▶ Chosen bandwidth minimizes the asymptotic MSE of the difference or sum (whichever smallest) of the density estimators

RD Manipulation Test Estimates:

▶ Conventional: \( T = -0.7752; P > |T| = 0.4382 \)
▶ Robust Bias-Corrected: \( T = 2.0162; P > |T| = 0.0438 \)
### E-mail and Phone Call Recipients

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Liabilities</td>
<td>516.50</td>
<td>7.64</td>
<td>503.69</td>
<td>528.81</td>
</tr>
<tr>
<td>Payments of Total Liabilities</td>
<td>346.57</td>
<td>243.74</td>
<td>0</td>
<td>528.81</td>
</tr>
<tr>
<td>Male</td>
<td>0.534</td>
<td>0.504</td>
<td>0</td>
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<tr>
<td>Age</td>
<td>43.9</td>
<td>9.5</td>
<td>20</td>
<td>63</td>
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<tr>
<td>Self-employed</td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Salaried</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Formerly Self-employed</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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### E-mail Recipients

<table>
<thead>
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<th>Standard Deviation</th>
<th>Min</th>
<th>Max</th>
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<tbody>
<tr>
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<td>499.32</td>
<td>18.42</td>
<td>468.02</td>
<td>531.99</td>
</tr>
<tr>
<td>Payments of Total Liabilities</td>
<td>185.03</td>
<td>221.24</td>
<td>0</td>
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<tr>
<td>Male</td>
<td>0.582</td>
<td>0.493</td>
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<td>1</td>
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<tr>
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<td>43</td>
<td>10.5</td>
<td>19</td>
<td>82</td>
</tr>
<tr>
<td>Self-employed</td>
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<td>0.233</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Salaried</td>
<td>0.0579</td>
<td>0.233</td>
<td>0</td>
<td>1</td>
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<tr>
<td>Formerly Self-employed</td>
<td>0.057</td>
<td>0.232</td>
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**Table:** Covariate Balance by Treatment at Optimal Bandwidth - Individual VAT
### E-mail and Phone Call Recipients

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
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<td>3.87</td>
<td>500</td>
<td>511.85</td>
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<td>Payments of Total Liabilities</td>
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<td>502.1</td>
</tr>
<tr>
<td>Male</td>
<td>0.72</td>
<td>0.453</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Age</td>
<td>55.8</td>
<td>19.4</td>
<td>22</td>
<td>96</td>
</tr>
<tr>
<td>Self-employed</td>
<td>0.116</td>
<td>0.324</td>
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<td>1</td>
</tr>
<tr>
<td>Salaried</td>
<td>0.883</td>
<td>0.324</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Formerly Self-employed</td>
<td>0.209</td>
<td>0.411</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

### E-mail Recipients

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Liabilities</td>
<td>499.80</td>
<td>6.74</td>
<td>488</td>
<td>512</td>
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<tr>
<td>Payments of Total Liabilities</td>
<td>120.75</td>
<td>168.15</td>
<td>0</td>
<td>511.96</td>
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<tr>
<td>Male</td>
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<td>0.434</td>
<td>0</td>
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<tr>
<td>Age</td>
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<td>17.2</td>
<td>18</td>
<td>108</td>
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<td>Self-employed</td>
<td>0.226</td>
<td>0.418</td>
<td>0</td>
<td>1</td>
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<tr>
<td>Salaried</td>
<td>0.773</td>
<td>0.418</td>
<td>0</td>
<td>1</td>
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<tr>
<td>Formerly Self-employed</td>
<td>0.155</td>
<td>0.362</td>
<td>0</td>
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</table>

**Table:** Covariate Balance by Treatment at Optimal Bandwidth
### E-mail and Phone Call Recipients

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Liabilities</td>
<td>553.06</td>
<td>37.42</td>
<td>420.31</td>
<td>588.05</td>
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<tr>
<td>Payments of Total Liabilities</td>
<td>404.18</td>
<td>244.82</td>
<td>0</td>
<td>588.05</td>
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<tr>
<td>Firm Age</td>
<td>15.7</td>
<td>22.9</td>
<td>1</td>
<td>50</td>
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### E-mail Recipients

<table>
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<tr>
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<th>Max</th>
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<tbody>
<tr>
<td>Total Liabilities</td>
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<td>10.94</td>
<td>15.16</td>
<td>0</td>
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</table>

**Table:** Covariate Balance by Treatment at Optimal Bandwidth - Corporate VAT
Figure: Likelihood of Becoming Delinquent Again
Raw difference of €180 in payments of tax liabilities up to €10,000 per €250 increment.
### Table: CEM Estimates of Effect of Combined Compliance Reminder on Payments of PIT

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
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<th>(5)</th>
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<tr>
<td>Combined Compliance Reminders</td>
<td>1.22**</td>
<td>1.85***</td>
<td>1.20***</td>
<td>0.85***</td>
<td>0.11***</td>
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<tr>
<td></td>
<td>(0.47)</td>
<td>(0.31)</td>
<td>(0.16)</td>
<td>(0.17)</td>
<td>(0.14)</td>
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<tr>
<td>Constant</td>
<td>3.239**</td>
<td>2.805***</td>
<td>2.42***</td>
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<td>3.54***</td>
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<td>(0.273)</td>
<td>(0.187)</td>
<td>(0.14)</td>
<td>(0.18)</td>
<td>(0.15)</td>
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<td>R-Squared</td>
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<td>0.051</td>
<td>0.05</td>
<td>0.04</td>
<td>0.00</td>
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<td>Pre-Matching Covariate Imbalance $L_1$</td>
<td>0.9593</td>
<td>0.9499</td>
<td>0.8024</td>
<td>0.8076</td>
<td>0.8326</td>
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<td>Post-Matching Covariate Imbalance $L_1$</td>
<td>0.2137</td>
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<td>0.5861</td>
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<td>Total Liability Range</td>
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<td>[600, 1000]</td>
<td>[1000, 2000]</td>
<td>[2000, 5000]</td>
<td>[5000, 10000]</td>
</tr>
<tr>
<td># of Matched Strata</td>
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<td>346</td>
<td>333</td>
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<tr>
<td># of Matched Treated Observations</td>
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<td>900</td>
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<td>389</td>
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<tr>
<td># of Matched Control Observations</td>
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<td>538</td>
<td>1441</td>
<td>955</td>
<td>332</td>
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<td>Observations</td>
<td>311</td>
<td>678</td>
<td>2,341</td>
<td>1,601</td>
<td>721</td>
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</tbody>
</table>

*** $p < 0.01; \ ** p < 0.05; * p < 0.1$. Standard errors in parentheses, clustered at zip code level.
Appendix

Figure: Universe of Tax Evasion Windows of Opportunity

Source: IMF

Tax Evasion Decision Tree

Declared

Immediate payment: Cash discount of 1.5%
Deferred payments: 3-7 monthly payments (interest free)
If No Payment

Non-payment: Prison for Tax Debt Above 5,000 Euros
Payment: Installment Scheme

0 Euros Due

Application for Audit Amnesty

Very low probability of being audited

Apply for Amnesty

Low probability of detection of non-declared tax liability

Interest (1 percent per month) and penalty are reduced by up to 80 percent

Immediate Payment Incentive: 5 Percent Discount
With Installment Scheme: up to 36 monthly payments
When Litigated: 50 Percent Due Immediately and 10 Year Extension on the Rest