Firm regulatory compliance and board oversight: Does sending reports to Colombian non-profit institutions work?

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Motivation

- In developing countries, the technical and enforcement capacity of oversight institutions is limited
- New technologies (e.g., data analytics resources, AI) may increase the technical capacities, but it is not clear whether this is sufficient also to improve enforcement
- We study the delivery of personalized reports to each supervised firm and answer two questions regarding the e-mail containing the report:
  - Does an informative framing increase compliance? And a deterrent framing?
  - Does sending the e-mail to the firm's board (with respect to the manager only) increase compliance?

Motivation (continued)

- It is not evident that tailored reports and e-mails work
  - Under weak enforcement, some firms may not react to information
  - Deterrence message can put them on alert, decreasing their compliance
- Collaborating with *SuperSolidaria* (the oversight institution for credit unions and cooperatives) allows us to identify "types" of firms based on their compliance history
- In terms of contributions...
  - Most studies explore tax compliance, whereas other regulatory compliance is less explored
  - Studies involving boards often explore their quality, independence, or composition. We study whether managers expect some enforcement from the board

What we do (and find)

- We study a specific regulatory compliance rule among credit unions and cooperatives: providing financial reports (on time)
- We take advantage of the personalized reports issued by the Data Analytics office at the *SuperSolidaria* (the oversight institution for these firms)
- We randomized the message carrying the report and the recipients
  - **Message:** informative, deterrent (alerts), and control
  - **Recipients:** manager or manager + board
- We find that messages improve reporting, especially when they are also sent to the board, but...
  - Among firms without board information, the deterrent message does not work

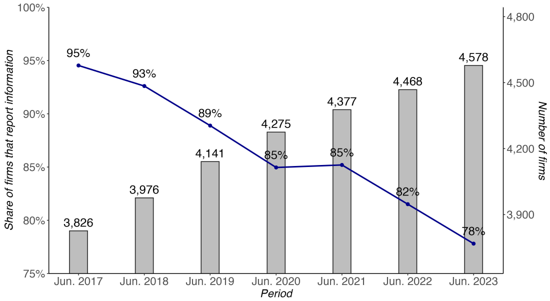
Roadmap:

1. Background and Study Design
2. Data and Empirical Specification
3. Results
4. Discussion

Context

- Solidarity economy in Colombia includes credit unions and cooperatives.
- Over 4,500 active firms as of 2024, providing financial services to $\sim$ 7.2 million members.
- The sector accounts for 2.2% of national revenues and holds 3.6% of Colombia's GDP in assets.
- Although these firms engage in financial intermediation, they are non-profit and member-owned organizations.

Reporting Rate and Number of Active Firms in the Solidarity Economy Sector (2017–2023)



Source: **Own elaboration based on administrative records from the Superintendence of the Solidarity Economy of Colombia.**

The Self-Enforcement Mechanism of Board Directors

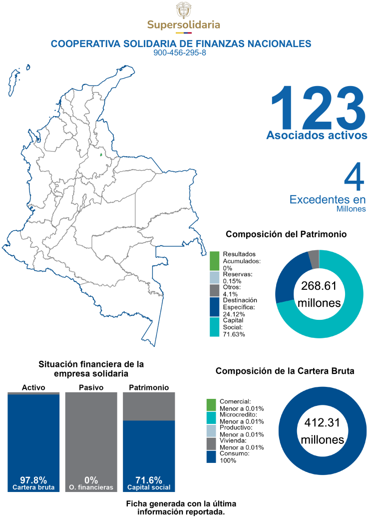
- In Colombia's cooperative sector, the Board of Directors is the permanent administrative body.
- Responsible for implementing strategic decisions from the General Assembly.
- Oversees key functions: policy setting, planning, financial supervision, and management oversight.
- Board members are elected by the cooperative's members and are directly accountable to them.
- This structure fosters a self-enforcing mechanism based on internal control and democratic accountability.

Experimental Design: Two-Level Randomization Across Firms

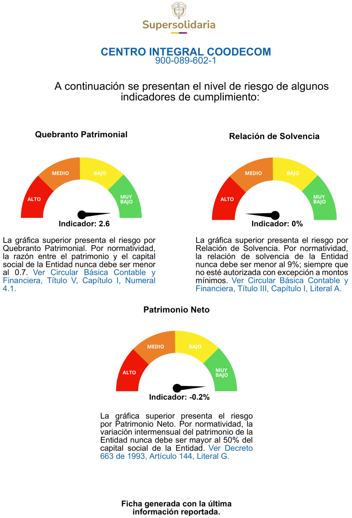
- Two-level randomization across 4,638 regulated firms.
- All treated firms received one of two emails:
  - **Information Mail**: Financial performance report with benchmarking.
  - **Deterrence Mail**: Risk checklist with early warning indicators.
- **Group 1 (3,309 firms)**: Only manager contact available.
  - Randomized into: Information, Deterrence, or Control (no email).
- **Group 2 (1,329 firms)**: Manager and Board contact available.
  - Randomized by message type and recipient:
    - Information to Manager
    - Deterrence to Manager
    - Information to Manager and Board
    - Deterrence to Manager and Board

Experimental Design: Email Content by Treatment Arm

(a) Informative



(b) Deterrence



Experimental Design: Mail Notification to Manager


Conozca estadísticas de su entidad: [redacted] - Superintendencia de Economía Solidaria. Recibidos ×

para mí

Estimado(a) [redacted],

En la Superintendencia de la Economía Solidaria, hemos creado el Grupo de Analítica de Datos y uno de sus propósitos es compartir información relevante para su entidad. A continuación, presentamos un **reporte** con el estado de algunos indicadores financieros y de gestión para su entidad. Pueden acceder al reporte haciendo click aquí.

Supersolidaria

[redacted]

A continuación se presentan el nivel de riesgo de algunos indicadores de cumplimiento:

Quebranto Patrimonial

Relación de Solvencia

Experimental Design: Baseline randomization checks

	BD Contact		No BD Contact		With BD Contact			
	No (1)	Yes (2)	Information (3)	Deterrence (4)	Information to Manager (5)	Deterrence to Manager (6)	Information to Manager and BD (7)	Deterrence to Manager and BD (8)
Panel A: Number of Regulatory Alerts.								
Prudential Alerts	2.277	-1.783***	2.249	0.056	0.458	0.06	0	0.083
	(0.051)	(0.067)	(0.071)	(0.102)	(0.081)	(0.123)	(0.121)	(0.12)
Governance Warnings	155.312	-48.788***	160.845	-11.07	112.877	-12.816	-8.09	-4.51
	(3.826)	(6.252)	(5.681)	(7.651)	(13.31)	(15.848)	(15.63)	(15.84)
Financial Risk Alerts	30.675	51.555	32.156	-2.964	223.783	-207.696	-162.181	-196.174
	(6.227)	(49.345)	(8.277)	(12.457)	(193.464)	(193.467)	(195.939)	(193.511)
Panel B: Firm size.								
N. Employees (Log)	1.518	0.329***	1.516	0.003	1.813	-0.125	0.093	0.166*
	(0.019)	(0.039)	(0.027)	(0.038)	(0.067)	(0.091)	(0.098)	(0.099)
N. Associates (Log)	5.343	0.119**	5.401	-0.116*	5.429	-0.055	0.081	0.108
	(0.031)	(0.059)	(0.044)	(0.063)	(0.1)	(0.14)	(0.144)	(0.142)
Total Assets (log)	20.734	0.376***	20.784	-0.099	21.025	-0.096	0.278	0.16
	(0.043)	(0.077)	(0.06)	(0.087)	(0.133)	(0.181)	(0.18)	(0.189)
Equity Value (Log)	18.696	0.857***	18.925	-0.458*	19.334	-0.25	0.874*	0.25
	(0.124)	(0.226)	(0.164)	(0.249)	(0.4)	(0.581)	(0.499)	(0.549)
Gross Income (log)	18.628	0.581***	18.643	-0.029	19.115	-0.394	0.521	0.25
	(0.087)	(0.164)	(0.122)	(0.173)	(0.286)	(0.418)	(0.381)	(0.395)
Panel C: Report Information Compliance.								
Reported in Dec 2023	0.762	0.048***	0.764	-0.003	0.798	0.003	0.036	0.01
	(0.007)	(0.013)	(0.01)	(0.015)	(0.022)	(0.031)	(0.03)	(0.031)
Share of Missed	0.172	-0.032***	0.172	0	0.156	-0.007	-0.038*	-0.019
Reports (2019-2023)	(0.005)	(0.009)	(0.008)	(0.011)	(0.016)	(0.023)	(0.021)	(0.022)
Number of firms	3,309	1,329	1,655	1,654	332	332	332	333

Notes: This table reports the results of the balance test across treatment groups at baseline. Each row shows a regression of the pretreatment variable in question on treatment dummies and a constant term. The constant term captures the value for the control group. Panel **(A)** presents the number of regulatory alerts issued by the Superintendency, categorized as Prudential Alerts, Governance Warnings, and Financial Risk Alerts. Panel **(B)** reports firm size characteristics, including the (log) number of employees and associates, as well as the (log) values of total assets, equity, and gross income. All monetary variables are expressed in 2024 USD. Panel **(C)** presents compliance indicators for information reporting: whether the entity submitted data in December 2023, and the share of reporting periods missed between 2019 and

Roadmap:

Data

- **Data sources**:
  - Administrative records from the Superintendence of the Solidarity Economy (2019–2024).
  - Firm-level financial statements, compliance reports, and contact directories.
- **Key variables**:
  - *Reporting Compliance*: Binary indicator for whether the firm submitted required reports.
  - *Asset Variation*: Change in reported assets before and after intervention.
  - *Reporting Consistency*: Share of unchanged account values across periods (proxy for reporting errors).

Empirical Strategy

- **Main specification (ITT)**: Two-way fixed effects model:

$$\text{Reporting}_{it} = \alpha_i + \lambda_t + \sum_j \phi_j \cdot \text{Treatment}_i^{(j)} \times \text{Post}_t + \epsilon_{it}$$

  - Outcome: Binary indicator for compliance with reporting duties.
  - Includes firm (α_i) and year (λ_t) fixed effects.

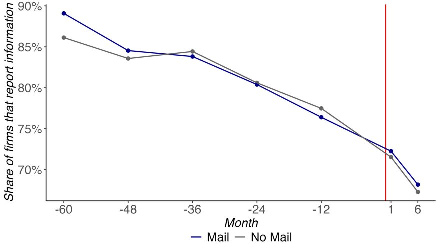
- **Instrumental variable strategy (LATE)**:
  - Uses actual *email opening* as an instrument for message exposure.
  - Estimates causal effect for *compliers*:

$$\text{Reporting}_{it} = \alpha_i + \lambda_t + \sum_j \phi_j^{LATE} \cdot \widehat{\text{Treatment}_i^{(j)}} \times \text{Post}_t + \nu_{it}$$

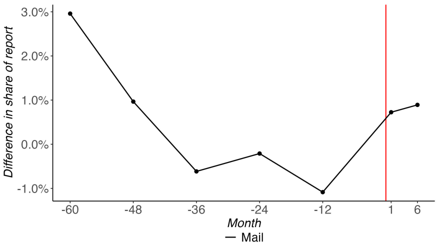
Roadmap:

Reporting Compliance Over Time Among Firms Without Board Contact Information

(a) Share of reports by treatment



(b) Reporting differences across groups



Notes: This figure shows reporting compliance trends among the 3,309 firms without board contact information. The outcome reflects the share of firms that submitted required reports each year. Panel **(a)** compares firms assigned to receive any email notification (pooled Information and Deterrence treatments) against those in the control group. Panel **(b)** displays percentage point differences between treatment and control groups.

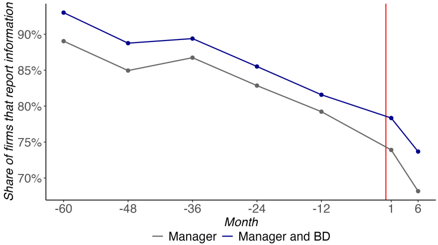
Effect of Notification to Manager on Compliance with Information Reporting:

	ITT		*LATE*	
	(1)	(2)	(3)	(4)
Mail x Post	0.009		0.070***	
	(0.011)		(0.025)	
Information x Post		0.012		0.087***
		(0.012)		(0.025)
Deterrence x Post		-0.004		0.041
		(0.016)		(0.029)
Dependent variable (share)	0.82	0.82	0.82	0.82
Observations	22,242	22,242	22,242	22,242
Number of firms	3,309	3,309	3,309	3,309
Firm F.E.	✓	✓	✓	✓
Month F.E.	✓	✓	✓	✓

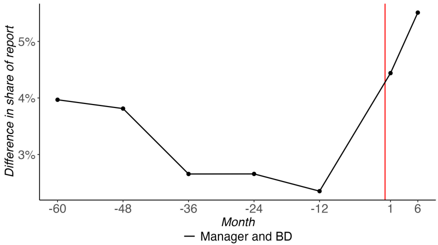
Notes: The dependent variable is a binary indicator equal to 1 if the firm submitted its information in a given period, and 0 otherwise. Columns (1) and (2) show Intention-to-Treat (ITT) estimates based on treatment assignment. Columns (3) and (4) show Local Average Treatment Effects (LATE) using email opening as an instrument. Robust standard errors, clustered at the firm level, are shown in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

Reporting Compliance Over Time Among Firms With Board Contact Information

(a) Share of reports by treatment



(b) Reporting differences across groups



Notes: This figure shows average reporting behavior over time for the sample of 1,329 firms with contact information for board directors. Panel **(a)** compares compliance rates between firms that received email notifications directed only to the Manager with those in which the message was sent to both the Manager and the Board of Directors (pooled across message types). Panel **(b)** shows the difference in reporting rates between mail to manager and the board of directors group and the manager group. The vertical axis represents the proportion of firms reporting information in each period.

Effect of Notification to Manager and BD on Compliance with Information Reporting:

	ITT		*LATE*	
	(1)	(2)	(3)	(4)
Manager and BD x Post	0.016		0.066***	
	(0.016)		(0.022)	
Deterrence to Manager x Post		-0.009		0.084**
		(0.024)		(0.038)
Information to Manager and BD x Post		0.015		0.107***
		(0.022)		(0.036)
Deterrence to Manager and BD x Post		0.009		0.108***
		(0.023)		(0.037)
Dependent variable (share)	0.86	0.86	0.86	0.86
Observations	8,866	8,866	8,866	8,866
Number of firms	1,328	1,328	1,328	1,328
Firm F.E.	✓	✓	✓	✓
Month F.E.	✓	✓	✓	✓

Notes: The dependent variable is a binary indicator equal to 1 if the firm submitted its information in a given period, and 0 otherwise. Columns (1) and (2) show Intention-to-Treat (ITT) estimates based on treatment assignment. Columns (3) and (4) show Local Average Treatment Effects (LATE) using email opening as an instrument. Robust standard errors, clustered at the firm level, are shown in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

Secondary Outcomes: Asset Levels and Reporting Quality

- Opening the email led to a 53–66 pp increase in reported assets, with larger effects for Information messages (LATE estimates). See Full Table
- Email exposure also reduced unchanged account values by 3–4 pp, improving the consistency of reported data. See Full Table
- Effects were stronger for Information mails than Deterrence mails across both outcomes.

Heterogeneous Effects of Notifications to Manager

	(1)	(2)	(3)	(4)
Mail	0.078**	0.063**	0.051*	0.083***
	(0.034)	(0.027)	(0.027)	(0.025)
Mail x Historical Report Complier	-0.008			
	(0.027)			
Mail x Structural Warnings		0.012		
		(0.020)		
Mail x Large Staff			0.065***	
			(0.019)	
Mail x Required				-0.081**
				(0.032)
Dependent variable (share)	0.82	0.82	0.82	0.82
Observations	22,242	22,242	22,242	22,242
Number of firms	3,309	3,309	3,309	3,309
Firm F.E.	✓	✓	✓	✓
Month F.E.	✓	✓	✓	✓

Notes: Historical Report Complier is equal to 1 if the firm submitted reports in at least 50% of required periods over the past five years. *Structural Warnings* is equal to 1 if the firm had at least one structural financial warning prior to the intervention. *Large Staff* is equal to 1 if the firm is at or above the 70th percentile in the distribution of reported employees. *Required* is equal to 1 if the firm had previously been formally required to report by the Superintendence. Robust standard errors, clustered at the firm level, are shown in parentheses. *** $p<0.01$; ** $p<0.05$; * $p<0.1$.

Heterogeneous Effects of Notifications to Manager and BD

	(1)	(2)	(3)	(4)
Manager and BD	0.030	0.064***	0.011	0.066***
	(0.052)	(0.023)	(0.027)	(0.022)
Manager and BD × Historical Report Complier	0.036			
	(0.049)			
Manager and BD × Structural Warnings		0.012		
		(0.038)		
Manager and BD × Large Staff			0.130***	
			(0.022)	
Manager and BD × Required				-0.020
				(0.063)
Dependent variable (share)	0.86	0.86	0.86	0.86
Observations	8,866	8,866	8,866	8,866
Number of firms	1,328	1,328	1,328	1,328
Firm F.E.	✓	✓	✓	✓
Month F.E.	✓	✓	✓	✓

Notes: Historical Report Complier is equal to 1 if the firm submitted reports in at least 50% of required periods over the past five years. *Structural Warnings* is equal to 1 if the firm had at least one structural financial warning prior to the intervention. *Large Staff* is equal to 1 if the firm is at or above the 70th percentile in the distribution of reported employees. *Required* is equal to 1 if the firm had previously been formally required to report by the Superintendence. Robust standard errors, clustered at the firm level, are shown in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

Discussion and Policy Implications

- Email notifications improved reporting compliance by **5–8 percentage points**, relative to a baseline of 82%.
- **Information messages** were more effective than deterrence-based ones—especially in improving data quality.
- **Board involvement amplified compliance**: effects were stronger when emails reached both the manager and board.
- Larger firms reacted more positively, while those with **formal reporting requirements** were less responsive.
- No significant heterogeneity by **historical compliance** or **financial warnings**.

Thanks!