One-Stop Licensing, Integrated Registers, and Social Security Compliance: Evidence from Indonesian Manufacturers

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Abstract:

Indonesia implemented a major regulatory reform in 2018 through the Online Single Submission (OSS)–Business Identification Number (NIB) system, which introduced a unified business identification number and, crucially, integrated business licensing with social-security administration. Before the reform, firms had to obtain business permits and register workers for social security through separate bureaucratic processes. Under the OSS–NIB system, business registration automatically triggers social-security enrolment, creating a digital link between licensing authorities and the social-security agency. By integrating these systems, the reform reduced firms' ability to remain "invisible" to regulators and increased the expected cost of noncompliance. Using a difference-in-differences and event-study design with firm-level data from Statistics Indonesia's Large and Medium Manufacturing Survey (2014–2021; 172,246 firm observations), this study evaluates whether the OSS–NIB reform improved firms' compliance with social-security mandates. The analysis compares large and medium firms, which differ in their regulatory visibility, and measures compliance through workers' social-security coverage. The results show that the reform significantly increased coverage among large firms relative to medium ones, consistent with a data-integration and monitoring mechanism that strengthened enforcement credibility. Event-study estimates support the parallel-trends assumption, while results on the log of social security expenditure per worker are interpreted descriptively given weaker pre-trend validity. The findings provide the first systematic evidence, particularly from a developing-country context, that digital administrative integration can enhance regulatory enforcement and expand worker protection.

1. Introduction

Indonesia's 2018 reform under Government Regulation No. 24/2018 established the Online Single Submission (OSS) system and introduced the Business Identification Number (NIB) as a unified business identity. Before this reform, business licensing and social-security registration operated separately, requiring firms to manually register with the national social-security agencies, BPJS Ketenagakerjaan (employment protection) and BPJS Kesehatan (health insurance), even after obtaining business permits. While the regulation primarily governs business licensing, it also enabled data integration across government systems. In practice, when a firm registers for a Business Identification Number (NIB) through the OSS platform, its legal and administrative information becomes automatically linked to other government databases, including the social-security institutions. This integration enhances regulatory visibility by allowing authorities to identify registered firms, although employers must still take the additional step of enrolling their workers to activate coverage.

The aim of this paper is to evaluate the impact of integrating business licensing with social security administration on firm-level social security outcomes. Specifically, we examine the reform's effect on firms' compliance in registering workers for social security which is our primary outcome and additionally assess whether the reform influence social security expenditure per worker, as a complementary measure of contribution intensity. Research on social security compliance in developing countries has largely focused on factors such as distance to labour inspection offices, the number of inspectors, and tax incentives (Almeida and Carneiro, 2012; Li et al., 2020; Ronconi, 2019), while the role of administrative integration and digitalization of business licensing as an enforcement tool remains largely unexplored.

To estimate the causal impact of the OSS–NIB reform on firms' social-security compliance, we implement a difference-in-differences design complemented by an event-study specification to assess dynamic treatment effects and pre-trend validity. Our identification strategy exploits variation in the reform's effective exposure: although the OSS–NIB system formally applied to all firms, larger establishments became more traceable across administrative databases, while smaller firms often remained less visible in practice. We therefore treat large firms as the "exposed" group and medium firms as the "less exposed" control group, consistent with evidence that compliance tends to be higher among larger firms because they are more visible to auditors and regulators (Kleven et al., 2016; Pomeranz, 2015). The analysis draws on firm-level data from Statistics Indonesia's Large and Medium Manufacturing Survey (IBS Survey), an annual census of registered manufacturing establishments covering year 2014–2021, yielding 172,246 firm observations.

This paper makes three contributions. First, it provides, to our knowledge, the first systematic evidence, particularly from a developing-country context, on whether an administrative integration and digital business-licensing reform can strengthen enforcement capacity and improve compliance with labour-market regulations, specifically firms' participation in social-security programs. Second, it leverages a nationally representative firm-level data from Indonesia's formal manufacturing sector, enabling analysis of compliance dynamics that have been largely absent in prior research. Third, it applies a modern difference-in-differences and event-study framework to a setting where existing studies are primarily descriptive, allowing a cleaner causal interpretation of regulatory enforcement effects.

Our main findings are twofold. First, the OSS–NIB reform significantly increased firms' compliance with social security mandates: large, more visible firms were more likely to enrol their workers in social security following the integration of business licensing and social-security systems, and event-study estimates support the validity of parallel pre-trends for this coverage effect. Second, changes in log of social security expenditure per worker are less clear: although expenditure rose descriptively for both large and medium firms following the reform, event-study results do not show a robust post-reform increase among treated firms because pre-trends are not well satisfied.

Beyond the average effect, we find meaningful heterogeneity in the policy's impact across firm types. The effect is stronger among firms with a higher share of female workers and production intensity, suggesting that the compliance response was particularly pronounced among gender-diverse and more labour-intensive establishments. In addition, domestically owned and non-exporting firms experienced larger compliance gains, consistent with the idea that the OSS–NIB reform primarily enhanced enforcement among firms that were previously less visible to international monitoring and reporting standards.

This paper contributes to the literature in labour economics, development economics, and labour-market policy on the enforcement of social-security compliance. First, we provide novel

causal evidence from a developing-country setting that an administrative data-integration reform can strengthen enforcement capacity and increase firms' registration of workers under social-insurance mandates. This study builds on and moves beyond prior evidence that attributes compliance improvements mainly to inspection or tax-policy design rather than administrative integration. Using Brazilian data, Almeida and Carneiro (2012) show that scaling up labour inspections raises formal employment and reduces informality without lowering total employment, while Ronconi (2010) finds similar effects of adding inspectors in Argentina. Cross-country evidence from Kanbur and Ronconi (2018) further shows that once enforcement capacity (inspectors, penalties, judicial credibility) is accounted for, the conventional claim that "strict regulation harms labour markets" weakens or reverses. Complementing these monitoring-based insights, firm-level evidence from China (Li et al., 2020) shows that higher social-security contribution rates raise evasion, whereas higher corporate income-tax (CIT) rates reduce it, implying that CIT design can indirectly curb social-security evasion.

Second, this paper extends insights from the public finance literature on "visibility effects," where third-party reporting and administrative data integration can dramatically raise compliance. Kleven et al. (2011) and Kleven et al. (2016) show that tax compliance in Denmark is near universal when self-reported income can be cross-checked against third-party records from employers and financial institutions, but evasion persists where such verification is not possible. Likewise, Pomeranz (2015) finds in Chile that verifiable business-to-business (B2B) receipts generate paper-trail effects that deter cheating and propagate compliance along supply chains. These studies highlight that visibility through cross-checking is a powerful enforcement mechanism. In the same vein, Indonesia's OSS–NIB reform creates an analogous system by linking business-licensing data (NIB) with social-security registration, enabling regulators to verify whether registered firms have enrolled their workers in the national social-security programs.

Finally, we situate our study within the Indonesian social-security literature, which to date has concentrated on program architecture, institutional development, and participation dynamics, with limited attention to the causal labour-market effects of data-integration reforms. Prior work is chiefly (i) historical–institutional, mapping the layered policy shifts from Indonesia's corporatist schemes for civil servants and military personnel (*TASPEN* and *ASABRI*) and health insurance (*ASKES*), through the semi-privatized *Jamsostek* program for private-sector workers, to the unified *SJSN/BPJS* social-security framework established in the 2010s (Murphy, 2019; Suryahadi et al., 2014), and (ii) participation-oriented, focusing on diagnosing persistently low social-security take-up and the institutional bottlenecks that hinder it, such as limited public awareness, weak enforcement capacity, poor agent performance, and overlapping regulations (Novita et al., 2020; Asher and Bali, 2015; Suryahadi et al., 2014; ILO, 2017) or documenting a pronounced formal–informal divide in social-security coverage, whereby workers with lower income and education, residing in rural areas, and employed in services sectors exhibit the lowest probability of labour social-security membership (Ngadi et al, 2025). A related strand of research examines behavioural nudges for compliance at the firm level, using light-touch randomized controlled trials (Behavioural Insights Team, 2019) that send email or legal-risk reminders to employers as prompts for compliance, rather than addressing the underlying "regulatory plumbing" of enforcement systems.

The remainder of the paper is organized as follows. Section 2 provides institutional setting on Indonesia's social security system evolution. Section 3 describes the firm-level data, construction of key variables, and the empirical strategy, detailing the difference-in-differences design. Section 4 presents the main regression results and explores heterogeneity in compliance

responses across firm characteristics. Section 5 examines the policy mechanism underlying the observed effects. Section 6 concludes and discusses directions for future research.

2. Institutional Setting — Evolution of Social Security for Workers in Indonesia

Indonesia's worker social security system has gradually evolved from a fragmented, occupation-based arrangement toward a more integrated and universal framework. In the early decades, coverage was limited to civil servants and military personnel through Taspen (established in 1963) and Asabri (1971), while private-sector employees remained largely excluded. During the New Order period, Government Regulation Number 33 Year 1977 introduced ASTEK, mandating registration for private formal workers, later expanded under Law Number 3 Year 1992 (Jamsostek) to include health insurance alongside existing employment-based benefits.

The vulnerabilities revealed by the 1997–98 Asian Financial Crisis renewed pressure for a more comprehensive and resilient social protection system. Parliament responded with Law Number 40 of 2004 establishing the *National Social Security System* (*Sistem Jaminan Sosial Nasional*, SJSN), which laid the foundation for universal employment-based and health-insurance coverage and provided the legal basis for an integrated framework. The reform created two implementing agencies: BPJS Ketenagakerjaan, administering employment-based protection programs covering work injury (JKK), death (JKM), old-age savings (JHT), pension (JP), and, since 2022, unemployment benefits (JKP), and BPJS Kesehatan, which manages the national health insurance scheme. Together, these institutions consolidated earlier employment and health insurance schemes into a unified system that extends coverage to both formal workers, who are enrolled by their employers, and informal workers, who self-enroll on a voluntary basis.

Despite these institutional advances, effective participation in social-security programs has remained low, only around 14–15 percent of the labour force actively registered, reflecting persistent administrative constraints and weak enforcement capacity (Asher and Bali, 2015; ILO, 2017). Consistent with these findings, Suryahadi et al. (2014) highlights the large gap between legal entitlements and actual coverage, driven by limited institutional capacity, weak inter-agency coordination, and low enrolment among informal workers. This pattern mirrors broader evidence from developing economies, where legal mandates alone often fail to secure compliance amid high informality and fragmented administration (Holzmann and Hinz, 2005; Levy, 2008; Aterido et al., 2011). In response to persistent gaps in compliance and coverage, the 2018 Online Single Submission (OSS) reform adopted an enforcement-oriented approach that linked the Business Identification Number (NIB) with social-security registration, thereby integrating business licensing with labour administration and enhancing regulatory oversight.

3. Data and Methodology

3.1. Data and Sample Construction

This study draws on firm-level data from Statistics Indonesia's *Large and Medium Manufacturing Survey (IBS)*, an annual establishment survey of registered medium- and large-scale manufacturers. Establishments are classified as medium-sized if they employ 20–99 workers and as large if they employ 100 or more workers, following Statistics Indonesia's official definitions (Badan Pusat Statistik, 2019).

The sampling frame is constructed from Statistics Indonesia's manufacturing enterprise directory (DPA), which is updated each year by linking (i) prior IBS waves, (ii) administrative

registers from line ministries and agencies, notably the Ministry of Industry's industrial licensing registry, the Ministry of Finance's tax register, and BPJS Ketenagakerjaan's social security participant records, together with local government licensing data, and (iii) targeted field verification. We analyze the 2014, 2015, 2017, 2018, 2019, and 2021 survey waves; the 2016 and 2020 waves are unavailable due to changes in survey coverage and public release. After harmonization, each cross-section contains approximately 24,000–30,000 firm-year observations.

The initial dataset contains 175,314 firm-year observations. Of these, 114,243 correspond to medium-sized firms (20–99 workers) and 58,003 to large firms (≥100 workers). For the main analysis, we restrict the sample to 172,246 firm-year observations by excluding around 3,000 observations from small-sized firms (fewer than 20 workers), which represent only a very small share of the dataset. These very small firms differ systematically from medium and large firms in terms of regulatory exposure, informality, and monitoring probability. Because our identification strategy contrasts large firms (treated) with medium firms (control), retaining micro-sized firms could confound comparisons due to their distinct compliance behaviour and limited relevance to the OSS–NIB enforcement framework. Nevertheless, robustness checks using the full sample (including micro-sized firms) indicate that the results remain similar.

3.2. Outcome Variables

Social security coverage is the main outcome variable, defined as a dummy equal to one if a firm reports positive expenditure on social security contributions for its workers and zero otherwise. Firms licensed under the OSS–NIB system are automatically registered in the social security database, but the survey data record only whether they actually contributed to social security. This measure therefore reflects actual provision or effective compliance, capturing whether firms have followed through with registration by contributing to social security on behalf of their workers. Table 1 shows that prior to the reform, large firms were substantially more likely to provide social security coverage than medium-size firms (0.608 vs. 0.421), reflecting well-known size-based gaps in compliance. Following the reform, coverage increased among both groups, but the improvement is markedly stronger for large firms, widening the compliance gap to 0.881 versus 0.677 in the post-policy period.

Second outcome is *Log of social security expenditure per worker*, defined as the logarithm of total social security expenditures by firm divided by the number of paid employees. This variable reflects the depth of firms' engagement with the social security system, conditional on participation. Prior to 2019, the survey aggregated pension, employment-related, and health contributions, while from 2019 onward these components were reported separately. For comparability, we aggregate all components into a single measure of social security expenditure across years. Table 1 shows that large firms consistently spend more on social security per worker than medium-sized firms, both groups exhibit higher expenditure after the reform. The rise is slightly larger among medium-size firms (7.014 to 7.626) relative to large firms (7.400 to 7.952), suggesting some degree of catch-up in contribution intensity despite continued levels gaps.

3.3. Control Variables

The analysis includes several firm-level characteristics that may influence compliance outcomes: the shares of female, production, and unpaid workers, as well as binary indicators for foreign ownership and export activity. Table 1 shows that large and medium-sized firms differ in several observable characteristics that may shape compliance outcomes. Medium-sized firms employ a slightly higher share of female workers than large firms in both periods (0.416 vs. 0.387 pre-policy; 0.393 vs. 0.377 post-policy). Differences in the share of production

workers are relatively small across the two groups, suggesting broadly similar employment structures in terms of production intensity. The share of unpaid workers remains low for both groups but is marginally higher among medium-sized firms, indicating modest yet persistent differences in informality. In contrast, large firms exhibit a consistently higher incidence of foreign ownership than medium-sized firms, with about 18–20 percent of large firms receiving foreign investment compared with roughly 4–5 percent of medium firms. A similar pattern holds for export activity: around 15–18 percent of large firms engage in export markets, whereas only about 5 percent of medium-sized firms do so. These gaps are evident both before and after the reform, reflecting large firms' stronger integration into global markets and greater regulatory visibility. All regressions include these firm-level controls, along with year and industry fixed effects (at the two-digit manufacturing subsector level), to absorb macroeconomic shocks and sector-specific heterogeneity.

Table 1. Summary Statistics by Firm Size and Policy Period

Variable	Definition	Pre-policy		Post-policy	
		Medium	Large	Medium	Large
Dependent variables:					
Sos_security_coverage	=1 if firm reports positive social security expenditure on worker, and 0 otherwise.	.421	.608	.677	.881
Log_sos_security_expenditure_perworker	Log of total social security expenditure divided by the number of workers.	7.014 (1.44)	7.400 (1.39)	7.626 (1.25)	7.952 (1.12)
Independent variables:					
Female_proportion	Proportion of female workers as a share of total paid employment.	.416 (0.28)	.387 (0.28)	.393 (0.26)	.377 (0.26)
Production_proportion	Proportion of production workers as a share of total paid employment.	.853 (0.15)	.823 (0.16)	.847 (0.15)	.831 (0.15)
Unpaid_proportion	Proportion of unpaid workers as a share of total paid employment.	.022 (0.04)	.001 (0.01)	.016 (0.03)	.002 (0.00)
Foreign_investment	=1 if the firm reports any foreign ownership or investment, and 0 otherwise.	.046	.206	.049	.183
Export	=1 if the firm reports exporting activity, and 0 otherwise.	.05	.18	.052	.151
Sector	=1 if in subsector Food Industry	.252	.202	.24	.201
	=2 if in subsector Beverage Industry	.017	.018	.02	.021
	=3 if in Tobacco Processing Industry	.029	.032	.017	.025
	=4 if in Textile Industry	.096	.089	.074	.077
	=5 if in Apparel Industry	.088	.089	.078	.079
	=6 if in Leather, Leather Goods, and Footwear Industry	.027	.031	.026	.032
	=7 if in Wood, Cork, and Bamboo Products Industry (excluding Furniture) and Woven Products from Bamboo, Rattan, and Similar Materials	.045	.047	.04	.045
	=8 if in Paper and Paper Products Industry	.018	.027	.023	.03
	=9 if in Printing and Reproduction of Recorded Media Industry	.03	.015	.037	.014
	=10 if in Petroleum and Coal Products Industry	.004	.003	.004	.004
	=11 if in Chemicals and Chemical Products Industry	.041	.046	.051	.053
	=12 if in Pharmaceutical, Chemical, and Traditional Medicine Products Industry	.008	.016	.008	.018
	=13 if in Rubber and Plastics Products Industry	.064	.098	.073	.101
	=14 if in Non-Metallic Mineral Products Industry	.074	.039	.07	.038
	=15 if in Basic Metal Industry	.012	.021	.014	.025
	=16 if in Fabricated Metal Products, Machinery, and Equipment Industry	.042	.04	.053	.041
	=17 if in Computer, Electronic, and Optical Products Industry	.01	.024	.008	.019
	=18 if in Electrical Equipment Industry	.011	.023	.015	.026
	=19 if in Machinery and Equipment Industry	.019	.017	.025	.02

	=20 if in Motor Vehicles, Trailers, and Semi-Trailers Industry	.014	.025	.018	.038
	=21 if in Other Transport Equipment Industry	.013	.019	.014	.019
	=22 if in Furniture Industry	.057	.047	.053	.041
	=23 if in Other Manufacturing Industry	.025	.026	.027	.029
	=24 if in Repair and Installation of Machinery and Equipment Industry	.008	.005	.012	.006
Year	=1 if year 2014	.293	.284	0	0
	=2 if year 2015	.318	.298	0	0
	=3 if year 2017	.389	.418	0	0
	=4 if year 2018	0	0	.356	.32
	=5 if year 2019	0	0	.342	.334
	=6 if year 2021	0	0	.302	.346

Notes: The table reports summary statistics for key firm-level variables, separately for medium-sized firms (20 to 99 paid workers) and large firms (≥100 paid workers), and by pre-policy (before 2018) and post-policy (2018 onward) periods. Figures in parentheses denote standard deviations.

3.4. Empirical Framework: Difference in Difference analysis

To evaluate the causal effect of the 2018 OSS–NIB reform on firms' social security provision, we analyze two outcomes: (i) a binary indicator for whether a firm contributes to social security, capturing the extensive margin of compliance, and (ii) the logarithm of social-security expenditure per worker, capturing the intensive margin. To identify the policy effect, we employ a difference-in-differences (DiD) framework in which the treatment group comprises large firms (*Large_firm* = 1 if the establishment employs at least 100 paid workers) and the control group consists of medium firms with 20–99 paid workers. The estimation approach is grounded in the assumption that, without the OSS–NIB reform, large and medium firms would have followed similar trends in social-security outcomes. Medium firms thus serve as the benchmark for what would have occurred to large firms in the absence of policy intervention. Comparing the two trajectories allows us to infer the reform's impact on firms' compliance behaviour, representing the average treatment effect on the treated (ATT).

Firm size serves as a proxy for exposure intensity to the OSS–NIB reform: although the reform formally applies to all firms, enforcement is expected to be more binding for larger establishments, which are inherently more visible and therefore more likely to be inspected and monitored. Because monitoring and enforcement costs are lower when firms are easily identifiable and maintain formal records, regulators tend to prioritize oversight of larger employers. Consistent with this logic, Almeida and Ronconi (2016) show, using data from 76 developing countries, that labour inspections are disproportionately concentrated among larger firms, reflecting size-based disparities in enforcement. Similar patterns arise in the tax-enforcement literature, where larger and more visible firms exhibit higher effective compliance due to the availability of third-party information and administrative cross-checks (Kleven et al., 2016; Pomeranz, 2015). Accordingly, we treat large firms as the "exposed" group and medium firms as the "less-exposed" control group in our DiD design.

Formally, we estimate the following difference-in-differences specification using information on firms:

$$Sos_security_coverage_{it} = \alpha + \beta\ (Post_t\ x\ Large_firm_i) + \ \gamma X_{it} + \delta_s + \ \tau_t + \ \epsilon_{it} \quad (1)$$

$$Log_of_sos_security_spending_perworker_{it} = \alpha + \beta\ (Post_t\ x\ Large_firm_i) + \ \gamma X_{it} + \delta_s + \ \tau_t + \ \epsilon_{it} \quad (2)$$

where:

$Sos_security_coverage_{it}$ is a binary indicator equal to one if firm *i* in year *t* makes any social security contributions, and 0 otherwise.

$Log_of_sos_security_spending_perworker_{it}$ is the logarithm of social security expenditure per worker in each firm *i* on year *t.*

$Post_t$ is a dummy variable equal to one for years 2018 and onward, corresponding to the period after the OSS–NIB reform, and zero for all years prior to 2018.

$Large_firm_i$ is a treatment variable indicating whether firm *i* belongs to the treatment group, defined as firms with 100 or more paid employees.

X_{it} is a vector of firm-level controls including the the proportion of female, production and unpaid workers, as well as dummies for foreign investment and export orientation.

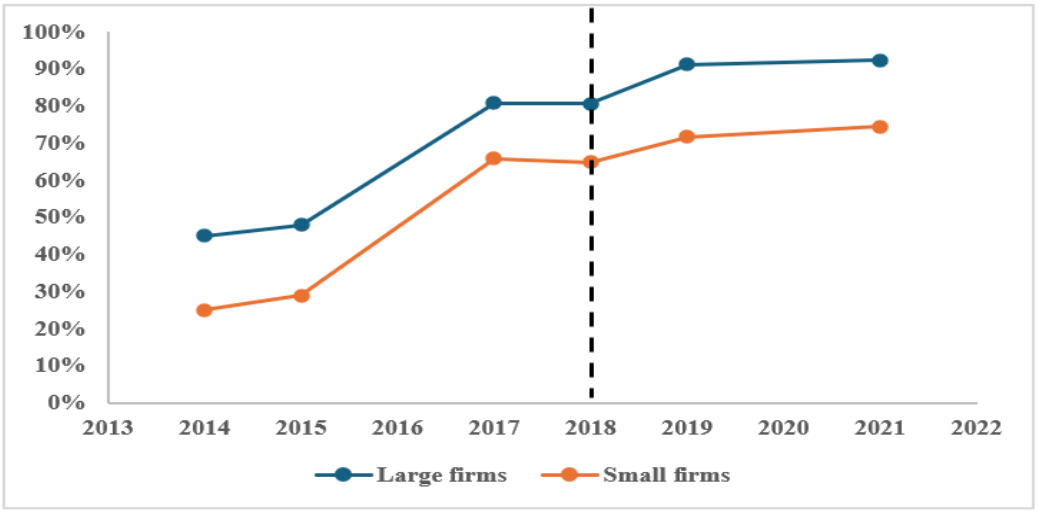
We also include sub-sector fixed effects (δ_s) and year fixed effects (τ_t) to account for time-invariant industry characteristics and common shocks. (ϵ_{it}) is the error term. The coefficient of interest, β, captures the causal effect of the reform on the outcomes.

4. Discussions

4.1. Descriptive Findings

Figure 1 shows the proportion of firms providing social security coverage to their workers, disaggregated by firm size between 2014 and 2021. It shows clear improvements in social security coverage among both medium and large firms over time. A sharp increase is already visible between 2015 and 2017, likely reflecting earlier enforcement efforts and the gradual expansion of mandatory registration. Around the introduction of the OSS system in 2018 (vertical dashed line), coverage rises further, especially among large firms, before stabilizing at high levels in the subsequent years. While medium-sized firms also experience substantial gains, a persistent compliance gap remains in favour of large firms, consistent with stronger monitoring and greater regulatory visibility among larger employers.

Figure 1. Proportion of firms with social security coverage

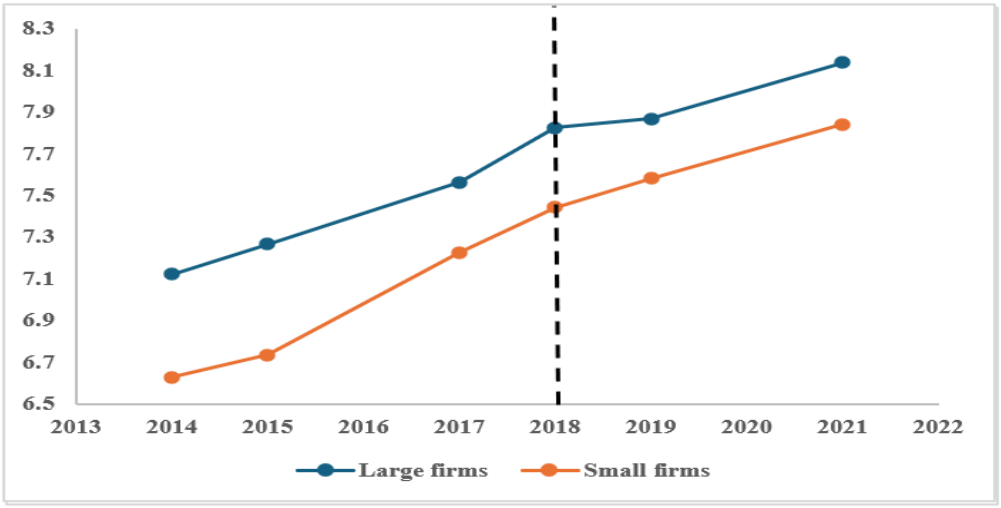


Notes: The figure plots the proportion of firms with social security coverage, separately for large firms (>=100 paid workers) and medium firms (20-99 paid workers), using data from the Statistics Indonesia's Large and Medium Manufacturing Survey. Coverage is defined as whether a firm reports positive expenditure on workers' social security. The vertical red line indicates the introduction of the OSS–NIB reform in mid-2018.

Figure 2 plots the log of social security expenditure per worker for large and medium-sized firms between 2014 and 2021. It shows that log of social security expenditure per worker increases steadily for both medium and large firms throughout the sample period, with no visible structural break around the 2018 OSS implementation. Rather than a sharp deviation from the pre-policy trajectory, the post-2018 pattern reflects a continuation of the earlier upward trend. Although large firms consistently spend more per worker, the gap relative to

medium firms narrows moderately over time, indicating gradual convergence in contribution levels as medium-sized firms improve both coverage and payment intensity.

Figure 2. Log of Social Security Expenditure per Worker by Firm Size



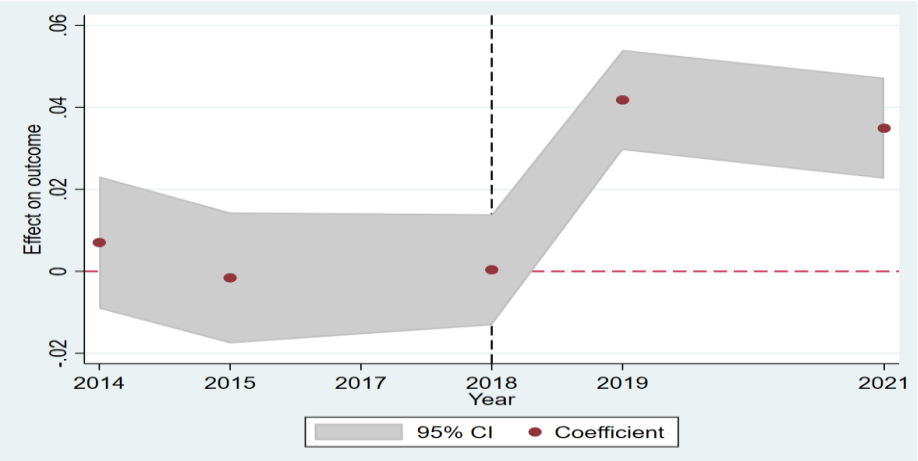
Notes: The figure plots the log of social security expenditure per worker, separately for large firms (>=100 paid workers) and medium firms (20-99 paid workers), using data from the Statistics Indonesia's Large and Medium Manufacturing Survey. Log of social security expenditure per worker is calculated as total firm expenditure social security divided by the number of employees. The vertical red dashed line marks the introduction of the OSS–NIB reform in mid-2018.

4.2. Empirical findings

4.2.1. Validation of the Common Trend Assumption

We begin by testing the validity of the common-trend assumption for both outcome variables. Figure 3 presents the event-study estimates for *Social security coverage* (Outcome 1), showing that pre-policy coefficients are close to zero and statistically insignificant, which supports the parallel-trends assumption and lends credibility to a causal interpretation of the subsequent DiD estimates. From 2019 onward, coverage among large firms rises significantly relative to medium ones and continues to increase in subsequent years, indicating a persistent policy effect on social security compliance.

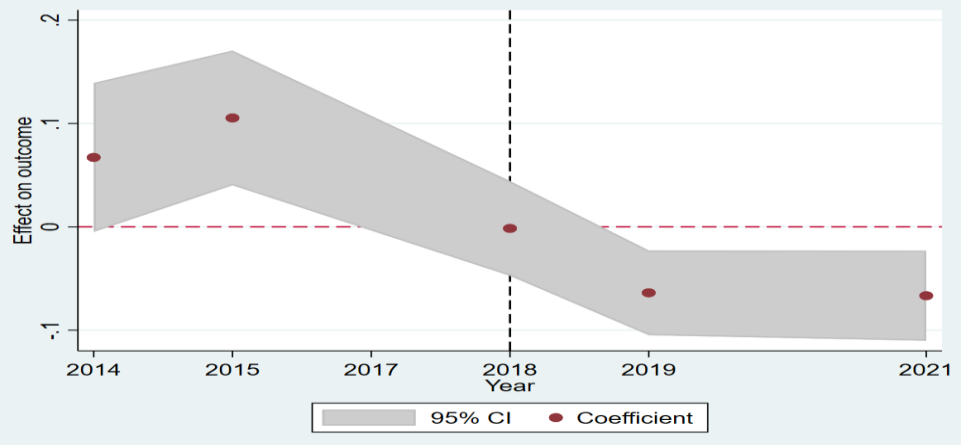
Figure 3. Event Study: Reform Effect on Social Security Coverage



Notes: The figure plots event study coefficients estimating the effect of the 2018 OSS–NIB reform on firms' social security coverage. Estimates are obtained from a difference-in-differences framework comparing large firms (treated) with medium firms (control), controlling for year and firm fixed effects. The vertical dashed line marks the year of the reform. Shaded areas represent 95 percent confidence intervals.

By contrast, Figure 4 presents the event-study results for social security expenditure per worker (Outcome 2), which reveal statistically significant differences in pre-policy trends between large and medium firms. This violation of the parallel-trends assumption implies that the post-policy DiD estimates should not be interpreted causally. Nonetheless, the descriptive pattern remains informative. Before the reform, large firms contributed substantially more per worker than medium firms, reflecting their stronger administrative capacity. The two groups exhibited similar trajectories in 2014 but began to diverge from 2015, indicating potential pre-trend differences prior to the 2017 base year. Following the OSS–NIB reform, however, the gap in contribution intensity narrowed as medium firms increased their per-worker expenditure at a faster rate. This convergence suggests a catching-up process among medium firms that were might previously constrained by higher administrative burdens or compliance costs, rather than a decline in contributions among large firms.

Figure 4. Event Study: Reform Effect on Log of Social Security Expenditure per Worker



Notes: The figure reports event study coefficients estimating the effect of the 2018 OSS–NIB reform on the log of social security expenditure per worker. Estimates are based on a difference-in-differences design that compares large firms (treated) with medium firms (control), controlling for firm and year fixed effects. The vertical dashed line marks the reform year, and the shaded area indicates 95 percent confidence intervals.

4.2.2. Baseline estimates

Having established that the common-trend assumption holds for *social security coverage* (Outcome 1) but not for *Log of social security expenditure per worker* (Outcome 2), the analysis now turns to the regression-based difference-in-differences estimates. The baseline specification focuses on Outcome 1, while the results for Outcome 2 are reported in Appendix Table A1 for descriptive reference.

Table 2 presents the baseline Difference-in-Differences estimates for the effect of the OSS–NIB reform on firms' social security coverage. Large firms exhibit a higher likelihood of providing coverage prior to the reform, as indicated by the positive and significant *Large firm* coefficient. More importantly, the coefficient on *Post* × *large firms* is positive and statistically significant once firm-level controls and fixed effects are included (Columns 2–3). The estimate of 0.0243 implies that large employers increased their probability of providing coverage by 2.4

percentage points more than medium firms after the reform, consistent with a compliance effect driven by strengthened monitoring and enforcement for firms with greater regulatory visibility.

The coefficients on firm-level controls show systematic differences across workforce and ownership characteristics. Firms with higher shares of female, production, and unpaid workers are significantly less likely to provide social security coverage, which may reflect differences in compliance capacity or administrative complexity across establishments. In contrast, foreign-invested firms exhibit higher coverage rates, consistent with stronger regulatory oversight and reputational pressures linked to international exposure. Exporting firms display a small but negative association with coverage, possibly due to reporting differences or reliance on short-term labour contracts. Overall, these results indicate that compliance behaviour varies with firms' structural characteristics and market orientation.

Table 2. Difference-in-Differences Estimates of the OSS–NIB Reform on Social Security Coverage

Variables	Dep var: Social security coverage		
	(1)	(2)	(3)
Post	0.279***	0.256***	0.451***
	(0.00282)	(0.00269)	(0.00398)
Large firm	0.187***	0.105***	0.0977***
	(0.00364)	(0.00389)	(0.00361)
Post x large firms	-0.00651	0.0198***	0.0243***
	(0.00451)	(0.00446)	(0.00425)
Female proportion		-0.0508***	-0.0295***
		(0.00434)	(0.00502)
Production workers' proportion		-0.296***	-0.282***
		(0.00851)	(0.00868)
Unpaid workers' proportion		-3.627***	-3.042***
		(0.0658)	(0.0604)
Foreign investment		0.0506***	0.0392***
		(0.00355)	(0.00342)
Export		-0.0759***	-0.0579***
		(0.00393)	(0.00400)
Constant	0.421***	0.774***	0.540***
	(0.00205)	(0.00715)	(0.00794)
Observations	172,246	172,246	172,246
R-squared	0.120	0.191	0.265
Controls	No	Yes	Yes
Sector dummies	No	No	Yes
Year dummies	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: The dependent variable is Social security coverage which is a dummy equal to one if the firm reports any expenditure on workers' social security. Column (1) reports baseline estimates including only treatment indicators. Column (2) adds firm-level controls (number of paid workers, workforce composition, foreign investment status, and export orientation. Column (3) adds sub-sector and year fixed effects. The coefficient of interest is Post × Large firms, which measures the differential effect of the 2018 OSS–NIB reform on large relative to medium firms.

4.2.3. Heterogenous effect

Table 3 examines whether the OSS–NIB reform generated heterogeneous effects on firms' social-security coverage across different firm characteristics. Columns (1)–(2) split the sample by the share of female workers, classifying firms as high-female if their female employment share exceeds the sample median (36.5 percent). Columns (3)–(4) group firms by production intensity. To better capture the contrast between less and more production-intensive establishments, we reclassify firms based on the sample median (87.5 percent) of production-worker share. This classification is appropriate given that Indonesia's manufacturing sector is structurally labour-intensive, by the 10th percentile, firms already employ around 65 percent production workers, and more than 75 percent employ above 95 percent. Finally, Columns (5)-(8) present results by foreign-investment and export status, distinguishing between firms with and without foreign investment and between exporters and non-exporters.

The coefficient on the interaction term *post* × *large firm* captures the differential policy effect for large relative to medium firms within each subgroup. The results show that both the magnitude and significance of the reform's impact vary across firm profiles. Specifically, the effect is larger among firms with a higher share of female workers and those with higher production intensity, suggesting that the compliance response was stronger among more gender-diverse and more labour-intensive establishments. The estimated effect is also larger and statistically significant for non-foreign-invested (domestic) firms and non-exporters, while it turns negative and significant for foreign-invested firms and exporters. This pattern implies that domestic and locally oriented firms, less exposed to international regulatory scrutiny, were more responsive to the enforcement linkage between business licensing and social-security registration introduced by the OSS–NIB reform. Overall, these results imply that the OSS–NIB reform enhanced regulatory compliance within the formal manufacturing sector, especially among firms that had weaker prior oversight, such as those with higher production intensity, greater female employment, and less integration into global markets.

Table 3. Heterogeneous Effects of the OSS–NIB Reform on Social Security Coverage by Firm Characteristics

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Share of female workers		*Share of production workers*		*Foreign investment*		*Export status*	
	Low	High	Low	High	Non-Foreign Inv	Foreign Inv	Non-exporter	Exporter
Post	0.442***	0.396***	0.472***	0.410***	0.445***	0.557***	0.458***	0.364***
	(0.00560)	(0.00566)	(0.00577)	(0.00533)	(0.00417)	(0.0139)	(0.00412)	(0.0156)
Large firms	0.103***	0.0870***	0.0739***	0.0964***	0.0958***	0.143***	0.0842***	0.180***
	(0.00495)	(0.00511)	(0.00475)	(0.00535)	(0.00389)	(0.0109)	(0.00380)	(0.0122)
Large firms x post	0.000513	0.0451***	-0.0197***	0.0624***	0.0340***	-0.119***	0.0431***	-0.0486***
	(0.00584)	(0.00602)	(0.00547)	(0.00622)	(0.00462)	(0.0130)	(0.00446)	(0.0149)
Constant	0.422***	0.813***	0.148***	3.299***	0.561***	0.408***	0.536***	0.524***
	(0.0100)	(0.0139)	(0.00957)	(0.0349)	(0.00852)	(0.0224)	(0.00849)	(0.0229)
Observations	86,132	86,114	85,979	86,267	155,634	16,612	156,944	15,302
R-squared	0.271	0.308	0.245	0.336	0.267	0.215	0.279	0.176

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: The table reports difference-in-differences estimates of the OSS–NIB reform across firm subgroups. Each column represents a separate regression, where the dependent variable is firms' social-security coverage.

5. Policy Mechanism

The stronger post-policy response among large firms can be attributed to several institutional and economic mechanisms. First, larger firms are inherently more visible to regulators and more likely to appear in administrative records, which increases the perceived probability of enforcement, consistent with evidence that labour inspections and monitoring activities in developing countries are disproportionately concentrated among larger establishments (Almeida and Ronconi, 2016). Second, larger firms possess superior administrative capacity, including formal payroll and human-resource systems, which lowers the marginal cost of enrolling and reporting workers. Consistent with this mechanism, regulatory burdens tend to disproportionately constrain small firms, whereas large enterprises are better able to absorb compliance demands (Chambers et al., 2022). Third, large firms face greater reputational and sanction risks when non-compliance is detected due to their deeper integration with formal supply chains, investor relations, and public accountability mechanisms, making penalties more salient and the perceived cost of reputational loss significantly higher (Preble & Early, 2024). Moreover, given the scale and complexity of their operations, large firms are more likely to require follow-up licensing and administrative services that hinge not only on registration but also on active participation in the social security system, thereby reinforcing incentives for sustained compliance.

Remaining non-compliance is likely to arise from two sources: (i) legacy firms that obtained licenses prior to OSS–NIB and never registered with social security office independently; and (ii) firms that are administratively registered as social security participants, either before or after the reform, but have not followed through with enrolling their workers or paying contributions. In these cases, the firm's presence in BPJS records reflects compliance only at the entity-registration level rather than effective worker coverage and therefore does not imply any actual expenditure on employment social security. This distinction is crucial in our empirical setting, as our compliance measure is based on realized contribution expenditure rather than administrative registration alone.

Taken together, the findings suggest that while the OSS–NIB reform has broadened the coverage of firms under formal regulatory oversight, its enforcement strength remains heterogeneous, operating more strongly among firms with greater visibility, administrative capacity, and regulatory exposure. Linking business licensing with the national social security administration can effectively increase worker coverage, particularly among large and highly visible firms. Overall, the results highlight that enhanced visibility and integrated enforcement systems are essential to closing compliance gaps and extending social protection within the formal economy.

6. Conclusions

In many emerging economies, weak enforcement and fragmented administration limit the reach of labour and social protection laws. Indonesia's 2018 OSS–NIB reform sought to address these gaps by integrating business licensing with social security administration through a digital platform. Using six waves of annual surveys of large and medium-sized firms from 2014 to 2021 (172,246 observations on manufacturing firms), the analysis applies a difference-in-differences approach comparing large firms, which are more exposed to regulatory monitoring, with medium-sized ones. The reform significantly increased worker enrolment in social security, with the largest gains among large establishments. The findings suggest that

administrative data integration enhances regulatory visibility, strengthens enforcement credibility, and reduces compliance frictions. The stronger response among large firms likely reflects their greater visibility to regulators, stronger administrative capacity, and higher exposure to reputational and sanction risks, with repeated licensing interactions further reinforcing the link between compliance and continued business operations. Overall, the evidence emphasizes how data integration and digital governance reforms can bolster labour law enforcement and expand social protection coverage in emerging economies. Future research could examine the mechanisms underlying firms' behavioural responses, potential spillovers to smaller enterprises, and the longer-term implications of digital governance reforms for worker protection and firm performance.

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Appendix

Table A1. Difference-in-Differences Estimates of the OSS–NIB Reform on Log of Social Security Expenditure per Worker

Variables	Dep var: Log of social security expenditure per worker		
	(1)	(2)	(3)
Post	0.611***	0.613***	1.163***
	(0.0112)	(0.0104)	(0.0187)
Large firm	0.386***	0.265***	0.266***
	(0.0144)	(0.0137)	(0.0131)
Post x large firms	-0.0590***	-0.0436***	-0.0770***
	(0.0171)	(0.0160)	(0.0154)
Female proportion		-0.936***	-0.985***
		(0.0169)	(0.0239)
Production workers' proportion		-1.170***	-1.142***
		(0.0334)	(0.0356)
Unpaid workers' proportion		-12.85***	-10.40***
		(0.549)	(0.488)
Foreign investment		0.396***	0.283***
		(0.0120)	(0.0118)
Export		-0.266***	-0.113***
		(0.0150)	(0.0149)
Constant	7.014***	8.427***	7.714***
	(0.00923)	(0.0270)	(0.0327)
Observations	107,730	107,730	107,730

R-squared	0.064	0.168	0.246
Controls	No	Yes	Yes
Sector dummies	No	No	Yes
Year dummies	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: The dependent variable is Log of social security expenditure per worker. Column (1) reports baseline estimates including only treatment indicators. Column (2) adds firm-level controls (workforce composition, foreign investment status, and export orientation. Column (3) adds sub-sector and year fixed effects. The coefficient of interest is Post × Large firms, which measures the differential effect of the 2018 OSS–NIB reform on large relative to medium firms. The sample comprises 107,730 firms that report positive social security expenditure for their workers.