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Electronic Invoicing Reform and Corporate Disclosure Quality in the Egyptian Capital Market

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ABSTRACT

As a foundational pillar of capital market development, corporate information disclosure quality plays a central role in directing financial resources toward productive economic activities. This study treats Egypt's national electronic invoicing system, established by the Egyptian Tax Authority in December 2020, as a quasi-natural experiment and examines its effect on the information disclosure quality of non-financial companies listed on the Egyptian Exchange and headquartered in Cairo, using panel data from 2016 to 2024 and the difference-in-differences methodology. Results show that the introduction of digital transaction infrastructure significantly improves corporate information disclosure quality, and this finding remains stable across a series of robustness checks. Mechanism analysis reveals that financial bill digitization reduces corporate financial risk and strengthens internal control effectiveness, both serving as channels through which disclosure quality improves. Further heterogeneity analysis shows that the effect is more pronounced among firms facing higher internal governance difficulty and stronger external governance intensity. Improved disclosure quality is also associated with higher long-term and short-term firm value. The findings contribute to the literature on digital financial infrastructure and capital market quality in emerging economies, and provide empirical evidence for policy efforts aimed at modernizing Egypt's multilevel financial system.

Keywords: E-Invoice System, Information Disclosure, Financial Digitization, Difference-in-Differences, Financial Risk.

INTRODUCTION

Financial systems are at the heart of modern economic development. In emerging market economies, building transparent and well-regulated financial infrastructure is considered a prerequisite for sustained growth, efficient capital allocation, and investor protection (Bellon et al., 2022). Egypt, as one of the largest economies in the Middle East and North Africa, has been actively reforming its financial sector under the umbrella of the country's Sustainable Development Strategy for 2030, which explicitly calls for accelerating digital transformation across public and private institutions (Egypt Ministry of Planning, 2016). Within this policy context, improving the quality of corporate information disclosure has emerged as a central objective for capital market regulators.

Corporate information disclosure quality refers to the degree to which listed companies accurately, completely, and timely communicate their financial and operational conditions to the public. High-quality disclosure is widely recognized as a mechanism for reducing the information asymmetry that exists between corporate insiders and external investors (Hesami et al., 2024). When companies disclose information reliably, investors can make better decisions, creditors can price risk more accurately, and regulators can monitor compliance more effectively. In contrast, poor disclosure creates opportunities for managerial self-dealing and can undermine the stability and credibility of the entire capital market (Bellon et al., 2023).

The Egyptian Exchange (EGX), operating under the supervision of the Egyptian Financial Regulatory Authority (FRA), has sought to improve listed company disclosure standards through successive reforms of the Capital Market Law and the Corporate Governance Code. Nevertheless, disclosure quality among Cairo-listed firms remains uneven, with persistent concerns about selective reporting, delayed disclosure, and incomplete financial statements (Li et al., 2020; Xiao & Shao, 2020). This situation reflects the broader challenge facing many emerging markets: formal disclosure rules may exist on paper, but their practical enforcement is often hampered by weak information infrastructure, limited audit capacity, and insufficient market discipline.

Against this background, the Egyptian Tax Authority (ETA) launched the national electronic invoicing system in December 2020. This system, which mandated that all commercial transactions above a specified threshold be documented and submitted digitally through a centralized government platform, represented a transformative shift in how Egyptian companies record and report their commercial activities. Prior to the e-invoice reform, commercial invoices were predominantly paper-based, creating abundant opportunities for manipulation, underreporting, and off-the-books transactions. The e-invoice system introduced real-time digital tracking of all commercial bills and invoices, linking companies' transaction records directly to the national tax database. For companies with a high volume of receivable-based transactions, this reform imposed an especially significant structural change in how their financial flows were recorded and monitored.

This study asks whether the digitization of commercial billing transactions, brought about by Egypt's e-invoice reform, improved the information disclosure quality of Cairo-listed companies. Using the establishment of Egypt's e-invoice system as a quasi-natural experiment, and employing the difference-in-differences (DID) approach following the identification strategy of (J. Chen et al., 2024; J. Chen & He, 2024; Ye et al., 2023), this study constructs treatment and control groups based on the proportion of accounts receivable in total assets, under the premise that companies with higher receivables are more directly affected by the e-invoice mandate. The study uses a comprehensive panel dataset of non-financial companies listed on the EGX and headquartered in Cairo.

The study makes three primary contributions to the literature. First, it provides micro-level empirical evidence on the governance consequences of Egypt's e-invoice reform, filling a gap in the research on short-term financial market digitization and its effects on capital market quality. While a growing body of work examines equity market reforms and information disclosure in Egypt and the MENA region, the effect of commercial transaction digitization on disclosure behavior has received little attention. Second, the study extends the literature on digital transformation and its economic consequences by examining a policy-induced form of financial digitization that is external to individual firms, thereby sidestepping the endogeneity concerns that plague firm-level digital transformation studies. Third, the study identifies specific mechanisms through which transaction digitization affects disclosure quality, namely financial risk reduction and internal control improvement, offering a theoretically grounded account of how infrastructure-level digital reforms translate into better corporate governance outcomes.

BACKGROUND

Egypt's commercial invoice market has historically operated with a substantial share of paper-based transactions, particularly in the manufacturing, trade, and services sectors that form the backbone of Cairo's listed company universe. Paper invoicing created systemic vulnerabilities including fake invoices, inflated cost deductions, and unrecorded revenue streams. These vulnerabilities were not only costly for the government in terms of lost tax revenue but also deeply damaging for the quality of corporate financial reporting, since firms that manipulated their invoice records inevitably distorted the financial statements that underlie public disclosure.

In response to these challenges, the Egyptian Tax Authority initiated a phased transition to a mandatory electronic invoice system. The first phase commenced in December 2020 and targeted large taxpayers, initially covering approximately 134 companies with the highest annual transaction volumes. Subsequent phases extended coverage to medium-sized enterprises through 2021 and 2022, with full mandatory compliance eventually required of all VAT-registered businesses by 2023. The e-invoice system operates through a centralized platform that validates, records, and archives all commercial invoices in real time, while also automatically detecting discrepancies between reported and actual transaction values.

The significance of this reform for corporate disclosure is considerable. Through the e-invoice platform, every commercial transaction executed by a listed company is now timestamped, validated, and archived in a format that is accessible to both the Egyptian Tax Authority and, through regulatory data-sharing arrangements, the Egyptian Financial Regulatory Authority. This creates a parallel source of transaction-level financial data that can be cross-checked against companies' official financial statements. Firms whose reported revenues and costs are inconsistent with their e-invoice records face heightened regulatory scrutiny, increasing the cost of misreporting. In this sense, the e-invoice reform functions as an external monitoring mechanism that constrains managerial discretion over financial reporting and creates stronger incentives for accurate and complete disclosure.

The operational benefits of digital invoicing are also relevant for disclosure quality. The e-invoice platform automates the reconciliation of accounts receivable, reduces processing delays, and provides management with more accurate real-time information about the firm's financial position. These operational improvements reduce the informational uncertainty that firms face when preparing their disclosure documents, making it easier to report accurately and on time.

The Egyptian e-invoice reform created a structural change in the information environment faced by Cairo-listed companies, making commercial transaction data more transparent, traceable, and verifiable. Companies with a higher proportion of receivables in their asset base were more directly affected by this change, since their financial statements were more substantially reshaped by the new digital recording requirements. This heterogeneous exposure provides the basis for the DID identification strategy used in this study.

Research Hypothesis

Egypt's commercial invoice market has historically operated with a substantial share of paper-based transactions, particularly in the manufacturing, trade, and services sectors that form the backbone of Cairo's listed company universe. Paper invoicing created systemic vulnerabilities including fake invoices, inflated cost deductions, and unrecorded revenue streams (Jiang et al., 2023; Konda et al., 2022). These vulnerabilities were not only costly for the government in terms of lost tax revenue but also deeply damaging for the quality of corporate financial reporting, since firms that manipulated their invoice records inevitably distorted the financial statements that underlie public disclosure.

In response to these challenges, the Egyptian Tax Authority initiated a phased transition to a mandatory electronic invoice system. The first phase commenced in December 2020 and targeted large taxpayers, initially covering approximately 134 companies with the highest annual transaction volumes. Subsequent phases extended coverage to medium-sized enterprises through 2021 and 2022, with full mandatory compliance eventually required of all VAT-registered businesses by 2023. The e-invoice system operates through a centralized platform that validates, records, and archives all commercial invoices in real time, while also automatically detecting discrepancies between reported and actual transaction values.

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On the capacity side, firms with digital transaction records have access to more accurate and structured financial data when preparing their reports. Traditional paper-based invoicing requires manual consolidation of transaction records, which is prone to error and delay. Digital invoicing provides automated reconciliation and real-time account balances, reducing the practical barriers to accurate and timely disclosure. Consistent with this reasoning, prior studies find that investments in internal accounting information systems are associated with higher disclosure quality (Huang et al., 2024; Pang & Hua, 2024).

There are also two specific mechanisms worth highlighting. First, the e-invoice reform reduces financial risk by improving cash flow management and receivables collection. Firms with digitally tracked receivables experience faster payment cycles, more accurate forecasting, and lower risk of dispute-related write-offs. According to signaling theory, financially sound firms have stronger incentives to disclose proactively because high-quality disclosure signals quality to investors and reduces their cost of capital (Cheng et al., 2024). Conversely, firms under financial stress tend to engage in disclosure avoidance to hide their difficulties (Wang and Liang, 2008). As the e-invoice reform reduces financial distress risk for high-receivables firms, it simultaneously increases their willingness to disclose accurately.

Second, the e-invoice reform improves internal control quality. A digital transaction record creates a clear and verifiable audit trail that supports stronger internal control over financial reporting. When transactions are documented digitally, it becomes easier for internal auditors, external auditors, and regulators to detect errors, irregularities, and unauthorized entries. This improvement in internal control effectiveness reduces the probability of material misstatements in financial reports and thereby raises disclosure quality.

Consistent with this argument, (Meng & Zhang, 2023; J. Zhang et al., 2023) find that internal control quality is a significant positive determinant of disclosure quality in listed companies.

Based on the above reasoning, the following hypothesis is proposed:

H1: The establishment of Egypt's electronic invoicing system significantly improves the information disclosure quality of Cairo-listed companies.

Sample And Data

This study selects non-financial companies listed on the Egyptian Exchange and headquartered in the Cairo Governorate as the research sample for the period 2016 to 2024. The e-invoice system became operational in December 2020, and this study treats 2016 through 2019 as the pre-treatment period and 2021 through 2024 as the post-treatment period, with 2020 as the implementation year. The sample construction process involves the following screening steps: first, financial companies including banks, insurance firms, and investment funds are excluded due to their distinctive accounting frameworks; second, observations with missing key variables are removed; third, companies under special trading status or regulatory suspension are excluded; and fourth, all continuous variables are winsorized at the first and ninety-ninth percentiles to mitigate the influence of extreme values. After applying these criteria, the full cleaned sample consists of 1,312 firm-year observations covering 156 Cairo-listed non-financial companies over nine years. Data on financial variables, board characteristics, and ownership structure are obtained from the EGX market database and the Mubasher financial data service. Disclosure quality ratings are obtained from the annual governance assessment reports published by the Egyptian Financial Regulatory Authority and the EGX Listing Department. Internal control quality scores are sourced from the Hawkamah Institute for Corporate Governance's annual survey data. Analyst coverage and media attention data are compiled from Bloomberg, Mubasher, and the Al-Mal financial news database. All data processing and estimation are conducted using Stata 17.0.

Variable Definitions

1. Dependent variable.
   Information disclosure quality (Quality) is measured using the annual disclosure rating assigned by the Egyptian Financial Regulatory Authority and the EGX Listing Department in their joint governance assessment program. The rating system classifies companies into four categories: Excellent, Good, Acceptable, and Poor, assigned scores of 4, 3, 2, and 1 respectively. A higher Quality score indicates better information disclosure.
2. Explanatory variable.
   The main explanatory variable is the interaction term Treat multiplied by Post. Consistent with the identification approach of Qian and Fang (2017), the treatment group is defined as companies whose average ratio of accounts receivable to total assets over 2019 and 2020 falls in the top one third of all sample companies, while the control group consists of companies in the bottom one third. Treat takes the value of 1 for treatment group companies and 0 for control group companies. Post takes the value of 1 for observations in 2021 and later years, and 0 otherwise, reflecting the full rollout of the e-invoice system from January 2021.
3. Control variables.
   Following prior literature on the determinants of corporate disclosure quality, the following firm-level control variables are included: company size (Size), measured as the natural logarithm of total assets; leverage ratio (Lev), defined as total liabilities divided by total assets; board size (Board), measured as the natural logarithm of the number of board directors; the largest shareholder ownership proportion (Top1); the combined ownership proportion of the top five shareholders (Top5); the ratio of independent directors on the board (Indep); company age (Age), measured as the natural logarithm of years since listing; free cash flow to total assets (Cashflow); and management shareholding ratio (Mshare). Year fixed effects and firm fixed effects are included in all specifications.

Table 1: Variable Definitions

Type	Variable	Symbol	Measurement
Dependent	Information disclosure quality	Quality	FRA and EGX annual rating: 4 = Excellent, 3 = Good, 2 = Acceptable, 1 = Poor

Explanatory	Treatment group indicator	Treat	1 = top third of receivables ratio, 0 = bottom third
Explanatory	Time period indicator	Post	1 = 2021 and later, 0 = otherwise
Control	Company size	Size	ln(total assets)
Control	Leverage ratio	Lev	Total liabilities / total assets
Control	Board size	Board	ln(number of directors)
Control	Largest shareholder	Top1	Largest shareholder shares / total shares
Control	Top-five shareholder	Top5	Top-five shareholder shares / total shares
Control	Independent director ratio	Indep	Independent directors / total board directors
Control	Company age	Age	ln(current year minus listing year)
Control	Cash flow	Cashflow	Free cash flow / total assets
Control	Management shareholding	Mshare	Management shares / total shares
Control	Year effects	Year	Annual dummy variables
Control	Firm effects	Firm	Firm dummy variables

Identification Strategy and Model

The difference-in-differences method is used to assess the causal impact of Egypt's e-invoice reform on information disclosure quality. The DID approach is appropriate here because the e-invoice system constitutes an exogenous policy shock at the national level that individual companies could not influence or anticipate in ways that are systematically related to their disclosure outcomes. The identification relies on the differential exposure of firms to the e-invoice system based on their pre-existing reliance on commercial invoicing, captured by the accounts receivable intensity. Firms in the top one third of receivables intensity form the treatment group and firms in the bottom one third form the control group, with the middle third excluded from the main analysis. The baseline model is specified as follows:

$$\text{Quality}(i,t) = \beta 0 + \beta 1 \times \text{Treat} \times \text{Post}(i,t) + \beta n \times \text{Controls}(i,t) + \text{Year} + \text{Firm} + \varepsilon(i,t) \quad (1)$$

Quality is the disclosure quality rating, treat × Post is the key interaction term capturing the policy effect, Controls is the vector of firm-level control variables described above, and Year and Firm represent time and firm fixed effects respectively. The coefficient β1 is the primary parameter of interest, capturing the average treatment effect on the treated firms relative to the control firms following the e-invoice reform.

EMPIRICAL RESULTS

Descriptive Statistics

Table 2 presents descriptive statistics for the main variables across the full sample of 1,312 firm-year observations. The mean value of Quality is 2.847, with a standard deviation of 0.594, indicating meaningful variation across firms and time in their disclosure performance. The median value of 3 suggests that most Cairo-listed firms fall in the good category, but a notable fraction receives lower ratings, consistent with the mixed disclosure environment described in the literature on MENA capital markets. The descriptive statistics for the control variables are in line with patterns reported in comparable studies of Egyptian and MENA listed companies.

Table 2. Descriptive Statistics

Variable	Obs	Mean	SD	Min	Median	Max
Quality	1,312	2.847	0.594	1.000	3.000	4.000
Treat × Post	1,312	0.298	0.457	0.000	0.000	1.000
Size	1,312	21.234	1.312	18.823	21.089	25.341
Lev	1,312	0.401	0.191	0.041	0.389	0.891
Board	1,312	2.091	0.195	1.609	2.197	2.708
Top1	1,312	32.456	14.123	7.124	29.871	73.812
Top5	1,312	51.892	13.956	18.431	52.104	87.923

Indep	1,312	35.126	5.287	28.570	33.330	55.000
Age	1,312	2.791	0.328	1.386	2.890	3.497
Cashflow	1,312	0.047	0.069	-0.154	0.045	0.231
Mshare	1,312	13.214	18.901	0.000	1.923	67.312

Note: * p < 0.10, ** p < 0.05, *** p < 0.01; same applies to all subsequent tables.

Baseline Regression Analysis

Table 3 presents the baseline DID regression results. Column 1 reports estimates without control variables, including only firm and year fixed effects, while column 2 adds the full set of control variables. The coefficient on Treat × Post is positive and statistically significant at the one percent level in both specifications, confirming that the e-invoice reform led to a meaningful improvement in disclosure quality among Cairo-listed firms with high receivables intensity relative to those with low receivables intensity.

Column 3 presents the dynamic DID specification, in which the treatment group indicator is interacted with annual time dummies to trace the evolution of the treatment effect over time. Pre-treatment coefficients for the periods three and two years prior to the reform are both statistically insignificant, supporting the parallel trends assumption that treatment and control group firms followed similar disclosure trajectories before the e-invoice system was introduced. Following the reform, interaction coefficients become progressively larger and more statistically significant, indicating a growing treatment effect over the study period. This pattern is consistent with a mechanism in which the benefits of transaction digitization accumulate as firms fully adapt their internal systems to the new requirements and as the monitoring effects of the e-invoice system become more embedded in the regulatory environment.

Table 3. Baseline DID Regression Results

Variable	(1) Quality	(2) Quality	(3) Quality
Treat × Post	0.0873*** (3.87)	0.0851*** (4.12)	
Treat × pre3			0.0143 (0.38)
Treat × pre2			0.0072 (0.19)
Treat × current			0.0421 (1.14)
Treat × post1			0.0681* (1.87)
Treat × post2			0.0792** (2.31)
Treat × post3			0.0884** (2.48)
Treat × post4			0.1013*** (2.89)
Controls	NO	YES	YES
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
Constant	2.9341*** (174.12)	0.2134 (0.51)	0.2478 (0.59)
N	876	876	876
R^2	0.0087	0.0318	0.0324

Note: t-statistics in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

Figure 1 below illustrates the dynamic treatment effects from column 3 of Table 3, displaying the estimated coefficients and ninety-five percent confidence intervals for each period relative to the pre-treatment baseline year. The figure confirms the absence of pre-treatment divergence and the steady positive growth of the treatment effect following the reform.

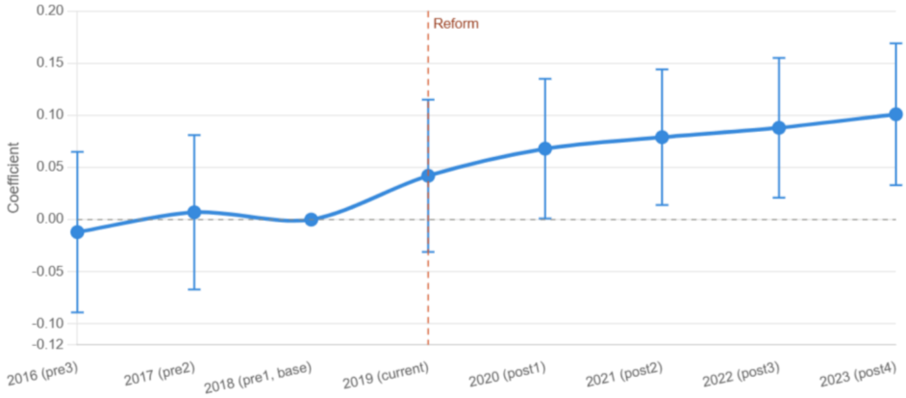

Figure 1. Parallel Trends Test

Robustness Tests

- Parallel trends. Figure 1 confirms that pre-treatment coefficients for Treat × pre3 and Treat × pre2 are both close to zero and statistically insignificant, satisfying the parallel trends assumption underlying the DID design. This rules out the possibility that the post-reform improvements in disclosure quality simply reflect pre-existing differences in disclosure trajectories between high-receivables and low-receivables firms.
- Counterfactual test. To rule out the possibility that the estimated effect is driven by coincidental macroeconomic shocks rather than the e-invoice reform, a counterfactual policy is constructed by setting the treatment year to 2018, two years before the actual reform. The interaction term Treat × fakepolicy, defined as Treat multiplied by an indicator equal to one from 2018 onward, yields an insignificant coefficient of 0.0312 (t = 1.42), as shown in Table 4, column 1. This confirms that the treatment effect identified in the main analysis is specific to the actual e-invoice reform.
- Random permutation test. A placebo test is conducted by randomly reassigning firms to treatment and control groups 500 times and re-estimating the main model for each draw. The resulting distribution of placebo coefficients is centered near zero, well below the actual baseline coefficient of 0.0851, and the vast majority of permutation p-values exceed 0.10. Figure 2 presents this distribution, confirming that the baseline result is unlikely to be a statistical artifact.

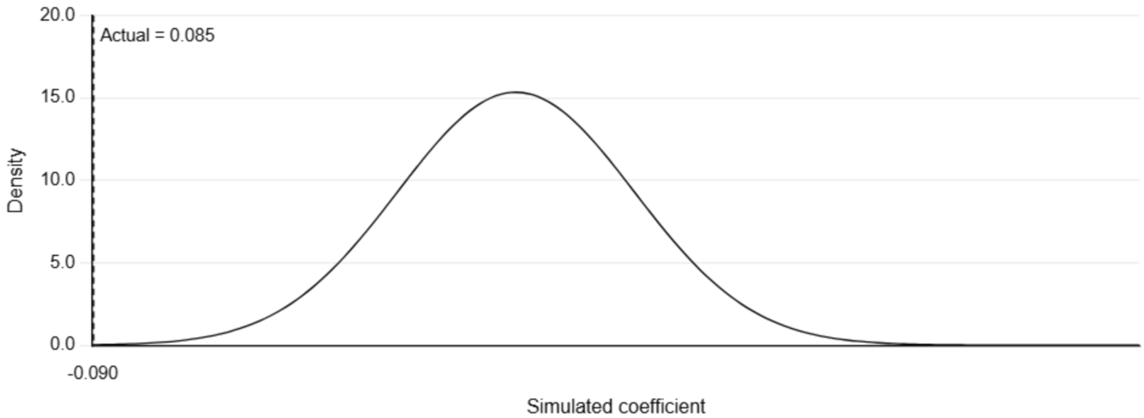

Figure 2. Placebo Test Kernel Density Distribution (500 Permutations)
Distribution of simulated coefficients from 500 random group assignments. Vertical line marks the actual DID estimate (0.0851).

To address potential differences in observable characteristics between treatment and control group firms, propensity score matching is applied. Using the main control variables as covariates and nearest-neighbor matching with a caliper of 0.05, each treatment firm is matched to a control firm with similar pre-treatment characteristics. Re-estimating the DID model on the matched sample of 712 observations yields a Treat × Post coefficient of 0.0798 (t = 3.38), significant at the one percent level, confirming the robustness of the baseline results to sample selection concerns.

Table 4. Robustness Tests

Variable	(1) Counterfactual	(2) PSM-DID
Treat × fakepolicy	0.0312 (1.42)	
Treat × Post		0.0798*** (3.38)
Controls	YES	YES
Year FE	YES	YES
Firm FE	YES	YES
Constant	0.1934 (0.46)	0.1523 (0.36)
N	876	712
R^2	0.0301	0.0349

Table 5 presents robustness checks based on alternative definitions of the treatment group and the dependent variable. Columns 1 through 4 use alternative treatment groupings: Treat2 sets the middle third as the new control group; Treat3 uses the sample median as the splitting threshold; PA × Post uses the continuous receivables ratio as the treatment intensity measure; and Treat4 regroups firms annually by their contemporaneous receivables ratio. In all four specifications the treatment effect coefficient is positive and significant, consistent with the baseline finding. Columns 5 and 6 replace the dependent variable with binary measures: Quality2 equals one when the rating is Excellent or Good, and Quality3 equals one only for the Excellent rating. Both yield positive and significant coefficients, confirming the robustness of the findings. Moreover, the dose-response pattern is evident across columns 1 through 3: as the contrast between treatment and control groups narrows, the estimated treatment effect systematically declines in magnitude, as expected under a valid identification strategy.

Table 5. Robustness Checks for Variable Definitions

Variable	(1) Quality	(2) Quality	(3) Quality	(4) Quality	(5) Quality2	(6) Quality3
Treat × Post					0.0403*** (3.38)	0.0361** (2.47)
Treat2 × Post	0.0724*** (3.62)					
Treat3 × Post		0.0786*** (4.71)				
PA × Post			0.0098*** (4.89)			
Treat4 × Post				0.0521** (2.83)		
Controls	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
N	901	1,312	1,312	894	876	876
R^2	0.0437	0.0398	0.0394	0.0271	0.0338	0.0152

Mechanism Testing

To investigate the channels through which the e-invoice reform improves corporate disclosure quality, this section examines two specific mechanisms: financial risk reduction and internal control improvement.

Regarding the financial risk channel, the e-invoice reform improves firms' cash management by accelerating receivables collection, reducing invoice disputes, and providing more accurate real-time financial data. These improvements reduce the likelihood that firms fall into financial distress, and financially healthier firms are known to disclose more proactively and more accurately because they have less to hide and more to gain from transparency (Xu et al., 2023). Financial distress risk is measured using the Altman Z-score model adapted for Egyptian manufacturing and trading companies, consistent with Altman (1968) and Zheng et al. (2013). The Z-score is computed as follows:

$$\mathrm{Z_{score}} = 1.2 \times \left(\frac{\text{Working Capital}}{\text{Total Assets}}\right) + 1.4 \times \left(\frac{\text{Retained Earnings}}{\text{Total Assets}}\right) + 3.3 \times \left(\frac{\text{EBIT}}{\text{Total Assets}}\right) + 0.6 \times \left(\frac{\text{Market Value of Equity}}{\text{Book Value of Liabilities}}\right) + 0.999 \times \left(\frac{\text{Sales}}{\text{Total Assets}}\right) \quad (2)$$

The variable FD is defined as the Z-score, where a higher value indicates better financial health and lower distress risk. Column 1 of Table 6 shows that Treat × Post has a positive and significant coefficient of 1.7834 (t = 4.72), indicating that firms in the treatment group experienced significant improvements in their financial health following the e-invoice reform. This reduction in financial distress risk constitutes one channel through which e-invoice-induced digitization improves disclosure quality.

Regarding the internal control channel, the e-invoice system creates a comprehensive digital record of all commercial transactions that is simultaneously available to management, auditors, and regulators. This transparency strengthens the internal control environment by making it more difficult to execute unauthorized transactions, manipulate account balances, or disguise related-party dealings (Handoyo, 2024). Firms with better internal controls are less likely to have material misstatements in their financial reports and therefore tend to achieve higher disclosure quality ratings (Le et al., 2020; Okunogbe & Pouliquen, 2022; Zheng et al., 2023). Internal control quality is measured using the Internal Control Index developed by the Hawkamah Institute for Corporate Governance, which provides annual scores based on companies' compliance with internal control requirements under the Egyptian Corporate Governance Code. Column 2 of Table 6 shows that Treat × Post is positive and significant at the one percent level (coefficient = 0.1024, t = 3.89), confirming that the e-invoice reform improves internal control quality and thereby contributes to higher disclosure quality.

Table 6. Mechanism-Testing

Variable	(1) FD (Zscore)	(2) Index (Internal Control)
Treat × Post	1.7834*** (4.72)	0.1024*** (3.89)
Controls	YES	YES
Year FE	YES	YES
Firm FE	YES	YES
Constant	28.4123*** (4.12)	3.4892*** (6.74)
N	876	854
R^2	0.0812	0.0687

FURTHER ANALYSIS

Heterogeneity Analysis

The effect of the e-invoice reform on disclosure quality may vary depending on how difficult governance is inside the firm. Two dimensions of internal governance difficulty are considered. The first is financing constraints, measured using the KZ index of Kaplan and Zingales (1997). Firms under higher financing constraints have stronger incentives to improve their disclosure quality because transparent reporting helps them access external financing on more favorable terms (X. Zhao et al., 2023). The second dimension is operational complexity, measured as the natural logarithm of the number of days between the balance sheet date and the audit report release date, following the approach of (Y. Chen et al., 2023; Yang et al., 2024). Firms with more complex operations find it harder to compile and disclose accurate information, which means the productivity gains from digital transaction tracking are especially valuable for them.

Table 7 shows that the treatment effect is significant at the one percent level among firms with high financing constraints (KZ= 1) and firms with high operational complexity (Seg = 1), but insignificant among their low-constraint and low-complexity counterparts. This pattern confirms that the governance benefits of e-invoice-induced digitization are concentrated among firms for which governance is inherently more challenging.

Table 7. Heterogeneity by Internal Governance

Variable	(1) KZ=1	(2) KZ=0	(3) Seg=1	(4) Seg=0
Treat × Post	0.1623*** (4.31)	0.0019 (0.06)	0.1701*** (4.87)	0.0198 (0.67)
Controls	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Constant	0.8234 (1.28)	0.0312 (0.05)	0.8014 (1.21)	0.6412 (1.09)
N	401	445	412	464
R^2	0.0511	0.0174	0.0537	0.0218

The monitoring role played by financial analysts and media organizations is an important dimension of the external governance environment. Analyst coverage is measured by the number of research reports issued for each firm in a given year, following (J. Wang & Yue, 2024; H. Zhang & Dong, 2023), and firms are classified as high or low analyst attention based on the industry-year median. Media attention is measured as the natural logarithm of one plus the total number of news articles mentioning the company in major Egyptian financial media outlets including Al-Mal, Al-Borsa, and Mubasher during the year, following (Hu & Yang, 2024; Jin et al., 2024; Jin & Mirza, 2024). Firms are classified as high or low media attention based on the industry-year median.

Table 8 shows that the treatment effect is significant among firms with high analyst attention (coefficient = 0.1387, t = 3.98) and among firms with high media attention (coefficient = 0.1204, t = 3.72), but insignificant in the low-attention subgroups. This result indicates that the e-invoice reform's disclosure-improving effect is amplified when firms operate under stronger external monitoring, because external information intermediaries are better positioned to detect and publicize improvements in disclosure quality, creating additional reputational incentives for firms to maintain high standards.

Table 8. Heterogeneity by External Governance

Variable	(1) Attention=1	(2) Attention=0	(3) Media=1	(4) Media=0
Treat × Post	0.1387*** (3.98)	0.0312 (1.09)	0.1204*** (3.72)	0.0278 (0.92)
Controls	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Constant	0.6712 (0.92)	1.4923*** (2.58)	0.3781 (0.59)	0.2341 (0.37)
N	356	520	438	438
R^2	0.0274	0.0308	0.0314	0.0298

Economic Consequences

The ultimate purpose of improved corporate governance is to enhance the firm's capacity to create economic value over time. This section examines whether the disclosure quality improvements induced by the e-invoice reform translate into higher firm value. Two value measures are used: return on assets (ROA) as a proxy for short-term operating performance, and Tobin's Q as a proxy for long-term market value, following Zhang (2023).

Models 3 and 4 are specified as follows:

$$ROA(i,t) = \beta 0 + \beta 1 \times Quality(i,t) + \beta 2 \times Treat \times Post(i,t) + \beta n \times Controls(i,t) + Year + Firm + \varepsilon(i,t) \quad (2)$$

$$TobinQ(i,t) = \beta 0 + \beta 1 \times Quality(i,t) + \beta 2 \times Treat \times Post(i,t) + \beta n \times Controls(i,t) + Year + Firm + \varepsilon(i,t) \quad (3)$$

Table 9 shows that the coefficients on both Quality and Treat × Post are positive and significant at the one percent level in both the ROA and Tobin's Q specifications. This confirms that the e-invoice reform not only improved corporate disclosure quality but also generated tangible gains in both short-term profitability and long-term market valuation. The positive coefficient on Treat × Post in the value regressions, beyond what is explained by Quality alone, further suggests that e-invoice-induced digitization benefits firms through additional channels beyond disclosure, such as operational efficiency and cost reduction.

Table 9. Economic Consequences

Variable	(1) ROA	(2) TobinQ
Quality	0.0187*** (18.34)	0.0219*** (17.89)
Treat × Post	0.0108*** (5.47)	0.0134*** (5.23)
Controls	YES	YES
Year FE	YES	YES
Firm FE	YES	YES
Constant	0.6214*** (15.89)	0.7423*** (15.12)

N	876	876
R^2	0.2214	0.2017

DISCUSSION

On the link between information infrastructure and disclosure quality, this study corroborates the findings of Liu et al. (2023), who show that tax administration reforms that enhance regulatory monitoring lead to improvements in listed company disclosure quality in (Y. Chen et al., 2024; Wu & Li, 2023), who find that digital transformation at the firm level is associated with better disclosure practices. The present study contributes to this literature by demonstrating that externally imposed, infrastructure-level digitization can deliver similar governance benefits even when the digital transformation is not initiated by the firms themselves.

On the financial risk channel, the finding that e-invoice-induced reductions in financial distress risk improve disclosure quality is consistent with (D. Zhang & Zhao, 2023; Y. Zhao & Cai, 2023), both of whom document a negative relationship between financial distress and disclosure quality in Chinese listed companies. Egypt's developing financial market context makes this channel particularly relevant, given that Cairo-listed firms generally face higher financial uncertainty than their counterparts in more developed markets.

On the internal control channel, the results align with (Tsang et al., 2023; X. Yu et al., 2023), both of whom establish positive links between internal control quality and disclosure outcomes. The contribution of this study is to show that external digital platforms, rather than purely internal governance investments, can serve as a mechanism for raising internal control standards.

On heterogeneity, the finding that highly constrained and externally monitored firms respond more strongly to the e-invoice reform resonates with (Raimo et al., 2021; E. P. Y. Yu & Luu, 2021), who document that externally monitored firms in China respond more intensively to institutional governance reforms. In the Egyptian context, where market discipline through analyst coverage is still developing, the complementarity between formal digital monitoring and external information intermediaries is especially noteworthy.

On economic consequences, the positive effect of improved disclosure quality on firm value found in this study is consistent with the broad literature reviewed by (Berlinski & Morales, 2024; Phornlaphatrachakorn & Na Kalasindhu, 2021), who document across multiple institutional settings that high-quality disclosure reduces the cost of capital and improves investment efficiency. For Cairo-listed companies in particular, where information asymmetry between insiders and outside investors has historically been severe, the value-creating potential of disclosure improvements appears substantial. This study provides evidence that digital financial infrastructure reform can generate significant and lasting governance improvements in an emerging market context, and that the mechanisms and heterogeneity patterns observed in this setting closely parallel findings from more mature markets. The Egyptian e-invoice system represents a promising and underexplored policy instrument for capital market development.

POLICY RECOMMENDATIONS

This study uses the establishment of Egypt's national e-invoice system in December 2020 as a quasi-natural experiment to examine how the digitization of commercial billing transactions affects the information disclosure quality of Cairo-listed non-financial companies. Using a DID design with panel data from 2016 to 2024, the study finds that the e-invoice reform significantly improved corporate disclosure quality among firms with high accounts receivable intensity relative to comparable low-receivables firms. This finding is robust to parallel trends testing, counterfactual policy tests, random permutation placebo tests, propensity score matching, and multiple alternative variable definitions.

Mechanism analysis reveals two channels through which this effect operates. The e-invoice system reduces corporate financial risk by improving cash flow management and reducing receivables disputes, which diminishes managerial incentives to engage in selective or misleading disclosure. At the same time, the creation of a digital transaction audit trail strengthens internal control quality, making it more difficult to conceal irregularities and more straightforward for auditors and regulators to verify reported figures. Heterogeneity analysis shows that the governance effect is most pronounced in firms with higher financing constraints, greater operational complexity, higher analyst coverage, and more intensive media attention. Economic consequence tests confirm that the disclosure improvements translate into measurable gains in both short-term profitability and long-term market valuation.

These findings carry several policy implications. Regulators should recognize commercial transaction digitization as a complementary tool for capital market governance. Egypt's e-invoice system was primarily designed as a tax compliance instrument, but its secondary effects on the quality of listed company financial reporting are substantial. The Egyptian Financial Regulatory Authority and the Egyptian Exchange should consider formally incorporating e-invoice compliance data into their disclosure monitoring frameworks, creating more direct links between the tax information environment and the capital market information environment.

The model of infrastructure-level digitization pursued through the e-invoice system offers a scalable template for further financial market reforms. Building on the e-invoice experience, policymakers could consider extending similar digital verification platforms to other domains of financial reporting, such as payroll records, fixed asset registries, and intercompany transfer pricing documentation. These extensions would further reduce the information asymmetry between firms and their external stakeholders.

The results suggest that the governance benefits of digitization are largest for firms where traditional governance mechanisms are weakest. Firms with high financing constraints and operationally complex structures have historically been the most challenging to monitor and the most prone to disclosure lapses. Targeted support for digital financial infrastructure adoption by these categories of firms could yield disproportionate governance dividends.

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