Harder to Evade, Easier to Distort: The Welfare Costs of Anti-Avoidance Rules

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Abstract

How should governments tax mobile corporate income without distorting real capital allocation? We explore this question by evaluating the global shift from capital-based to earnings-based anti-avoidance rules, a cornerstone of international tax reform. Exploiting Uganda's exogenous regime change, we show that while earnings-based caps reduce interest deductions, they fail to raise revenue and instead contract real activity. Welfare comparison shows such shifts replace a broad, low-distortion constraint with a narrow, high-distortion one, raising deadweight costs without a revenue dividend. Our findings challenge the consensus that earnings-based rules are uniformly superior, providing a general framework for designing anti-avoidance policy that balances avoidance and real objectives.

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I Introduction

How should governments tax corporate income when capital and profits are highly mobile across borders? This question has become one of the central problems of modern public finance. Multinational enterprises (MNEs) account for a rising share of global value added (over one-third of world output and two-thirds of international trade),[1] yet jurisdictions struggle to tax their profits effectively because taxable income and real activity can be relocated across borders at low cost (Tørsløv *et al.*, 2023; Bilicka, 2019). This problem is especially acute in developing countries, where corporate income tax accounts for an average of 21 percent of total tax revenue—nearly twice the OECD average of 12 percent—and where MNEs account for a disproportionate share of the formal tax base (OECD, 2025; Bachas *et al.*, 2024; Wier, 2020).

To prevent MNEs from eroding the tax base, governments use anti-avoidance rules. But these rules can be double-edged swords: a rule that makes avoidance costly may also raise the cost of capital, thereby reducing investment and real activity (Grubert & Slemrod, 1998; Suárez Serrato, 2018). The welfare impact of such rules therefore depends not only on how much avoidance they deter, but also on how much investment, employment, and output they distort. A mechanically effective rule can be economically undesirable if it raises revenue only by imposing large real distortions. In this paper, we focus on a flagship anti-avoidance rule recommended by the OECD in 2015 and implemented by more than 85 countries by 2025 to estimate its welfare impacts, accounting for both intended and unintended consequences (OECD, 2025).

The rule targets one of the principal channels of profit shifting: debt. Interest payments are usually deductible from corporate taxable income so that debt creates a tax shield. In a domestic setting, this tax shield affects the choice between debt and equity. In a multinational setting, it also creates an opportunity to relocate profits across jurisdictions. A multinational can assign debt to affiliates in high-tax countries, especially through intra-group loans, thereby increasing deductible interest expenses where tax rates are high. To limit such profit shifting, governments restrict the deductibility of interest expenses. Historically, most countries relied on Thin Capitalization Rules (TCR), which disallow interest deduction once a firm's debt-to-equity ratio exceeds a statutory safe harbor. More recently, the international standard has shifted toward Earnings Stripping Rules (ESR), which cap deductible interest as a

[1] See Cadestin *et al.* (2018) for details.

fixed percentage of a firm's earnings (typically EBITDA). In 2015, the OECD recommended ESR as the primary anti-avoidance instrument under Action 4 of its BEPS framework, arguing that earnings-based caps are harder to circumvent (OECD, 2015). This recommendation triggered a rapid shift toward ESR, fundamentally reshaping the design of interest deductibility regimes around the world.

Despite the widespread adoption empirical evidence on whether the switch from TCR to ESR achieves its intended objectives remains scarce. Existing studies typically focus on high-income countries or simulate the effects of hypothetical reforms, leaving a gap in our understanding of how these rules perform when deployed at scale. This paper fills the gap by exploiting a clean natural experiment. In 2018, Uganda became one of the first African countries to replace its existing thin capitalization rule with an earnings stripping rule. Driven by OECD's advice rather than domestic fiscal conditions, the reform creates a sharp, plausibly exogenous shock to the deductibility regime for multinational affiliates. We use administrative data covering the universe of corporate tax returns to estimate the impacts of this switch on avoidance and real outcomes.

To guide our empirical analysis, we develop a tractable model of MNE behavior, where they choose real capital and debt-based profit-shifting, while the government limits interest deductibility through a leverage- or earnings-based cap. The model highlights a fundamental asymmetry in how each regime interacts with firm heterogeneity. Because TCR imposes a flat, capital-based ceiling, it binds monotonically at the upper tail of the productivity distribution, concentrating distortions on large, highly productive affiliates. By contrast, ESR ties deductibility to endogenous earnings, generating a non-monotone binding pattern that spreads user-cost wedges unpredictably across the firm distribution. These results have important policy implications. Much of the current debate on the two avoidance regimes centers around their avoidance costs. Our model, however, shows (perhaps for the first time) that these regimes bind in different areas of the productivity distribution, and their welfare ranking therefore depends not only on the base they broaden but also on which firms they constrain, the user-cost wedges they impose, and the responsiveness of the capital they distort. The case for ESR accordingly cannot rest solely on its robustness to tax avoidance, as is usually made (for example in OECD, 2015). Even if it is superior on tax avoidance, it may be welfare-inferior if it constrains a more elastic base or if it raises the cost of capital for firms whose debt is not tax-motivated.

Our empirical strategy exploits the fact that replacing TCR with ESR changes the binding constraint for different firms in different directions. Before 2018, an affiliate was constrained only if its leverage exceeded the TCR safe harbor; after 2018, it was constrained only if its interest expenses exceeded 30 percent of EBITDA. Using only pre-reform tax returns, we can thus assign each affiliate to one of four cells defined by whether it was close to the TCR threshold, the ESR threshold, both thresholds, or neither. This classification generates three treatment-control comparisons. Affiliates close only to the ESR threshold identify the effect of introducing an earnings-based cap. Affiliates close only to the TCR threshold identify the effect of removing a leverage-based cap. Affiliates close to both thresholds identify the net effect of replacing TCR with ESR. Affiliates close to neither threshold serve as the common control group. We estimate these effects using a difference-in-differences framework, comparing treated and control affiliates before and after the reform, absorbing firm fixed effects, year fixed effects, and industry-by-year shocks. Identification does not require random assignment to a treatment or control cell but rather that outcomes of compared groups would have trended similarly in the absence of the treatment, which we confirm through event-study specifications.

Before estimating the causal effects, we first establish that profit shifting through debt is empirically relevant in Uganda. We compare MNEs to similar-sized domestic firms in the same industry and location to document three important patterns. First, MNEs report roughly 3.8 times higher loans and 3.9 times higher interest expenses than comparable domestic firms. Importantly, this gap is driven almost entirely by related-party borrowing, the hallmark of intra-group profit shifting. Second, despite having similar assets and sales MNEs report 25 times lower taxable profits than domestic firms. Third, the effective tax rate of MNEs is about half that of domestic firms, and the gap is almost entirely attributable to the extensive margin: 59 percent of MNE firm-year observations report losses compared with 37 percent for domestic firms. This gap rises to 30 percentage points among the largest firms, the opposite of what one would expect if persistent losses reflected genuine economic distress rather than tax avoidance. While these descriptive patterns are not causal evidence of avoidance, they align closely with what one would expect if debt is used to shift taxable profits out of the domestic tax base: high related-party borrowing, large interest deductions, and a disproportionate tendency to report little or no taxable profit.

We next estimate the causal effects of the three treatments separately. Treatment 1, which introduces ESR on previously unconstrained affiliates, produces the sharpest responses. Loans of treated MNEs decrease by roughly 70 percent and their interest deductions by 80 percent after the reform. But the sharp decline in interest deduction does not translate into higher taxable profits or tax revenue. Instead, the tax base contracts even more than deductions, resulting in a net decline in tax liability. Importantly, the contraction extends to real economic activity: sales of treated firms decline, their assets shrink, and their liabilities rise, leading to a nearly 20 percent drop in the net book value. Third-party-reported items such as wages and customs-recorded trade, which are difficult to manipulate, move together with these outcomes, indicating a genuine reduction in real activity rather than mere accounting adjustment. Our second treatment—the removal of the legacy TCR—produces no detectable response on any margin, validating the long-standing view that leverage-based caps are ineffective (OECD, 2015). The third treatment studies firms transitioning from binding TCR to binding ESR. The average effects of this treatment are muted because the reform tightened the constraint for some firms and relaxed it for others. But when we split this group by whether ESR disallowed more interest than TCR at baseline, the pattern mirrors the first treatment. Across all three experiments, the central result is therefore clear: ESR is behaviorally effective but generates no revenue gain and contracts the real tax base; TCR, by contrast, is largely inert.

We translate these reduced-form estimates into a formal welfare comparison using the sufficient-statistic test developed in our theoretical model. The test evaluates whether the transition from TCR to ESR lowers the marginal deadweight cost per dollar of potential revenue. Three findings drive the comparison. The ESR-constrained base is roughly an order of magnitude smaller than the TCR-constrained base, so the mechanical revenue available from tightening the earnings cap is limited. The TCR proves empirically non-distortionary, imposing little efficiency cost when it binds. And the ESR generates large responses, with implied user-cost elasticities in the range of -1.5 to -2.4, in line with recent firm-level evidence from advanced economies (Bloom *et al.*, 2007; Zwick & Mahon, 2017). Thus on every margin our welfare test considers the ESR fares worse than TCR: it constrains a smaller base, raises the user cost of capital more sharply, and bites where firms respond more elastically on the real margin. The reform thus replaced a largely innocuous cap on a broad base with a distortionary cap on a narrow one, raising no additional revenue while shrinking the real base on which all other taxes are levied. These findings challenge the consensus that earnings-based rules are uniformly superior and underscore how globally harmonized standards can generate unanticipated distortions, especially when deployed outside the institutional context for which they are designed.

Our paper contributes to three literatures. First, we speak to the literature on multinational profit shifting, which shows that MNEs report systematically less taxable income in high-tax jurisdictions and shift profits through transfer prices, royalties, and internal debt (Huizinga & Laeven, 2008; Desai *et al.*, 2004; Bilicka, 2019; Tørsløv *et al.*, 2023; Wier, 2020). Our contribution is to move beyond detecting profit shifting to evaluating the rules designed to curb it. Second, we contribute to the literature on debt shifting and interest limitation rules (Fuest *et al.*, 2011; Buettner *et al.*, 2012; Blouin *et al.*, 2014; De Mooij & Hebous, 2018; Jamal, 2024). Existing evidence shows that thin capitalization rules can reduce internal debt, while policy debates often presume that earnings-based caps are more robust. We provide direct causal evidence on the central reform advocated by the OECD of replacing leverage-based caps with earnings-based caps. By decomposing the reform into three separate treatments, we show that ESR is not simply a stricter version of TCR. Instead, it targets a different set of firms and generates different welfare consequences. Third, we add to a growing literature showing that anti-avoidance rules can affect real activity (Grubert & Slemrod, 1998; Suárez Serrato, 2018; de Mooij & Liu, 2021). We show that these real effects are not incidental. They arise because governments regulate observable proxies for avoidance, and those proxies also capture ordinary financing used to support production.

The paper proceeds as follows. Section II develops a simple model of capital choice and profit shifting under TCR and ESR, derives our sufficient-statistic welfare test, and characterizes optimal policy under each regime. Section III describes the 2018 reform and the institutional environment. Section IV outlines our empirical strategy, including the definition of treatment groups, the differences-in-differences design, and the construction of the analysis sample. Section V presents evidence on the prevalence of debt-based profit shifting among multinational affiliates in Uganda. Section VI reports the main causal estimates. Section VII maps the reduced-form estimates into the welfare ranking. Section VIII concludes.

II Theory

This section develops a simple model of capital choice and profit shifting by multinational affiliates in high-tax jurisdictions. The model clarifies how interest-limitation rules affect efficiency and incidence across the productivity distribution, thus offering an apparatus for comparing distributional and aggregate consequences of the two canonical rules. We derive a sufficient statistic test for determining whether a revenue-neutral switch from TCR to ESR will enhance welfare.

II.A Environment

Consider a unit mass of multinational affiliates indexed by productivity $\phi \in [0,1]$ with density $h(\phi)$. Output is given by

$$y = \phi f(k),$$

where k denotes capital and the technology satisfies $f'(k) > 0$ and $f''(k) < 0$.[2]

Profit shifting. In this paper, we focus exclusively on profit shifting through the debt channel. We show later that in our empirical setting the switch from TCR to ESR did not cause substitution to other channels of profit shifting, including transfer pricing. To model profit shifting through the debt channel, we assume that all capital is financed externally at the competitive interest rate r_e. For tax purposes, however, an affiliate may *report* that a share $\lambda \in [0,1]$ of its capital is financed through intragroup debt at interest rate r_i. The interest deduction reported by the affiliate is therefore

$$I_{\text{rep}}(k,\lambda) = r_e(1-\lambda)k + r_i\lambda k = r_e k + (r_i - r_e)\lambda k.$$

Because real financing is entirely external, λ represents a pure profit-shifting choice. Note that treating all internal debt as a profit-shifting device is merely a modeling choice and is not restrictive. More broadly, external debt should be interpreted as the firm's *actual* borrowing and internal debt as an *over-reported* book entry for tax purposes.

Interest limitation rules. To prevent profit shifting through excessive leverage, governments impose interest limitation rules. Consistent with the international practice, we consider two canonical forms of such rules.

1. *Thin capitalization rules (TCR):* These rules cap deductible interest at θk, where

[2] We abstract from labor because it does not affect the mechanisms governing financing, misreporting, or the user cost of capital. With a perfectly elastic labor supply at wage w, the labor first-order condition pins down $F_L = w$. Under the interest limitation rules we study, the optimal labor choice is undistorted. Accordingly, we normalize labor to one and work with the reduced-form technology $f(k) \equiv F(k,1)$ with $k = K$. Any dependence of interest limitation rules on L can be absorbed into parameters when L is fixed, so this normalization entails no loss of generality for the comparative statics and equilibrium conditions that follow.

$\theta > 0$ represents the deductible interest rate per unit of capital.[3] The allowed deduction is thus $\min\{I_{\text{rep}}(k, \lambda),\, \theta k\}$. In our setup, the cap has a bite only if $\theta \in (r_e, r_i)$. If $\theta \leq r_e$, the cap binds even at $\lambda = 0$, and if $\theta \geq r_i$, the cap never binds.

2. *Earnings stripping rules (ESR):* These rules limit deductible interest to a share $\gamma \in (0, 1)$ of EBITDA, which equals $\phi f(k)$ in our framework. The allowed deduction is thus $\min\{I_{\text{rep}}(k, \lambda),\, \gamma\, \phi f(k)\}$.

Avoidance costs. Profit shifting through misreporting is costly due to anti-avoidance rules, audits, and expected penalties. We model these resource costs under regime $j \in \{\text{tcr}, \text{esr}\}$ as

$$C^j(\lambda, k, \phi) \;=\; k\, c^j(\lambda, \phi),$$

where $c^j(\lambda, \phi)$ represents the per-unit-of-capital cost function. To ensure the firm's problem is well behaved, we impose the following restrictions on the cost function.

Assumption 1 (*Avoidance Technology*). *For each $j \in \{\text{tcr}, \text{esr}\}$, c^j is C^2 on $[0, 1] \times [0, 1]$ and satisfies*
(i) Convexity in λ: $c^j_\lambda(\lambda, \phi) > 0$ and $c^j_{\lambda\lambda}(\lambda, \phi) > 0$.
(ii) Productivity advantage: $c^j_\phi(\lambda, \phi) \leq 0$ and $c^j_{\lambda\phi}(\lambda, \phi) \leq 0$.
(iii) Bounded cross-effects: $|c^j_{\lambda\phi}(\lambda, \phi)| \leq \rho_j\, c^j_{\lambda\lambda}(\lambda, \phi)$ for some $\rho_j \in [0, 1)$.
(iv) Low-ϕ boundary: $\lim\limits_{\phi \downarrow 0} c^j_\lambda(\lambda, \phi) = +\infty$ for any fixed $\lambda > 0$.

These are natural restrictions on the avoidance technology. Convexity in λ ensures that marginal avoidance cost rises with the aggressiveness of tax planning. The productivity terms $c_\phi \leq 0$ and $c_{\lambda\phi} \leq 0$ capture economies of scale in tax planning: more productive (larger) affiliates face lower per-unit-of-capital costs and lower marginal costs of avoidance. The bounded cross-effects condition $|c_{\lambda\phi}| \leq \rho c_{\lambda\lambda}$ guarantees well-behaved, monotone comparative statics, where optimal misreporting scales with productivity but not explosively. Finally, the boundary condition $\lim_{\phi \downarrow 0} c_\lambda(\lambda, \phi) = +\infty$ enforces no shifting at very low productivity, preventing degenerate corner solutions.

[3] In practice, thin capitalization safe harbors are often expressed as maximum debt-to-equity ratios (e.g. $D/E \leq \eta$). Writing $K = D + E$, this is equivalent to $D \leq \frac{\eta}{1+\eta} K \equiv \theta_D K$. Since deductible *interest* on the safe-harbor debt equals a benchmark rate $\bar{r}$ times D, the implied cap becomes $\bar{r}\, \theta_D K$. We absorb $\bar{r}$ into θ as $\theta \equiv \bar{r}\, \theta_D$ to express the cap as θk.

Firm problem. Under regime j, an affiliate with productivity ϕ chooses (k, λ) to maximize

$$\text{(1)} \qquad \max_{k \geq 0,\ \lambda \in [0,1]} \pi^j(k, \lambda; \phi) = \underbrace{[\phi f(k) - r_e k]}_{\text{economic profits}} - \underbrace{t\Big(\phi f(k) \ - \ \mathrm{Ded}^j(k, \lambda, \phi)\Big)}_{\text{tax liability}} - \underbrace{k\, c^j(\lambda, \phi)}_{\text{avoidance costs}},$$

where

$$\mathrm{Ded}^{\mathrm{tcr}}(k, \lambda) = \min\{I_{\mathrm{rep}}(k, \lambda),\ \theta k\}, \qquad \mathrm{Ded}^{\mathrm{esr}}(k, \lambda, \phi) = \min\{I_{\mathrm{rep}}(k, \lambda),\ \gamma\, \phi f(k)\}.$$

II.B Optimal Firm Choices

When the interest limitation cap is not binding, the optimal λ solves

$$\text{(2)} \qquad \frac{\partial \pi^j}{\partial \lambda} = t(r_i - r_e)\, k \ - \ k\, c^j_\lambda(\lambda, \phi) = 0 \iff c^j_\lambda(\lambda^u_j(\phi), \phi) = t(r_i - r_e).$$

Using Assumption 1 and the implicit function theorem we get a unique $\lambda^u_j(\phi) \in [0, 1]$ as a solution with

$$\text{(3)} \qquad \frac{d\lambda^u_j}{d\phi} = -\frac{c^j_{\lambda\phi}}{c^j_{\lambda\lambda}} \in [0, \rho_j], \qquad \lambda^u_j(0) = 0.$$

The desired profit shifting is increasing in productivity but with bounded slope.[4] On the same unconstrained branch, the capital FOC leads to the following

$$\text{(4)} \qquad (1 - t)\, \phi\, f'(k(\phi)) = (1 - t) r_e - t(r_i - r_e)\lambda^u_j(\phi) + c^j(\lambda^u_j(\phi), \phi).$$

Differentiating (4) with respect to ϕ and using $c^j_\lambda(\lambda^u_j, \phi) = t(r_i - r_e)$ from (2) we obtain

$$\text{(5)} \qquad (1 - t)\Big[f'(k) + \phi f''(k)\, k'(\phi)\Big] = c^j_\phi(\lambda^u_j(\phi), \phi) \leq 0,$$

which implies that $k'(\phi) \geq 0$ because $f'(k) > 0$, $f''(k) < 0$, and $c^j_\phi \leq 0$ under Assumption 1(ii).[5]

[4] Note that we focus on the interior case where the marginal shifting benefit $t(r_i - r_e)$ lies within the range of marginal avoidance cost $c^j_\lambda(0, \phi) \leq t(r_i - r_e) \leq c^j_\lambda(1, \phi)$ for all $\phi \in (0, 1]$ so that $\lambda^u_j(\phi) \in (0, 1)$ for $\phi > 0$. The corner cases ($\lambda^u = 0$ or 1) are handled identically with the obvious modifications.

[5] For the local analysis in this section, we assume the productivity density $h(\phi)$ is continuous at any cutoff ϕ^*; firm choices $k(\phi)$ and $\lambda(\phi)$ are smooth on the slack and constrained branches; and the measure of firms exactly at the cutoff is zero. Under these regularity conditions, small changes in θ or

II.C Critical Productivity Thresholds

We now establish one of our key results that in general the two anti-avoidance rules bind in different areas of the productivity distribution. This has important welfare and efficiency consequences. When a cap binds at the top, it concentrates distortions on more productive affiliates, curbing the largest shifters but also risking bigger real distortions. On the other hand, if the cap binds at the lower end of the productivity distribution, it spreads smaller wedges across many affiliates, having substantially different welfare consequences.

Proposition 1 (*Unique TCR Cutoff*)**.** *Under the standard assumptions on production and avoidance technologies described above, there exists a unique, interior* $\phi^*_{\text{tcr}} \in (0, 1)$ *solving*

$$(r_i - r_e)\,\lambda^u_{\text{tcr}}(\phi^*_{\text{tcr}}) \;=\; \theta - r_e,$$

such that TCR binds if and only if $\phi \geq \phi^*_{\text{tcr}}$.

Proof. See Appendix A.1 □

Proposition 2. *Under the standard assumptions on production and avoidance technologies described above, there is no guarantee of a unique, interior threshold* $\phi^*_{\text{esr}} \in (0, 1)$ *solving*

$$(r_i - r_e)\lambda^u_{\text{esr}}(\phi^*_{\text{esr}}) = \gamma\phi^*_{\text{esr}}\frac{f(k(\phi^*_{\text{esr}}))}{k(\phi^*_{\text{esr}})} - r_e,$$

such that ESR binds if and only if $\phi \geq \phi^*_{\text{esr}}$. *Instead for less than full deductibility* $\gamma < 1$, *ESR necessary binds on a neighborhood of* $\phi = 0$, *implying that the constrained set is either the whole support, a bottom interval* $[0, \phi^*_{\text{esr}}]$ *(complete reversal of the TCR result), or a non-contiguous bind–slack–bind union.*

Proof. See Appendix A.2 □

II.D Optimal Tax Policy

We now characterize the optimal tax rate and interest deductibility threshold a benevolent government will choose under each regime $j \in \{\text{tcr}, \text{esr}\}$. The government val-

γ do not create first-order mass reclassification at the boundary. This assumption rules out bunching at the TCR and ESR cutoffs. While the lack of bunching at the cutoffs is consistent with what we observe in our empirical application, the assumptions can be relaxed. If bunching is present, local changes in θ or γ will generate extra boundary terms that capture firms located at the cutoff (those indifferent between being constrained and unconstrained).

ues both economic surplus and public revenue so that social welfare is

$$W = \int_0^1 [\, \hat{\pi}(\phi) + \mu\, \tau(\phi) \,]\, h(\phi)\, d\phi, \tag{6}$$

where $\hat{\pi}(\phi)$ is the after-tax profit net of avoidance cost (net private benefit) for a firm of type ϕ; $\mu > 1$ the marginal value of public funds (MVPF); and $\tau(\phi)$ is the tax liability.

Proposition 3 (*Optimal Policy Under TCR*)**.** *When the government implements TCR as its only interest limitation rule, the optimal tax rate t^* and interest deduction cap θ^* are characterized by the following.*

$$t^* = \frac{\mu - 1}{\mu} \cdot \frac{1}{\varepsilon_B} \tag{7}$$

$$\frac{r_e - \theta^* + \bar{c}_{\kappa,\theta}}{1 - t} = \frac{\mu - 1}{\mu} \cdot \frac{K_{\mathcal{C}}}{\mathcal{K}'_\theta} \tag{8}$$

Proof. *See Appendix A.3* □

Here $\varepsilon_B \equiv -\frac{1}{B}\frac{dB}{dt}$ is the aggregate semi-elasticity of the tax base;[6] $K_{\mathcal{C}}$ is the total capital at constrained firms (where TCR cap is binding); and $\mathcal{K}'_\theta$ is how sensitive that capital is to the cap. The dynamics behind the optimal policy is detailed in Appendix A.3. Importantly, the optimal deduction cap equates marginal efficiency cost of the cap (LHS) to its marginal revenue benefit (RHS). A large $K_{\mathcal{C}}$ (big mechanical gains) or a small $\mathcal{K}'_\theta$ (little behavioral erosion) pushes the policy toward a tighter cap.

Proposition 4 (*Optimal Policy Under ESR*)**.** *When the government implements ESR as its only interest limitation rule, the optimal tax rate t^* and interest deduction cap γ^* are characterized by the following*

$$t^* = \frac{\mu - 1}{\mu} \cdot \frac{1}{\varepsilon_B} \tag{9}$$

$$\frac{1 - \gamma^*}{1 - t + t\gamma^*} = \frac{\mu - 1}{\mu} \cdot \frac{1}{r_e + \bar{c}_{\kappa,\gamma}} \cdot \frac{Y_{\mathcal{C}}}{\mathcal{K}'_\gamma}. \tag{10}$$

[6] The aggregate base elasticity is the base-share weighted average of firm-level elasticities. Firms contributing a larger share of the total tax base matter more for revenue and hence their behavioral response to t is more important for the optimal rate (see Appendix A.4 for details).

Proof. See Appendix A.4 □

Here as earlier $\varepsilon_B \equiv -\frac{1}{B}\frac{dB}{dt}$ is the aggregate semi-elasticity of the tax base; $Y_{\mathcal{C}}$ is the aggregate EBITDA of constrained firms; and $\mathcal{K}'_\gamma$ is how much their capital expands when the ESR cap is loosened. For the ESR cap, the optimal γ^* tightens the cap until the MVPF-weighted mechanical revenue from constrained EBITDA exactly offsets the deadweight loss from raising the user cost of capital. For the detailed dynamics driving the optimal policy see Appendix A.4.

II.E Welfare Analysis of a Revenue-Neutral Reform

We now turn to welfare comparison of the two anti-avoidance regimes. To keep the exercise transparent, we begin with a benchmark where both avoidance regimes are in place and their caps are set at optimal values. We then consider a small *revenue-neutral* reform that loosens the TCR cap (raises θ) and tightens the ESR cap (lowers γ). Holding both the tax rate and total revenue fixed allows us to isolate how the cap mechanism—flat under TCR, earnings-based under ESR—reallocates distortionary wedges across different firms and economic margins. Using this thought experiment, we derive a simple sufficient-statistics test: the reform raises welfare if and only if the ESR's shadow deadweight cost per revenue dollar is below that of the TCR.

Proposition 5 (*Revenue-Neutral Reform*)**.** *Consider a small, revenue-neutral reform that loosens the TCR cap (raises θ) and tightens the ESR cap (lowers γ), with $d\gamma = -\frac{\partial R/\partial\theta}{\partial R/\partial\gamma}\,d\theta$ and $\partial R/\partial\gamma \neq 0$. Evaluated at the current policy (t,θ,γ), the reform increases welfare if and only if*

$$\frac{1-\gamma}{1-t+t\gamma}\cdot\frac{(r_e+\bar{c}_{\kappa,\gamma})\,\mathcal{K}'_\gamma}{Y_{\mathcal{C}}} < \frac{r_e-\theta+\bar{c}_{\kappa,\theta}}{1-t}\cdot\frac{\mathcal{K}'_\theta}{K_{\mathcal{C}}}. \tag{11}$$

Proof. See Appendix A.5 □

This condition compares the efficiency cost of the last dollar raised under each regime. The government should prefer whichever instrument minimizes this efficiency cost at the margin. Practically, ESR tends to dominate when the ESR-constrained set is inelastic, is sizable in EBITDA (large $Y_{\mathcal{C}}$), or when avoidance is not resource-intensive at the ESR cap (low $\bar{c}_{\kappa,\gamma}$). By contrast, TCR tends to dominate when its constrained firms are inelastic in capital and when reaching the TCR cap is cheap (low $\bar{c}_{\kappa,\theta}$). Because every term in this inequality is a sufficient statistic, it can be taken directly to data to assess welfare without solving the full model.

Our welfare test has important policy implications on its own. Much of the current debate on the two avoidance regimes centers around avoidance costs, with a general consensus that these costs are higher under ESR than under TCR (OECD, 2015). Inequality (11), however, shows that avoidance costs are only one piece of the welfare calculus. Whether one antiavoidance regime dominates the other also depends on which firms the regime constrains (the composition and size of the constrained set), the user-cost wedge the regime imposes when binding, and the responsiveness of constrained capital to the cap (behavioral erosion). Even if one rule is cheaper on the avoidance margin, it could still be welfare-inferior if it bites where firms are highly responsive, raises the effective cost of capital more sharply, or concentrates distortions on particularly productive (or particularly numerous) affiliates.

III Institutional Context

Uganda is a low-income country with a GDP per capita of approximately $3,276 (PPP, current international dollars) and a population of 53 million as of 2024.[7] Over the past three decades, it has substantially expanded its domestic revenue base: the tax-to-GDP ratio rose from around 9 percent in 2000 to 12.5 percent in 2021, following an even more dramatic increase from approximately 5 percent in the 1980s (UNU-WIDER, 2023; OECD, 2024).[8] Corporate income tax (CIT) revenue has followed a similar trajectory, rising from approximately 0.34 percent of GDP in 1995 to about 1 percent of GDP in 2021.

A striking feature of Uganda's CIT regime is the level and stability of its statutory rate. At 30 percent, Uganda's rate is among the highest in the world (Figure B.I). While the global average has declined steadily, Uganda's rate has remained unchanged. In terms of the model, a high statutory rate t amplifies both the tax-saving benefit of profit shifting, $t(r_i - r_e)$, and the distortionary wedge imposed by interest limitation rules on constrained firms. This dual role makes Uganda an especially informative setting for studying the interaction between anti-avoidance rules and real economic outcomes.

[7]Source: World Development Indicators, World Bank.

[8]The OECD's Revenue Statistics in Africa reports Uganda's tax-to-GDP ratio at 12.5 percent in 2021–2022. Earlier figures from the 1980s–1990s are from McNabb (2017).

Our data cover the period 2014 to 2022. In nearly the middle of this period, the country switched its avoidance regime from TCR to ESR, thus offering a natural setting to compare the impacts of the two rules on avoidance and real outcomes. The timeline of the interest limitation legislation is depicted in Figure B.II. Initially, the country had a TCR in place that disallowed interest deductions for affiliates whose debt-to-equity ratio exceeded 1; the ratio was relaxed to 1.5 in 2015. The rule applied exclusively to multinational affiliates with explicit exemption for domestic firms. In addition, there was an arm's-length carve-out in place, exempting affiliates whose total debt did not exceed the amount an independent financial institution would lend, a policy common in most countries that implement TCR. Financial and banking sector firms were exempt from the rule.

In 2018, Uganda replaced its TCR with an ESR. The new rule applied to multinational affiliates and domestic groups, restricting interest deductions where *gross* interest expenses exceeded 30% of EBITDA. As under the previous regime, the disallowance was marginal: only interest in excess of the threshold was denied. Because earnings are more volatile than debt or equity, a disadvantage of earnings-based rule is that the ability to deduct interest fluctuates from year to year. To mitigate this, earnings-based rules usually allow for some form of carry forward of the excess interest (OECD, 2015). Uganda's provision allowed carry forward for up to three years. There was no *de minimis* threshold and the rule applied to all MNEs regardless of their size. As before, the rule did not apply to firms in the finance, banking, and insurance sectors. The rule was applied using the stand-alone approach, which considers the leverage of each subsidiary separately rather than at the global (MNE) level.

The motivation behind the reform was to implement Action 4 of the BEPS framework. This is explicitly stated in the Uganda Revenue Authority's submission to a tax tribunal (URA, 2021):

> Uganda, like other jurisdictions, previously applied the thin capitalization rule to limit excessive deduction of interest, but the Action 4 report and its recommendations pointed out that this method of limiting interest deduction was not effective as entities would easily manipulate the rule to achieve interest deductions that are not commensurate with the level of economic activity. It was recommended that jurisdiction adopt [sic] the fixed ratio rule, which grants an entity interest claiming capacity based upon the level of its taxable income, and therefore Uganda followed suit.

Uganda is not the only country to replace its TCR with ESR following the OECD's recommendation. Figure B.III uses data from Wamser *et al.* (2024) to illustrate that more than 45 countries did so by 2020. Despite this strong global shift toward ESR, several of Uganda's neighbors still rely on thin capitalization rules as their main interest limitation rule, while others, such as the Democratic Republic of the Congo, impose no interest limitation at all.

Appendix B provides further details of our institutional context. These include a section each on how MNEs use debt to shift profits and the advantages and disadvantages of the two canonical interest limitation rules.

IV Research Design

We estimate the causal impacts of the ESR and TCR by exploiting the variation created by the 2018 reform. To see our research design, consider a multinational affiliate i in industry j observed in year t. The firm faces a regulatory state $d \in \{0, tcr, esr\}$, with $Y_{ijt}(d)$ denoting the potential outcome under state d. These potential outcomes are the conceptual objects our treatment effects compare: the effect of imposing the ESR on an otherwise-unconstrained firm, for instance, is $Y_{ijt}(esr) - Y_{ijt}(0)$. What makes the reform usable for identification is that it moved firms between these states in a way fixed by their baseline position. Before the reform, the only binding limit available was the TCR, so a firm's state was $d = tcr$ if the debt-to-equity limit bound and $d = 0$ otherwise. After the reform, the TCR was abolished and replaced by the ESR, so the only available binding state became $d = esr$. Whether a given firm's state actually changed, and in which direction, thus depends on its standing under *both* caps before the reform.

We classify firms using pre-reform data on (i) whether the TCR bound before 2018 and (ii) whether the ESR was predicted to bind, which is computed from baseline earnings and interest. Cross-classifying firms in this way yields the four cells in Figure I, with the mapping to model objects summarized in the table beneath it. Three cells change state and constitute our treatment groups, each isolating a distinct contrast in potential outcomes. *Treatment 1* ($0 \to esr$) identifies the effect of introducing the earnings limit on previously unconstrained firms; *Treatment 2* ($tcr \to 0$) identifies the effect of removing the debt limit; and *Treatment 3* ($tcr \to esr$) identifies the *net* effect of swapping one binding constraint for the other. The fourth cell ($0 \to 0$) is unaffected and serves as the control group. Because each firm's cell is fixed by baseline characteristics, the assignment is unaffected by post-reform responses.

To avoid contamination from firms near either statutory threshold, for practical implementation we impose a doughnut hole around each cap. A firm is taken to fail the TCR if its average debt-to-equity ratio in the pre-reform years exceeds 1.3 rather than the statutory threshold of 1.5. Similarly, a firm is taken to fail the ESR if its average interest-to-EBITDA ratio in the pre-reform years exceeds 0.2 rather than the statutory threshold of 0.3.

Let $G_i \in \{C, T_1, T_2, T_3\}$ denote the cell firm i belongs to, with $D_i^g \equiv \mathbb{1}(G_i = g)$. We recover the effect of each treatment through the differences-in-differences specification

$$Y_{ijt} = \alpha_i + \xi_{jt} + \beta_{\text{DiD}}^g \cdot D_i^g \cdot \text{Post}_t + \varepsilon_{ijt}, \tag{12}$$

estimated on the sample containing firms in the corresponding treatment and control cells only. Here α_i is a firm fixed effect, ξ_{jt} an industry-by-year fixed effect, and Post_t indicates the post-2018 period. The coefficient β_{DiD}^g is the sample analogue of the average change in potential outcomes induced by treatment g. We restrict the sample to MNEs only, so identification comes entirely from within-MNE changes around the 2018 reform that differentially affect the the treated and control cells. Identification rests on the assumption that absent the reform the change in outcomes for treated firms would have followed the same trajectory as for control firms, conditional on the fixed effects in our specification. We assess this assumption empirically through pre-treatment event-study coefficients.

Figure C.I reports the proportion of MNEs that fail the TCR, the ESR, or both in a given year. These proportions define the sizes of the three treatment and the control cells illustrated in Figure I. Of the 3,251 MNE-year observations in our sample, roughly 20 percent fail the TCR, 5–6 percent fail the ESR, and about 2 percent fail both. Because our treated groups are relatively small, conventional inference that relies on large-sample approximations may overstate the statistical significance of our estimates. In one of our robustness tests, we therefore also report standard errors from three procedures specifically designed for settings with small treated groups. The first is randomization inference, which compares the actual estimate to the distribution of placebo estimates obtained by repeatedly reassigning treatment within the estimating sample while preserving the empirical treatment structure (Young, 2019). The second is the approach of Conley & Taber (2011), which constructs the sampling distribution of the treatment effect from the large pool of untreated firms and so does not depend on the number of treated units. The third augments the Conley-Taber procedure with the heteroskedasticity correction of Ferman & Pinto (2019). Reassuringly, our principal results are robust to these alternative approaches.

We measure all outcomes in levels (UGX billions). This choice is motivated by three features of our setting. First, many outcomes, such as taxable income, interest expenses, and net profit, frequently take zero or negative values, which rules out log or inverse-hyperbolic-sine transformations (Chen & Roth, 2023). Second, the welfare test in Proposition 5 is expressed in terms of aggregates ($K_{\mathcal{C}}$, $Y_{\mathcal{C}}$) and their derivatives ($\mathcal{K}'_{\theta}$, $\mathcal{K}'_{\gamma}$), all of which are naturally denominated in levels. Third, the government's objective function weights each firm's tax base linearly (through the MVPF), so equal absolute changes carry equal welfare weight regardless of firm size. We winsorize all continuous outcomes at the 1st and 99th percentiles to limit the influence of outliers and report treatment effects as percentages of the treatment-group baseline mean for ease of interpretation.

Data

We use administrative data from the Uganda Revenue Authority (URA), which includes the universe of corporate tax returns filed between 2014 and 2022. The data have a panel structure, allowing us to track firms over these nine years. Corporate tax returns are submitted electronically within six months of the end of the company's financial year. We observe all variables reported in the tax return, including items in the balance sheet, the profit and loss account, and the calculation of tax liability. Further details on the construction of our analysis sample and the definitions of variables are provided in Appendix C.

Uganda's financial year runs from July 1 to June 30. Throughout this paper, year t refers to the *financial* year beginning on July 1 of year $t-1$. Firms file their tax return six months after the close of their accounting year. The accounting years of firms need not coincide with the tax year: many MNEs follow the calendar year, while others use non-standard years (e.g., April to March). The reform we exploit was enacted on June 21, 2018, and its behavioral effects would therefore begin from the first accounting year closing after the announcement date. In our data, approximately 50 percent of MNEs have accounting years ending after June. For these firms, the 2018 reform affects the return filed for tax year 2018. We therefore treat 2018 as the first post-reform year and 2014–2017 as the pre-reform baseline, giving us four pre-reform and five post-reform years.

Table C.I reports summary statistics of the data. We present the mean and standard deviation of 28 variables used in our empirical analysis, separately for the three types of firms. Our dataset contains 3,251 firm-year observations related to MNEs, the main focus of our analysis. In comparison to domestic firms, MNEs are larger, have higher loan amounts, and adjust more interest expenses. Figure C.II illustrates the industrial and spatial distributions of firms. MNEs are present in most industries and are spread throughout Uganda rather than being concentrated in specific industries or locations.

V Results: Do MNEs Use Debt for Profit Shifting?

Before presenting our causal estimates on the effects of interest limitation rules, we establish that profit shifting through debt is empirically relevant in Uganda. If MNEs do not shift profits via the debt channel, the interest limitation rules cannot have any effect along the avoidance margins.

V.A Level of Loans and Interest Expenses

We first follow the strategy developed by Bilicka (2019) in comparing loans, interest expenses, and other variables of MNEs with domestic firms. Because MNEs are on average larger than other firms, we compare firms of equal size, defined both by annual sales and total assets. Specifically, we estimate the following equation

$$y_{ijc} = \eta + \rho_j + \sigma_c + \delta\, \mathrm{MNE}_i + \phi\, \mathrm{DG}_i + X'\Theta + \nu_{ijc}. \tag{13}$$

Here ρ_j and σ_c are industry and city fixed effects, DG_i a dummy variable indicating that the firm is a domestic group, and X are time-varying controls (annual sales and total assets). We omit the dummy for domestic standalone firms and normalize the outcomes by the average value of the outcome for this omitted category. The coefficients on the two included dummy variables therefore express the average value of the outcome among MNEs and domestic groups as a multiple of the standalone average. Importantly, this comparison is made among firms located in the same city, operating in the same industry, and having the same size.

Table I reports the results. On average, MNEs report roughly 3.8 times higher loans, deduct 3.9 times higher interest expenses, and claim 7.8 times higher non-interest financial expenses than comparable domestic standalones. Their total deductions are 5.4 times the standalone average, yet they report roughly 25 times *lower* profits than comparable standalones. Note that 5-fold higher deductions cannot account for a 25-fold profit shortfall if both MNEs and standalones earn similar gross returns on their assets. This suggests that MNEs are not merely reporting *lower* profits, they are systematically pushing reported profits toward zero or below. Importantly, decomposing loans by counterparty (columns 6–7) shows that the difference in debt is driven almost entirely by related-party loans.[9] In fact, loans from unrelated parties are statistically indistinguishable across the compared groups.

To ensure these differences are not artifacts of linear functional form assumptions or a lack of common support in the firm size distribution, Appendix Table D.I replicates the analysis on a matched sample, where each MNE is compared to standalones matched on observables—industry, district, total assets, and sales—using propensity-score matching, and outcomes are contrasted across the matched firms. The estimates are qualitatively identical: MNEs still have substantially higher loans, interest expenses, and total deductions than comparable standalones, and the gap remains concentrated in related-party borrowing. Magnitudes in these matched comparisons are somewhat smaller but the asymmetry between deductions and reported profits persists.

V.B Effective Tax Rate

In our second strategy to investigate if MNEs shift profits out of Uganda, we compare the effective tax rate paid by MNEs and domestic standalones across the size distribution (see Figure II). We define the effective tax rate as the ratio between net tax liability and net profits, considering the rate to be zero if net profits are zero or negative (see Appendix C.2 for the exact definition). The figure also benchmarks the effective tax rate against the statutory rate (30%) and the Global Minimum Tax rate (15%). Panel A shows that MNEs pay roughly half the effective tax rate of domestic standalones throughout the size distribution, with the rate hovering between one-sixth and one-third of the statutory rate. Panel B demonstrates that this gap persists after partialling out industry and location fixed effects, ruling out compositional differences in the industrial or spatial distribution of firms as the explanation.

The effective tax rate is a ratio, so the MNE-domestic gap could arise through two distinct channels. MNEs may be more likely to report zero or negative profits (extensive margin), or they may face a lower tax rate conditional on being profitable (intensive margin). We next decompose the gap along these margins. Panel A of Fig-

[9] Note that for domestic standalone firms related-party loans mean loans from shareholders and directors. Please see Appendix C.2 for the exact definition.

ure III shows that 59.3 percent of MNE firm-year observations have a zero effective tax rate compared with 36.6 percent of domestic standalones, a raw gap of 23 percentage points. To confirm this gap is not driven by differences in size, industry, or other observables, we estimate a linear probability model regressing an indictor that the firm reports losses or zero profits on an MNE indicator and a series of time-varying controls. Table D.II reports the results. The raw MNE coefficient is 22.7 pp (column 1), which remains stable once the controls are added (columns 2–5).

Panel B of Figure III explores the size gradient in propensity to report losses in more details. It plots the raw loss or zero-profit rate by size decile for MNEs and domestic standalones separately. Among small firms (deciles 1–4), both types report high loss rates ($\sim 80\%$) and the gap is essentially zero. The MNE–standalone gap opens up sharply above the median: by the 6th–9th decile, MNEs are 20–30 pp more likely to report losses than same-size domestic standalones. This is the *opposite* of what real economic fundamentals would predict: larger, more established firms should be less likely to report persistent losses. Panel C of the figure formalizes this by plotting the MNE coefficient from above regressions estimated separately within each size decile. The effect is indistinguishable from zero for the bottom four deciles but rises to 25–30 pp (and is statistically significant) for deciles 6 through 10.

We next examine whether MNEs face a lower effective tax rate conditional on reporting positive profits. Table D.III restricts the sample to firm-years with strictly positive before-tax profits and regresses the effective tax rate on the MNE indicator. The raw gap is 5.6 pp (column 1), which narrows to around 4.0 pp (column 5) with full set of controls. The gap is statistically significant but economically modest. Panel D of Figure III plots the intensive-margin MNE effect by size decile. In contrast to the extensive margin, the point estimates are roughly flat across the distribution at -3 to -5 pp, and the confidence intervals are wide enough that no individual decile rejects zero. Among firms that do report positive profits, the tax code treats MNEs and standalones fairly similarly. The action is overwhelmingly at the extensive margin.

The above descriptive patterns while not causal evidence of avoidance align closely with what one would expect if debt is used to shift profits out Uganda: high related-party borrowing, large interest deductions, and a disproportionate tendency to report little or no taxable profit.

VI Results: Impacts of Anti-Avoidance Rules

In this section, we present our causal estimates of the three treatments illustrated in Figure I and described in section IV. We will focus exclusively on MNEs by dropping from the sample domestic firms.

VI.A Treatment 1: ESR Introduced

We begin by comparing outcomes between MNEs in Treatment 1 and control group using event studies corresponding to specification (12). This comparison isolates the causal impact of the introduction of the ESR, the OECD's recommended approach to limiting debt-based profit shifting. The top two panels of Figure IV present results for the two outcomes—loans and interest expenses—most directly affected by the reform. Both outcomes were evolving on a common trend prior to the 2018 reform, with the event study coefficients statistically indistinguishable from zero in each prereform year. The introduction of the ESR produced a sharp response: relative to the control group total loans reported and interest expenses claimed by treated MNEs reduced sharply when the new rule was implemented and stayed lower in the next five years. The first two columns of Table II show the magnitude of the response, presenting the corresponding difference-in-differences results. Loans of treated MNEs decrease by nearly UGX 13 billion and interest expenses by UGX 1 billion, a substantial reduction of nearly 70 percent and 80 percent relative to the baseline mean.

The remaining panels of Figure IV and columns (4)–(7) of Table II decompose the loans response along two dimensions. The top two panels split borrowing by counterparty and the bottom two by collateral. The first decomposition—related parties (intra-group affiliates) versus unrelated parties (arm's-length lenders)—maps directly onto the internal-versus-external distinction in debt-based profit shifting: a dollar of debt generates the same tax reduction in Uganda regardless of who the lender is but only related-party borrowing relocates the corresponding interest income to an affiliated jurisdiction and thereby reduces the consolidated tax base. The second decomposition provides complementary evidence. Unsecured borrowing—debt not backed by specific assets—is more likely to be a characteristic of intra-group lending, where the absence of arm's-length information frictions removes the need for collateral as a screening device.[10] The empirical pattern we discover is sharp. Unrelated-party loans

[10] Please note that this mapping is imperfect: highly rated firms also borrow externally on an unsecured basis, and intra-group loans can be formally collateralized for documentation or regulatory reasons. We therefore use the secured/unsecured split alongside, rather than as a substitute for, the

and secured loans fall substantially after the reform and remain depressed throughout the post-reform window. In contrast, related-party loans fall only modestly, and unsecured loans are essentially flat or slightly higher. This asymmetry is consistent with a standard reordering of the financing margin. When a binding interest-deduction limit raises the marginal cost of debt, MNEs unwind the loans with the lowest marginal benefit first; related-party loans, which retain their profit-shifting value at any feasible level of leverage, are the last to adjust.[11]

We turn next to items that determine a firm's tax liability (Figure V and Table III). Panel B of the figure (Column 2 of the table) shows that total deductions claimed by the treated firms fall significantly after the reform.[12] In fact, the comparison of deductions with interest expenses shows that deductions decline more than interest expenses by roughly UGX 0.6 billion. This suggests that MNEs' response was broader than a mere mechanical adjustment of leverage. The next two panels and columns examine *disallowed* deductions and carry-forward balance. Under the ESR, firms cannot deduct interest expense exceeding 30 percent of EBITDA in a given year but can carry forward the excess interest for up to three years. Disallowed deductions do not change significantly but the accumulated balance of carry-forward falls. The absence of disallowance could reflect either that treated firms may have actively reorganized their interest claims to hold net interest at or below the 30 percent ceiling or that interest may simply have fallen at least as fast as earnings so that the ratio never crossed the ceiling. The final panel of the figure (Column 5 of the table) shows that the tax liability of treated firms *falls* immediately after the reform but recovers later so that the overall decline is not statistically significant. At first reading, this finding is puzzling because with earnings held fixed, lower deductions must raise tax liability. Panels A and D together provide the explanation. Although the deductions of treated firms fall, their earnings before these deductions (EBITDA) fall even more so that the tax base shrinks rather than expanding. Treated firms also draw down their carry-forward balance (Panel D; column 4), which further offsets the loss of current-period deductions. The reform thus reduced deductions that was its primary target but the resulting revenue gain was overturned by a contraction in the underlying tax base.

counterparty split.

[11]Specifically, at the consolidated level a dollar of related-party debt yields two benefits: the local interest deduction in Uganda and the relocation of taxable income to a lower-tax affiliate. By contrast, a dollar of arm's-length debt yields only the first benefit. When the marginal cost of debt rises, loans having lower marginal benefit are retired first.

[12]Deductions are the adjustments—such as interest expenses, depreciation and amortization—firms can make against their gross income to reduce the tax liability.

The contraction in the tax base could reflect either misreporting or a genuine reduction in real activity. Figures VI–VII and Tables IV–V distinguish between these two mechanisms. Both the income statement and the balance sheet of treated firms contract after the reform: sales, costs, profits, equity, and assets all fall, while liabilities rise. Critically, however, the contraction appears to be driven by a real reduction in economic activity as harder-to-manipulate, third-party-reported items such as wages, imports, and exports also decline like other items (see Figure VII and Table V).

To connect our estimates to the corporate-tax literature, we compute the implied user-cost elasticity of outcomes $\varepsilon_{Y,u} \equiv \frac{\Delta Y/Y_0}{\Delta u/u_0}$ in our setup. The numerator in this expression is the proportional treatment effect from our difference-in-differences specification, whereas the denominator is the proportional change in the user cost of capital induced by the reform calculated under our model. Full technical details of these calculations are provided in Appendix Sections A.6 and A.7, which include the closed-form expression for the user cost and the calibration procedure. Table VI reports the resulting estimates for our five headline outcomes under three calibration scenarios, which bound the user-cost wedge across plausible values of profit shifting intensity.[13] For loans, the implied elasticity ranges from -2.6 under low-shifting to -1.5 under high-shifting scenario. These estimates fall within the published range surveyed by Bloom *et al.* (2007) and are close to recent firm-level evidence in Zwick & Mahon (2017) and Maffini *et al.* (2019).

Robustness and Sensitivity

In this section, we conduct a series of checks on our baseline results presented above to show that they are robust to alternative estimation and inference procedures.

We begin by showing that the evolution of *aggregate* outcomes over our sample period is consistent with our difference-in-differences results. Figures E.I and E.II plot the annual aggregate value of outcomes reported by MNEs in the Treatment 1 group. Each plot shows the corresponding outcome summed across the treated MNEs and indexed to its 2017 value. These plots are model-free objects: they do not condition on covariates, do not invoke a comparison group, and do not impose a functional-form assumption. They just ask whether a structural break around the 2018 reform is visible in the raw data. Indeed, a stark structural break exists in most outcomes.

[13]The user-cost wedge depends on the avoidance-cost technology, which is not directly identified from our data. The three scenarios calibrate the spread $r_i - r_e$ at $\{0.03, 0.08, 0.12\}$ and the unconstrained shifting share λ^u at $\{0.25, 0.40, 0.55\}$, where the medium scenario matches the observed pre-reform share of related-party loans among Treatment 1 firms.

Total loans, interest expenses, secured loans, and unrelated-party loans all collapse from their 2017 levels to roughly 10–35 percent of that benchmark within a year of the reform and remain depressed throughout the post-reform window. Sales and wages, representative real-side outcomes, exhibit the same pattern. This structural break raises confidence in our event-study and DD estimates, illustrating that the conditional-mean dynamics estimated by our specifications are not artifacts of fixed-effects choices or covariate adjustment but rather reflect a feature of the data any reasonable estimator would recover.

Our conceptual framework models a single channel of profit shifting (debt). But in practice MNEs shift profits through several margins, including transfer mispricing, intra-group management fees, and royalties. This raises a substitution concern. Once the ESR makes debt-based shifting more costly, MNEs may redirect profits through these alternative channels, which may conflate real responses we document above. We can rule out such substitution for the following reasons. First, simultaneous contraction in both imports and exports rules out substitution toward transfer-mispricing. Shifting profits out of Uganda through trade requires over-invoicing imports and under-invoicing exports, both of which raise recorded import values yet we observe imports falling rather than rising. Second, Figure E.III replicates our analysis estimating the response of management-fee to the 2018 reform. The estimates are tightly centered on zero throughout the post-reform period, with no break at the 2018 reform, indicating that firms did not raise management-fee payments to offset the loss of interest deductions. We do not present similar evidence for royalties as hardly any MNE in our sample reports non-zero royalties in their corporate tax returns either before or after the reform. The evidence therefore suggests that the post-reform contraction we report above reflects a real response rather than a reallocation of profit shifting across margins.

Table E.I shows that our estimates are robust to inference procedures designed for settings with few treated units. The last three rows of the table report p-values from randomization inference based on 2,000 permutations that reassign treatment status across firms while preserving the empirical treatment structure (Young, 2019), control-based variance estimator of Conley & Taber (2011), and the same estimator with the Ferman & Pinto (2019) correction. The qualitative pattern of results remains unchanged across all three approaches. The estimated decline in total loans (column 1) remains statistically significant at the 1% level under all three approaches. Similarly, the sharp reduction in interest expenses (column 2) and the reallocation away from related-party borrowing (column 4) retain significance or marginal significance across all specifications. Where p-values shift upward under the more conservative corrections, the overall qualitative pattern implied by them remains unaltered.

In our next robustness test, we use independent data from Revelio Labs to assess if our headline result that the introduction of ESR caused a contraction in debt-based profit-shifting activity of MNEs also surfaces in non-tax data.[14] The logic behind our test is simple: if the reform truly curtailed profit-shifting operations (reduced debt, interest expenses, etc.), the contraction should also be visible in the labor market that supports these activities, namely the stock of specialized advisers MNEs employ for tax planning. We use Revelio data to compare the evolution of the employment of these professionals in Uganda relative to a control group comprising nine African countries that retained a TCR regime and never adopted an ESR over our 2014–2025 window.[15] We estimate the standard double- and triple-difference event-study specifications using PPML estimators.

The first panel of Figure VIII presents the double-difference results. The pre-reform coefficients are small and show no differential trend ahead of the reform. After adoption, following a transitory rise the tax-planning headcount declines steadily in Uganda, reaching about -17 log points ($\sim$15% reduction) by the fourth and fifth years. The lagged, progressive contraction is consistent with the slow adjustment of an employment stock. Panel B reports the triple-difference version that absorbs any Uganda-specific shock, most importantly differential LinkedIn adoption and the COVID-19 disruption, through country-by-year fixed effects. This specification identifies the estimate of interest from within-country gap between profit-shifting advisers and a comparison occupation, contrasted between Uganda and the never-treated controls. Against all three benchmarks the estimate is flat before the reform and turns increasingly negative afterward, scaling with how narrowly the benchmark profession is drawn. In the most similar comparison, the decline relative to domestic (non-planning) tax professionals is roughly -40 log points. The contraction is therefore specific to profit-shifting roles rather than a general decline in tax or finance employment and is robust to country-by-year shocks.

Taken together, the overall message from the evidence presented in the last two sections is clear and sobering. The earnings stripping rule induces strong behav-

[14] The Revelio data reconstructs individual career histories from their public professional profiles and is the same data used by Bustos *et al.* (2022) to study Chile's transfer-pricing reform.

[15] These countries are Tanzania, Rwanda, Ghana, Zimbabwe, Mauritius, Malawi, Mozambique, Ethiopia, and Senegal.

ioral responses among treated MNEs: they reduce their borrowing and interest deductions. These adjustments, however, do not translate into higher reported profits or higher corporate tax remittances in Uganda, the primary objective of the reform. Instead, treated firms contract their real footprint, with net book value falling by roughly 20 percent over the post-reform window. The intended margin therefore yields little, while the unintended margin yields a great deal.

VI.B Treatment 2: TCR Removed

We next turn to the causal effects of the removal of the TCR in 2018. Figure F.I shows the results from estimating event-study specifications corresponding to (12) for loans and related outcomes for Treatment 2. We exclude the year 2014 from our sample to avoid conflating the effects of the 2015 reform.[16] The results show that the reform does not affect any of the six outcomes significantly. All outcomes evolve similarly between the treatment and control groups throughout the five post-reform years. There are slight increases in interest expenses and loans, but these changes are not statistically significant. Figures F.II-F.IV extend this analysis to the 18 other outcomes we study. The findings are consistent with the trends observed above. The reform does not produce statistical significant effects and where on rare occasions it does (e.g. sales and gross profits) the changes as expected are in the opposite direction to what we observe for Treatment 1.

These findings are not surprising. Indeed, the key reason behind the OECD's recommendation that the TCR should not be used as the main anti-avoidance rule for debt-based profit shifting was that MNEs could easily circumvent this rule (please see Appendix B.2 for details). Our results validate the rationale behind the OECD's recommendation. The TCR does not seem to have any effect on interest deduction claimed by MNEs. Nor does it result in an increase in tax paid in Uganda.

VI.C Treatment 3: TCR Replaced by ESR

We now examine our final treatment. This experiment involves MNEs transitioning from the TCR to the ESR. Any response would thus be informative about which of the two tests is more effective against profit shifting through the debt channel. Figure G.I shows the results for loans and related outcomes, illustrating that the treatment does not induce any significant response. The outcomes do not diverge in any meaningful

[16]Recall that in 2015, the safe harbor for TCR was relaxed from 1 to 1.5. Effectively, we are assuming that the response to the 2015 reform was immediate and permanent, making the years 2015–2017 a stable baseline. Our event studies are indeed consistent with this assumption.

way from the pre-existing trend at the time of the reform. Figures G.II-G.IV confirm that this pattern holds in general for the other 18 outcomes we study.

One important distinction between Treatment 3 and other treatments is that the intensity of treatment under this experiment does not move in one single direction for all treated firms. When the TCR is replaced by the ESR, the treatment intensity—measured as the amount of interest deduction disallowed by each test—would increase for some MNEs while decreasing or remaining the same for others. The *average* effect of the treatment therefore is not informative of the underlying responses. To address this issue, we define a new dummy variable that takes the value 1 if for an MNE the interest deduction disallowed by the ESR is greater than the interest deduction disallowed by the TCR at the baseline (2014–2017). Effectively, these MNEs face similar incentives to those in Treatment 1 given that the 2018 reform restricts their interest expense deduction to some degree. Therefore, the responses of these MNEs must be similar to those facing Treatment 1.

Tables G.I-G.IV test this hypothesis. We estimate our difference-in-differences model by partitioning the double interaction term into two parts. The additional, triple-interaction term captures the responses of MNEs for which the 2018 reform results in increased treatment intensity. The results are consistent with the hypothesis laid out above. Loans, interest expenses, and financial expenses decrease for MNEs with increased treatment intensity, while they move in the opposite direction for the other treated firms. Similar to Treatment 1, the reduction in loans is largely driven by loans from unrelated parties and secured loans. Additionally, the lower deduction of interest expenses does not lead to higher tax payment as the tax liability of MNEs experiencing increased treatment intensity actually falls. In general, the real economic activity of these treated firms contracts: their assets decrease, liabilities rise, and net book value falls. For this analysis we do not have the same statistical power as we do for Treatment 1, and as a result some of the signs are not statistically significant. But the overall message is consistent with our earlier results: MNEs that transition from a binding TCR to a binding ESR behave similarly to those experiencing the ESR for the first time (Treatment 1), provided this transition imposes tighter restriction on their ability to deduct interest expenses.

VII Welfare Discussion

Proposition 5 characterizes the condition under which a revenue-neutral transition from the TCR to the ESR raises welfare. The evidence above indicates that such transition did not increase tax payments by MNEs in Uganda. We now turn to the second margin highlighted by the proposition: whether the ESR reduced the real distortions associated with interest limitation rules and thus improved welfare by lowering the efficiency cost.

The key inputs to this exercise are the behavioral parameters $\mathcal{K}'_\gamma$ and $\mathcal{K}'_\theta$ together with the size of the constrained bases $K_\mathcal{C}$ and $Y_\mathcal{C}$. The constrained bases are observed directly in the data and are plotted in Figure G.I. Total assets among TCR-constrained MNEs, which proxy for $K_\mathcal{C}$, average roughly UGX $1{,}600$ billion in the pre-reform period, whereas aggregate EBITDA among ESR-constrained MNEs, $Y_\mathcal{C}$, averages about UGX 85 billion. These magnitudes are not directly comparable as one is a stock and the other a flow. Our welfare comparison therefore rests on the assembled sides of inequality (11) rather than these magnitudes. But given that by construction the ESR cap binds on firms with low EBITDA means $Y_\mathcal{C}$ is generally narrow, so that any behavioral response on the ESR margin usually translates into a larger deadweight cost per dollar of revenue raised.

The result of substituting these objects into the welfare inequality is therefore unsurprising. The ESR regime performs worse than TCR for two complementary reasons. First, $\widehat{\mathcal{K}'_\theta} \approx 0$ effectively collapses the right-hand side of the inequality: the TCR regime is ineffective and thus virtually non-distortionary in our setting.[17] Second, the smaller ESR base inflates the left-hand side of the inequality: each unit of behavioral response on the ESR margin translates into a larger welfare cost per unit of revenue raised. Both channels push the comparison in the same direction. ESR imposes higher marginal deadweight costs on its constrained base than TCR does on its own and this holds across every calibration we consider in Appendix A.6.[18] The reform thus can be effectively viewed as replacing a relatively non-distortionary cap applied to a broader base with a distortionary cap applied to a narrower base without generating any additional revenue.

This comparison, however, captures the within-MNE allocative wedge only. Our reduced-form evidence shows that treated MNEs contracted real activity after the re-

[17]Our inference of $\widehat{\mathcal{K}'_\theta} \approx 0$ is based on the lack of response to Treatment 2 (see Figure F.I). Note that our welfare comparison does not rely on an exact zero. The Treatment 2 point estimates lie close to zero across all capital outcomes, and their confidence intervals exclude values large enough to reverse the welfare comparison. Sampling uncertainty is therefore unlikely to overturn the ranking between TCR and ESR.

[18]This conclusion is based on revenue neutrality and ignores that the ESR caused a reduction in government revenue. Taking the revenue loss into account will add a term $\mu\,\Delta R$ to the welfare change. Because $\mu > 0$, the revenue loss will reinforce the conclusion rather than offsetting it.

form. The implied loss of real output and tax revenue from a shrinking base lies outside the inequality and worsens the welfare comparison further. Read together, the reform paid no revenue dividend, distorted capital, and shrank the real base on which all other taxes are levied. These findings provide the first reduced-form evidence that the BEPS Action 4 framework—a centerpiece of the OECD's anti-avoidance agenda—may impose welfare losses in low-capacity tax environments that its design rationale does not anticipate.

VIII Conclusion

Governments around the world are redesigning corporate tax systems to limit profit shifting by MNEs. A central piece of this redesign is the move from leverage-based thin capitalization rules to earnings-based interest limitation rules. This paper uses Uganda's 2018 reform in this direction to provide causal evidence on the consequences of the two canonical interest-limitation regimes. We show that the reform changed firm behavior but not in the predicted way. The ESR reduced borrowing and interest deductions among treated MNEs, yet these reductions did not increase taxable profits or corporate tax payments. Instead, the affected firms contracted on real margins. By contrast, the leverage-based cap proved non-distortionary. The reform did not increase welfare as it replaced a broad, low-distortion constraint with a narrow, high-distortion one.

These results carry important policy implications. The BEPS Action 4 is likely designed for a setting where capital markets are deep, enforcement capacity is strong, and real activity is less sensitive to the user cost of capital. When transplanted to a low-capacity environment such as Uganda, the rule does not produce the effects it is designed to produce. This does not imply that ESR is always inferior to TCR, much less that governments should abandon efforts to curb profit shifting. Rather, it highlights that the welfare ranking of anti-avoidance rules depends on institutional factors, such as the size and elasticity of the constrained base, the prevalence of tax-motivated versus commercially motivated debt, and the responsiveness of real activity. Our sufficient-statistic test provides a blueprint for other revenue authorities to evaluate their interest limitation regimes using routinely collected administrative data, allowing for context-sensitive policy design rather than one-size-fits-all harmonization.

Several caveats bound our conclusions and point to a research agenda. Our estimates come from a single country and a relatively small population of treated MNEs, which limits the precision of some effects and our ability to explore heterogeneity. Our welfare comparison captures medium-run rather than long-run adjustment; firms may reorganize their financing or real operations more fully over a longer horizon. And while we characterize the welfare ranking of the two regimes as implemented, we do not solve for the optimal cap or for the optimal combination of interest limitation with other anti-avoidance tools, both of which are natural next steps. We leave these questions to future work, while noting that the central message is likely to be robust to them: the choice among anti-avoidance technologies is not merely a question of which rule is harder to evade but of which distortions a government is prepared to impose on the real economy in order to protect its base.

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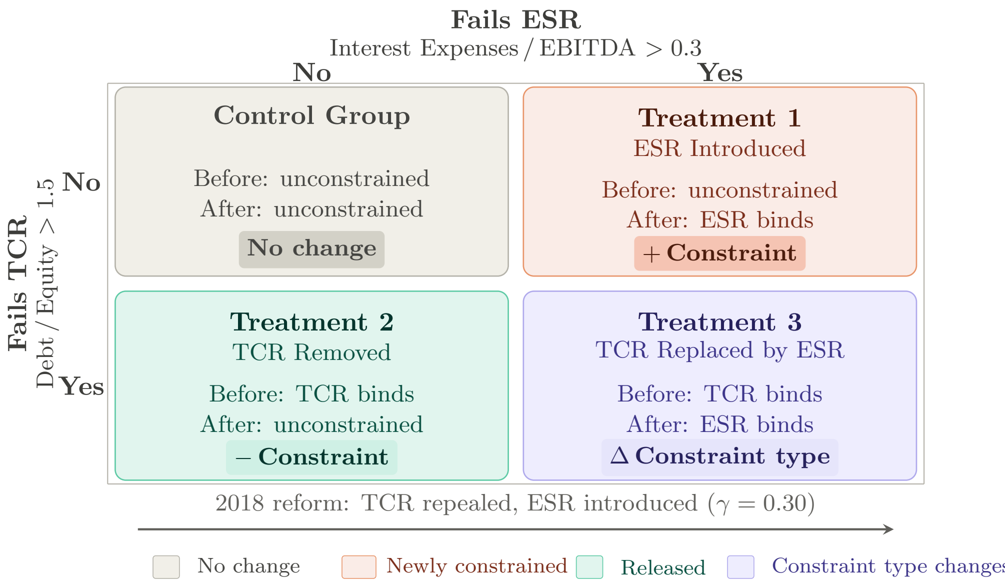
FIGURE I: **VARIATION CREATED BY THE REFORM**

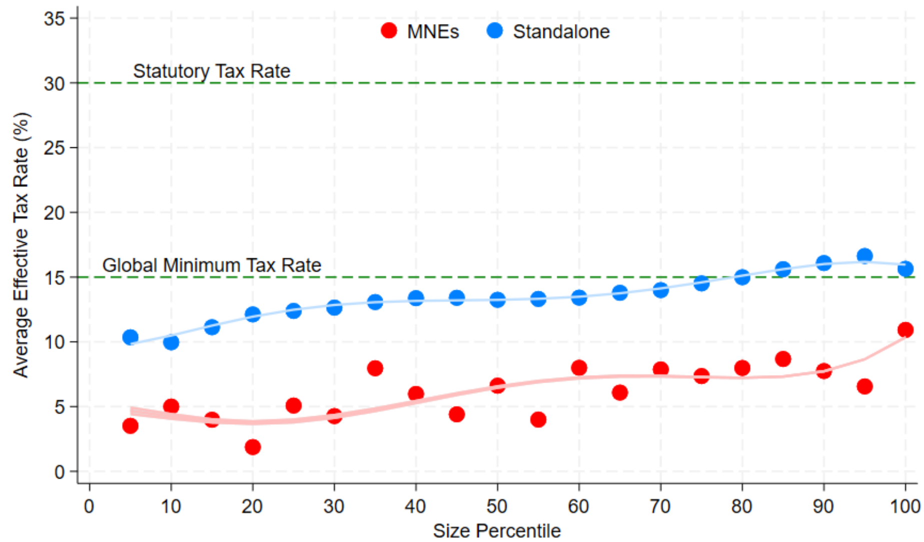


Group	TCR_i	ESR_i	Regime change	Model object identified
Control	0	0	$0 \to 0$	—
Treatment 1	0	1	$0 \to$ ESR	$\mathcal{K}'_{\gamma}$, $Y_{\mathcal{C}}$ (ESR side)
Treatment 2	1	0	TCR $\to 0$	$\mathcal{K}'_{\theta}$, $K_{\mathcal{C}}$ (TCR side)
Treatment 3	1	1	TCR $\to$ ESR	Net welfare comparison

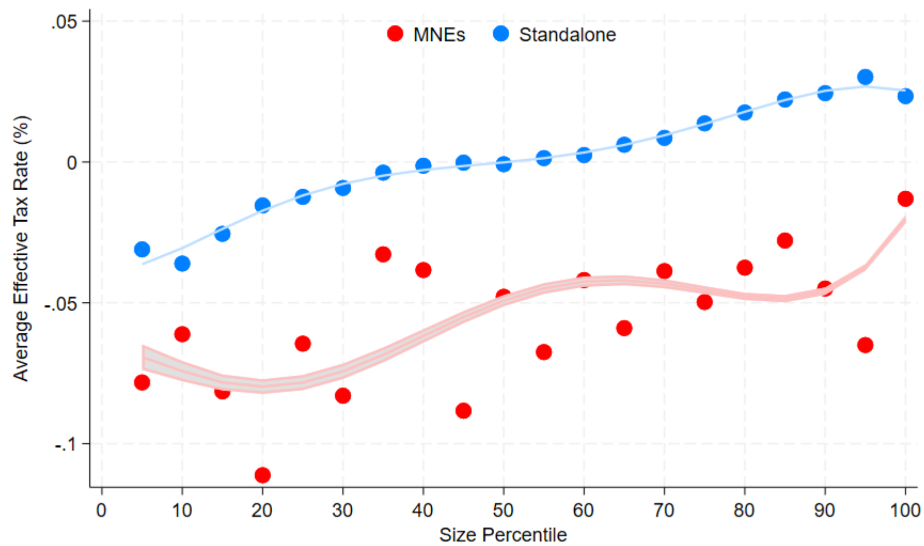
Notes: The figure shows the three treatments created by the 2018 reform, which replaced the Thin Capitalization Rule (TCR) with the Earnings Stripping Rule (ESR). The rows indicate whether a firm fails the TCR, meaning its debt-to-equity ratio exceeds 1.5, while the columns indicate whether the firm fails the ESR, meaning its interest expenses to EBITDA ratio exceeds 0.3. Each cell shows the constraint status before and after the reform. Treatment assignment is determined entirely by baseline characteristics during 2014–2017 and held fixed throughout the sample period. Firms in the *Control Group* (gray) were never at risk of failing either test. Firms in *Treatment 1* (coral) were unconstrained under the TCR but become constrained under the ESR. Firms in *Treatment 2* (teal) were constrained by the TCR but are released when it is repealed. Firms in *Treatment 3* (purple) transition from one binding constraint to another. TCR_i and ESR_i are indicators for whether the firm would be constrained by the TCR and ESR, respectively, based on baseline (2014–2017) characteristics. The control group consists of firms constrained by neither test. To avoid contamination from firms near either statutory threshold, for practical implementation we impose a doughnut hole around each cap. A firm is taken to fail the TCR if its average debt-to-equity ratio in the pre-reform years exceeds 1.3 rather than the statutory threshold of 1.5. Similarly, a firm is taken to fail the ESR if its average interest-to-EBITDA ratio in the pre-reform years exceeds 0.2 rather than the statutory threshold of 0.3. Firms in the intervening bands are excluded from the analysis. The table shows the sufficient statistics in our model identified by each treatment.

FIGURE II: **DO MNES USE DEBT TO SHIFT PROFITS?**

A: Effective Tax Rate – Raw

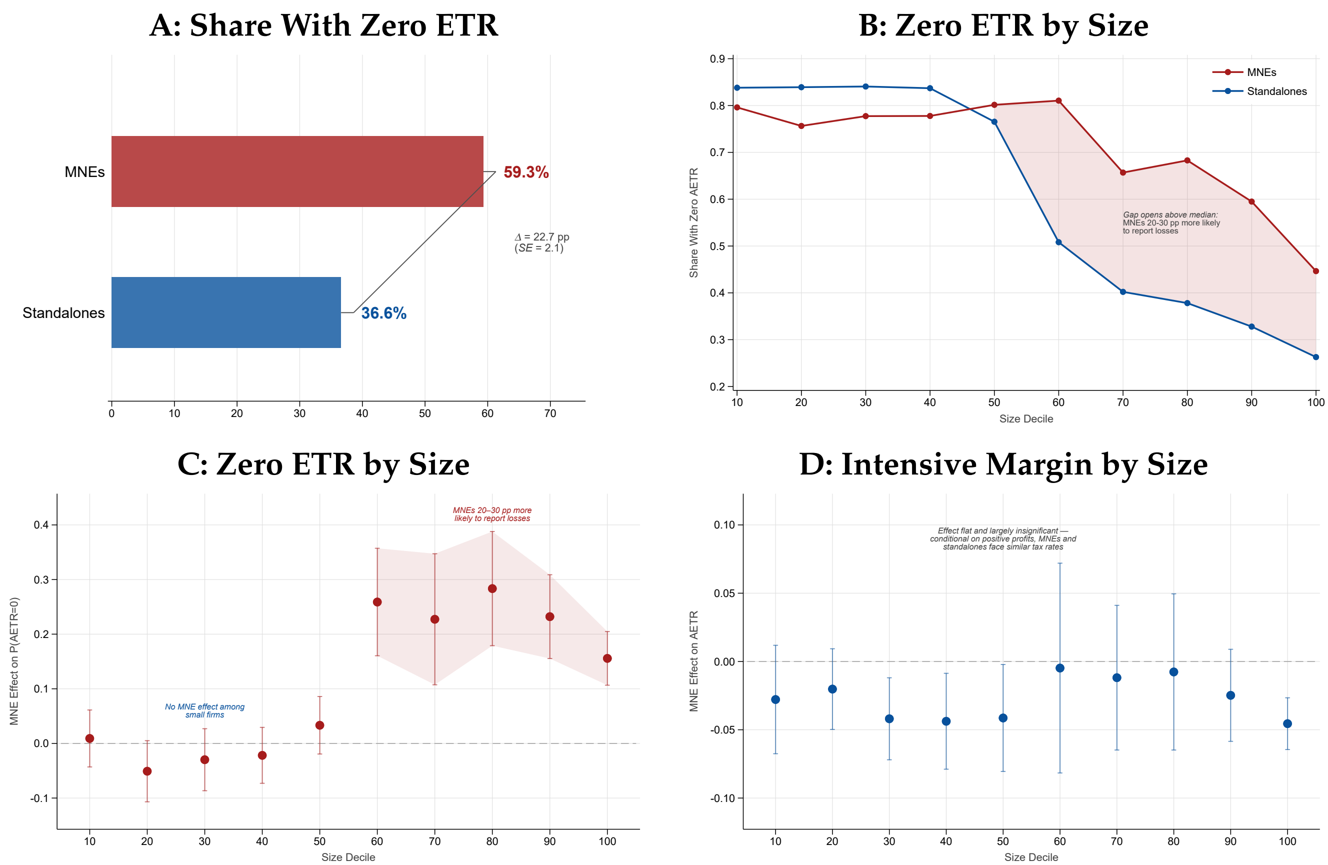


B: Effective Tax Rate – Within Industry and Location



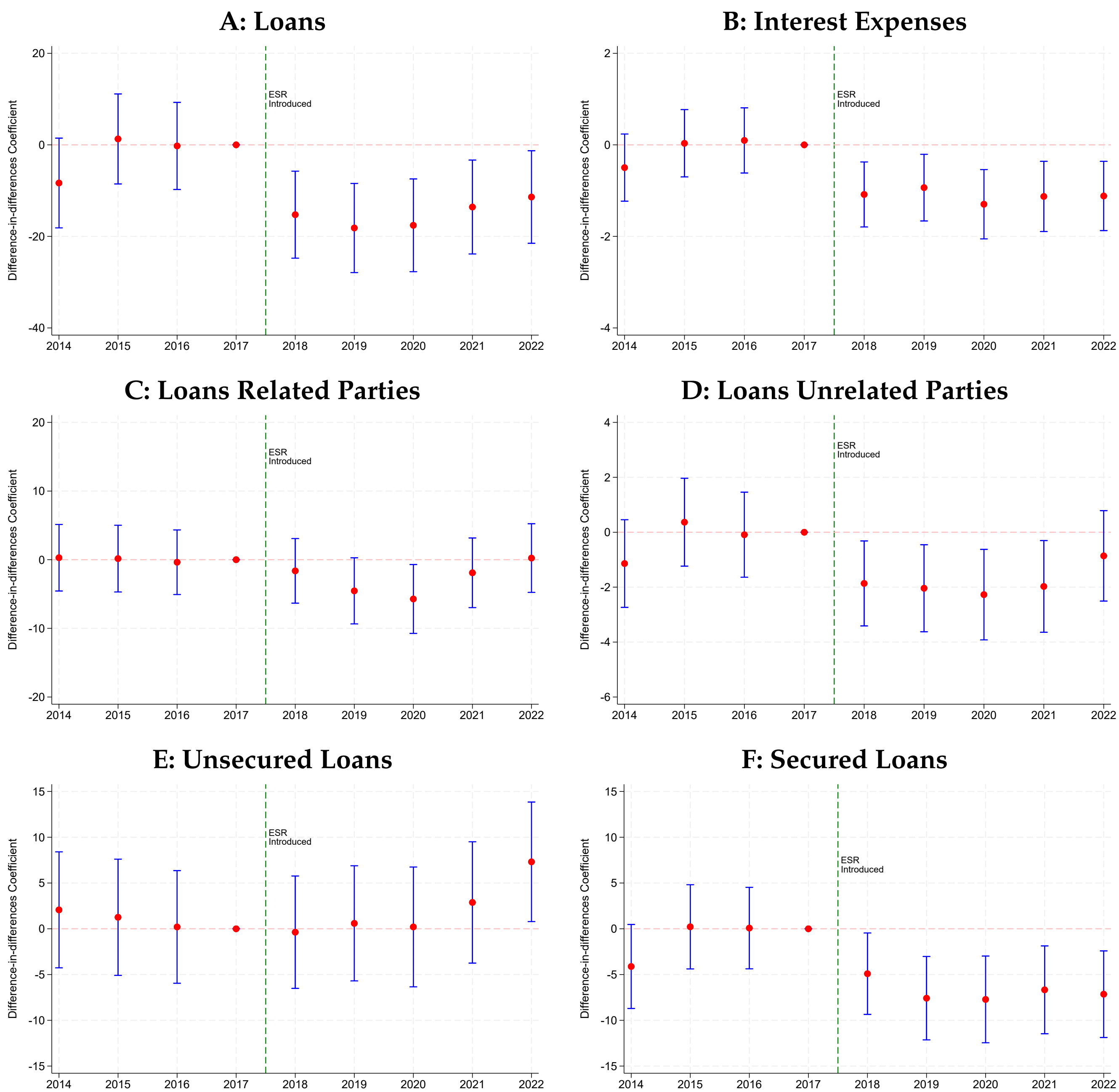
Notes: The figure compares the average effective tax rate faced by MNEs in Uganda with that of domestic standalone firms, using pooled data from 2014 to 2022. Firms are divided into size percentiles based on their annual sales, creating size percentiles at the firm-year level. We define effective tax rate as the ratio between net tax liability and net profits.The tax rate is calculated as zero if net profits are not positive. Panel A plots the average effective tax rate faced by MNEs and domestic standalones within each size percentile bin. Each bin represents a range of 5 percentiles, with the upper bound of the bin included in the bin (e.g. the bin marked 10 includes firms in the size percentiles (5,10]). Panel B replicates the analysis in Panel A, but we now partial out the effects of industry and location. We regress the effective tax rate faced by a firm i in year t on the full set of industry and city fixed effects. We then plot the average value of the residuals from this regression in each bin, separately for the two types of firms. We superimpose a polynomial of degree 4 along with 95 percent confidence interval around it on each set of scatter points.

FIGURE III: **DO MNES USE DEBT TO SHIFT PROFITS?**



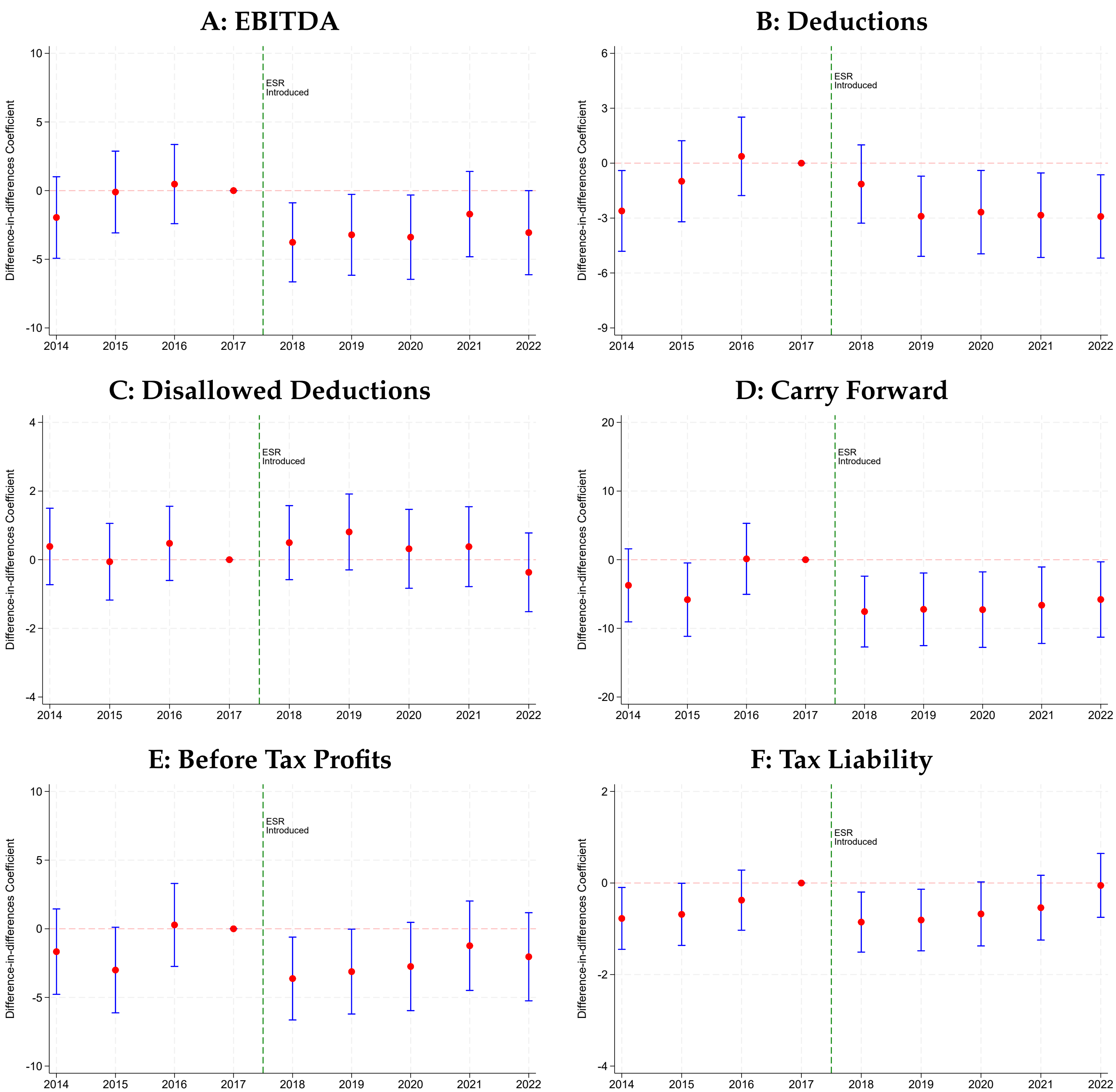
Notes: The figure documents the contribution of differential loss reporting to the gap in effective tax rates between MNEs and domestic standalone firms. Throughout this figure, zero ETR denotes firm-year observations with non-positive profits before tax, for which the average effective tax rate (AETR) is mechanically zero. Panel A reports the unconditional share of zero-ETR observations among MNEs and standalones (59.3% vs. 36.6%; raw gap of 22.7 pp, SE $= 2.1$). Panel B plots the same shares in each decile of the within-year firm-size distribution, where deciles are constructed from annual sales. Panels C and D report, by size decile, the MNE coefficient from regressions of the zero-ETR indicator in Panel C and the AETR conditional on positive profits in Panel D on the MNE indicator with controls for log sales, age, asset tangibility, and debt ratio with industry-by-year and district-by-year fixed effects. Markers display point estimates and bars the 95% confidence intervals. For exact variable definitions, see Appendix C.2.

FIGURE IV: **IMPACTS OF TREATMENT 1**



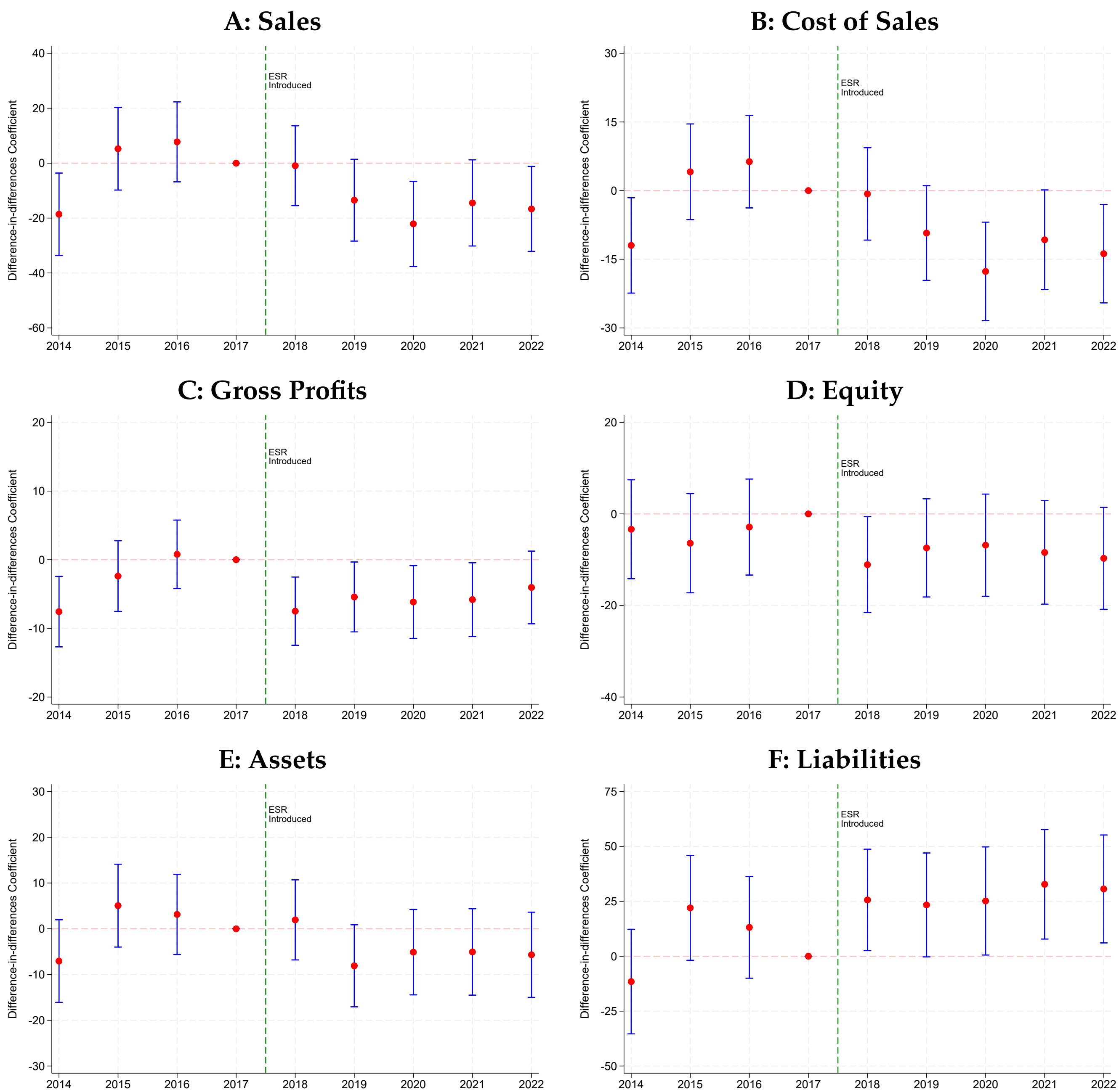
Notes: The figure plots the results from our event study specification corresponding to model (12), illustrating the impacts of the introduction of ESR on MNEs. The sample here comprises only MNEs in the Treatment 1 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average interest expenses to EBITDA ratio during the baseline years of 2014–2017 was greater than 0.2, while their debt to equity ratio never exceeded 1.3 in any of these years. These firms were close to failing the ESR but were never at risk of failing the TCR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please refer to section C.2.

FIGURE V: **IMPACTS OF TREATMENT 1**



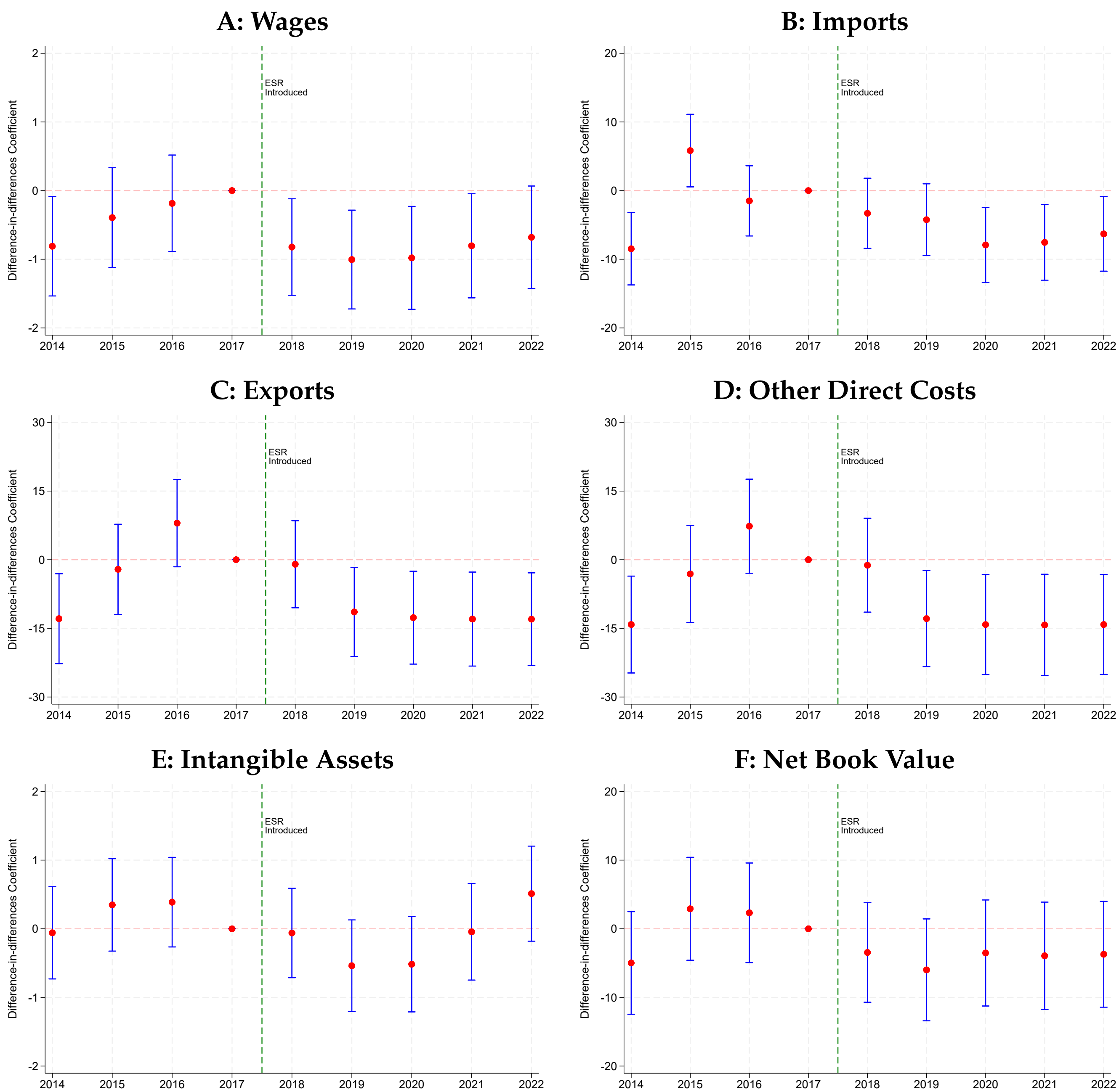
Notes: The figure plots the results from our event study specification corresponding to model (12), illustrating the impacts of the introduction of ESR on MNEs. The sample here comprises only MNEs in the Treatment 1 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average interest expenses to EBITDA ratio during the baseline years of 2014–2017 was greater than 0.2, while their debt to equity ratio never exceeded 1.3 in any of these years. These firms were close to failing the ESR but were never at risk of failing the TCR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please refer to section C.2.

FIGURE VI: **IMPACTS OF TREATMENT 1**



Notes: The figure plots the results from our event study specification corresponding to model (12), illustrating the impacts of the introduction of ESR on MNEs. The sample here comprises only MNEs in the Treatment 1 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average interest expenses to EBITDA ratio during the baseline years of 2014–2017 was greater than 0.2, while their debt to equity ratio never exceeded 1.3 in any of these years. These firms were close to failing the ESR but were never at risk of failing the TCR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please refer to section C.2.

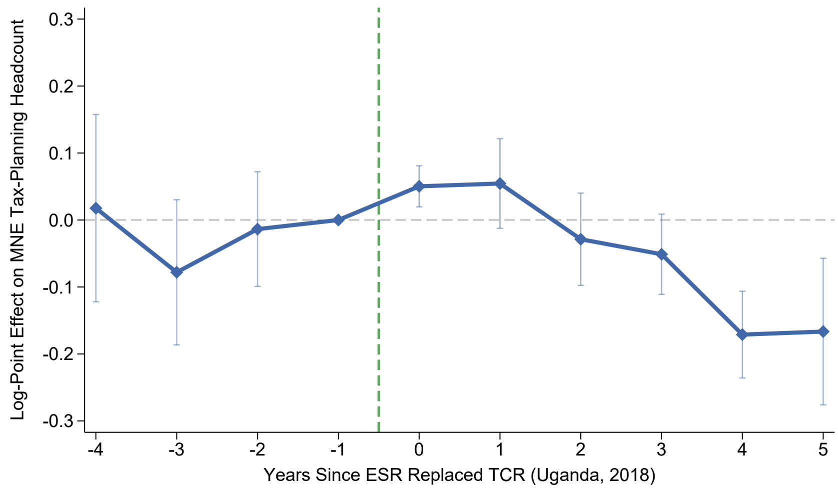
FIGURE VII: **IMPACTS OF TREATMENT 1**



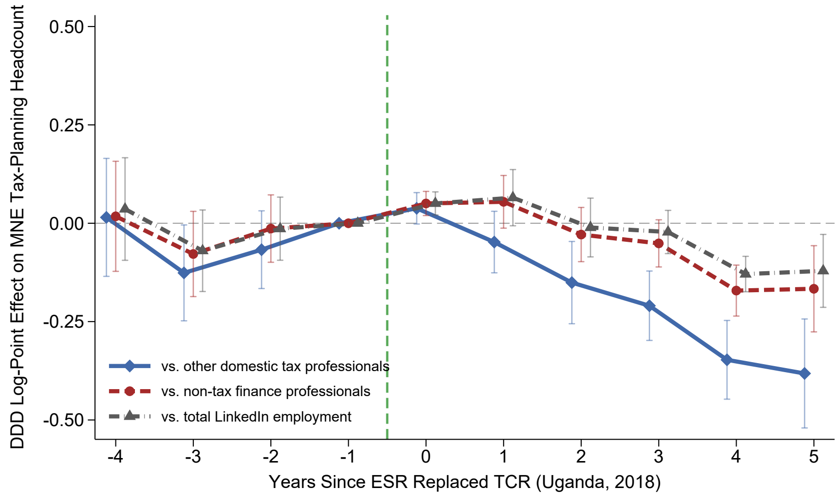
Notes: The figure plots the results from our event study specification corresponding to model (12), illustrating the impacts of the introduction of ESR on MNEs. The sample here comprises only MNEs in the Treatment 1 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average interest expenses to EBITDA ratio during the baseline years of 2014–2017 was greater than 0.2, while their debt to equity ratio never exceeded 1.3 in any of these years. These firms were close to failing the ESR but were never at risk of failing the TCR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please refer to section C.2.

FIGURE VIII: IMPACTS ON THE DEMAND FOR TAX PLANNING PROFESSIONALS

A: Relative to Non-Tax Finance Professionals



B: Relative to Within-Country Comparison Groups



Notes: The figure plots event-study estimates of the effect of 2018 reform. The outcome is the annual stock of workers in MNE tax-planning ("profit-shifting") advisory positions, identified from Revelio Labs profiles using job titles, position descriptions, and Revelio's standardized role taxonomy. Uganda is the treated country; the control group consists of nine African countries that retained debt-to-equity ratio based thin-capitalization rules and never adopted an earnings-stripping rule during the 2014–2025 window (Tanzania, Rwanda, Ghana, Zimbabwe, Mauritius, Malawi, Mozambique, Ethiopia, and Senegal). Event time is measured relative to the year the reform took effect (2018), the year before the reform ($t = -1$) is the omitted reference period, and the endpoints are binned so that every sample year contributes, giving a window from four years before to five years after the reform. All estimates are obtained by Poisson pseudo-maximum-likelihood, and the vertical dashed line marks the reform. Markers are point estimates and capped vertical bars are 95% confidence intervals based on standard errors clustered by country. Panel A reports a difference-in-differences event study with country and year fixed effects. Panel B reports the corresponding triple-difference specification estimated on country $\times$ occupation-group $\times$ year cells with all double interactions included in the regression. The country-by-year fixed effects absorb all country-specific shocks, including differential LinkedIn adoption and the COVID-19 disruption.

TABLE I: **DO MNES USE DEBT TO SHIFT PROFITS?**

Outcomes (y_i):	Loans	Interest Expenses	Non-Interest Financial Expenses	Deductions	Before Tax Profits	Loans Related Parties	Loans Unrelated Parties
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MNE	3.759	3.858	7.772	5.369	-25.782	4.674	0.519
	(0.088)	(0.118)	(0.105)	(0.093)	(1.853)	(0.097)	(0.120)
Domestic Group	1.781	1.846	1.849	2.173	-5.360	1.929	1.522
	(0.134)	(0.180)	(0.160)	(0.142)	(2.818)	(0.148)	(0.182)
Observations	287,273	287,273	287,273	287,273	287,273	287,273	287,273
Control Mean (UGX Millions)	323.592	9.103	8.781	68.785	2.198	115.971	52.440
Controls	Industry Fixed Effects; Location Fixed Effects; Assets; Revenue						

Notes: The table investigates whether MNEs use debt to shift profits out of Uganda. We report results from estimating the regression specification (13). We omit the dummy for domestic standalone firms and run the regression of each outcome on the two other firm-type dummies, controlling for the total assets and revenue of the firm and including both industry and location fixed effects. Here *industry* denotes the 2-digit industry classification the firm belongs to and the *location* the sub-district the firm is located in. For details of industries and locations in our sample, please see Figure C.II. We normalize the outcomes by the control mean (reported in the last row of the table), so that the estimated coefficients show that the average value of the outcome among MNEs and domestic groups as a multiple of the average value of the outcome among standalones. For the precise definitions of the seven variables used here, please see section C.2 in the appendix.

TABLE II: **IMPACTS OF TREATMENT 1**

Outcomes (y_i):	Loans	Interest Expenses	Financial Expenses	Loans Related Parties	Loans Unrelated Parties	Secure Loans	Unsecure Loans
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
treat × after	-13.489***	-1.014***	-1.052*	-2.734***	-1.594**	-5.753***	1.019
	(4.522)	(0.350)	(0.567)	(1.033)	(0.711)	(2.002)	(1.271)
Observations	1,423	1,423	1,423	1,423	1,423	1,423	1,423
Baseline Mean (UGX Billions)	19.5	1.3	2.3	7.0	1.6	7.7	3.2
Effect Size as % of Baseline Mean	-69.3	-79.8	-45.7	-38.8	-98.7	-74.7	32.2
Fixed Affects:	Firm; Year; Industry × Year						

Notes: The table reports the results from our difference-in-differences model (12), estimating the impacts of the introduction of ESR on MNEs. The sample here comprises only MNEs in the Treatment 1 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average interest expenses to EBITDA ratio during the baseline years of 2014–2017 was greater than 0.2, while their debt to equity ratio never exceeded 1.3 in any of these years. These firms were close to failing the ESR but were never at risk of failing the TCR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. The last two rows report the baseline mean of the outcomes in the treatment group in UGX billions and the effect size as percent of this mean. Robust standard errors are in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels. For precise definitions of the outcomes used here, please refer to section C.2.

TABLE III: **IMPACTS OF TREATMENT 1**

Outcomes (y_i):	EBITDA	Deductions	Disallowed Deductions	Carry Forward	Tax Liability	Profits Before Tax	Profits After Tax
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
treat × after	-2.707**	-1.631*	0.147	-4.678*	-0.158	-1.600	-1.853*
	(1.092)	(0.879)	(0.311)	(2.485)	(0.233)	(1.174)	(1.107)
Observations	1,423	1,423	1,423	1,423	1,423	1,423	1,423
Baseline Mean (UGX Billions)	2.4	3.8	0.7	0.2	0.2	0.1	0.2
Effect Size as % Of Baseline Mean	-110.9	-43.4	21.2	-1926.6	-74.8	-1797.5	-830.0
Fixed Affects	Firm; Year; Industry × Year						

Notes: The table reports the results from our difference-in-differences model (12), estimating the impacts of the introduction of ESR on MNEs. The sample here comprises only MNEs in the Treatment 1 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average interest expenses to EBITDA ratio during the baseline years of 2014–2017 was greater than 0.2, while their debt to equity ratio never exceeded 1.3 in any of these years. These firms were close to failing the ESR but were never at risk of failing the TCR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. The last two rows report the baseline mean of the outcomes in the treatment group in UGX billions and the effect size as percent of this mean. Robust standard errors are in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels. For precise definitions of the outcomes used here, please refer to section C.2.

TABLE IV: **IMPACTS OF TREATMENT 1**

Outcomes (y_i):	Sales	Cost of Sales	Gross Profits	Assets	Liabilities	Equity	Net Book Value
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
treat × after	-11.374	-9.432*	-3.646	-4.388	21.334**	-5.678	-4.213**
	(7.273)	(5.584)	(2.268)	(3.353)	(10.083)	(3.606)	(2.077)
Observations	1,423	1,423	1,423	1,423	1,423	1,423	1,423
Baseline Mean	21.0	17.3	4.3	28.1	19.4	22.8	23.5
Effect Size as % of Baseline Mean	-54.1	-54.6	-84.0	-15.6	110.2	-24.9	-17.9
Fixed Affects	Firm; Year; Industry × Year						

Notes: The table reports the results from our difference-in-differences model (12), estimating the impacts of the introduction of ESR on MNEs. The sample here comprises only MNEs in the Treatment 1 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average interest expenses to EBITDA ratio during the baseline years of 2014–2017 was greater than 0.2, while their debt to equity ratio never exceeded 1.3 in any of these years. These firms were close to failing the ESR but were never at risk of failing the TCR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. The last two rows report the baseline mean of the outcomes in the treatment group in UGX billions and the effect size as percent of this mean. Robust standard errors are in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels. For precise definitions of the outcomes used here, please refer to section C.2.

TABLE V: **IMPACTS OF TREATMENT 1**

Outcomes (y_i):	Wages	Imports	Exports	Other Direct Costs	Intangible Assets	Fixed Assets	Shareholder Capital
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
treat × after	-0.517*	-4.494	-8.042*	-8.389*	-0.314*	0.178	-1.352***
	(0.264)	(2.845)	(4.747)	(5.039)	(0.168)	(2.658)	(0.468)
Observations	1,423	1,423	1,423	1,423	1,423	1,423	1,423
Baseline Mean	0.6	8.2	9.2	9.9	0.2	50.1	6.0
Effect Size as % of Baseline Mean	-88.9	-55.1	-87.2	-84.8	-144.9	0.4	-22.5
Fixed Affects	Firm; Year; Industry × Year						

Notes: The table reports the results from our difference-in-differences model (12), estimating the impacts of the introduction of ESR on MNEs. The sample here comprises only MNEs in the Treatment 1 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average interest expenses to EBITDA ratio during the baseline years of 2014–2017 was greater than 0.2, while their debt to equity ratio during these years was less than 1.3. These firms were close to failing the ESR but were never at risk of failing the TCR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. The last two rows report the baseline mean of the outcomes in the treatment group in UGX billions and the effect size as percent of this mean. Robust standard errors are in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels. For precise definitions of the outcomes used here, please refer to section C.2.

TABLE VI: **IMPLIED USER-COST ELASTICITY**

	DD estimate (UGX bn)	Pre-reform mean (UGX bn)	Proportional effect (%)	Implied $\widehat{\varepsilon}_{Y,u}$: No shifting ($\lambda^u = 0$)	Low shifting	Medium shifting	High shifting
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Loans	-13.49***	19.5	-69.3	-2.60***	-2.41***	-1.93***	-1.46***
	(4.52)			(0.87)	(0.81)	(0.65)	(0.49)
Interest expenses	-1.01***	1.3	-79.8	-2.93***	-2.72***	-2.17***	-1.64***
	(0.35)			(1.01)	(0.94)	(0.75)	(0.57)
Loans, related parties	-2.73***	7.0	-38.8	-1.47***	-1.36***	-1.09***	-0.82***
	(1.03)			(0.56)	(0.52)	(0.41)	(0.31)
Loans, unrelated parties	-1.59**	1.6	-98.7	-3.75**	-3.48**	-2.77**	-2.10**
	(0.71)			(1.67)	(1.55)	(1.24)	(0.94)
Secured loans	-5.75***	7.7	-74.7	-2.81***	-2.61***	-2.08***	-1.58***
	(2.00)			(0.98)	(0.91)	(0.72)	(0.55)
User-cost wedge $\Delta u/u_0$ *(%)*				26.6	28.7	35.9	47.4

Notes: The table converts our difference-in-differences estimates presented in Table II into elasticity estimates. Column (1)–Column (3) report the corresponding estimates from Table II. Columns (4)–(7) present the implied elasticity of outcome Y with respect to the user cost, defined as $\widehat{\varepsilon}_{Y,u} = (\widehat{\beta}^{\text{DiD}}/\bar{y}^{\text{pre}})/(\Delta u/u_0)$. Column (4) reports the *no-shifting* benchmark ($\lambda^u = 0$): with no pre-reform profit shifting the user-cost wedge collapses to $\Delta u/u_0 = (1/(1-t+t\gamma)) - 1 = 26.6\%$, which depends only on the statutory parameters t and γ and is invariant to the avoidance-cost primitives. Columns (5)–(7) report the elasticity under three calibrations of the avoidance-cost technology: *low shifting* sets $r_i - r_e = 0.03$ and $\lambda^u = 0.25$; *medium shifting* sets $r_i - r_e = 0.08$ and $\lambda^u = 0.40$; *high shifting* sets $r_i - r_e = 0.12$ and $\lambda^u = 0.55$. The corresponding user-cost wedge $\Delta u/u_0$ is shown in the bottom row. Because a larger assumed pre-reform shifting position raises the wedge and thereby shrinks the implied elasticity, the positive-shifting calibrations in columns (5)–(7) are conservative relative to the no-shifting benchmark in column (4). Common parameters across calibrations: $t = 0.30$, $\gamma = 0.30$, $r_e = 0.10$, with quadratic avoidance technology $c(\lambda) = 0.5\kappa\lambda^2$ and κ recovered from the unconstrained shifting first-order condition. Standard errors on the elasticity are computed via the delta method, treating the calibrated wedge as fixed. ***, **, and * denote significance at the 1%, 5%, and 10% levels. For further technical details of these calculations please see Appendix Sections A.6 and A.7.

Online Appendix

A Proofs and Derivations

A.1 Proposition 1: Critical Productivity Threshold for TCR

Proof. The TCR constraint binds if and only if the desired deduction $I_{\text{rep}}(k, \lambda^u_{\text{tcr}})$ exceeds the statutory cap θk. Substituting the expression for the reported interest I_{rep}, the cap binds when

$$r_e k + (r_i - r_e)\lambda^u_{\text{tcr}}(\phi)k \geq \theta k.$$

Since $k > 0$, we can rewrite the binding condition in terms of the unconstrained misreporting share $\lambda^u_{\text{tcr}}(\phi)$ as

$$(r_i - r_e)\lambda^u_{\text{tcr}}(\phi) \geq \theta - r_e.$$

Denoting the threshold misreporting share as $\bar{\lambda}_{\text{tcr}} \equiv \frac{\theta - r_e}{r_i - r_e}$, the cap binds if $\lambda^u_{\text{tcr}}(\phi) \geq \bar{\lambda}_{\text{tcr}}$. The mapping $\phi \mapsto \lambda^u_{\text{tcr}}(\phi)$ is continuous and non-decreasing (from equation 3, $0 \leq d\lambda^u_{\text{tcr}}/d\phi \leq \rho_{\text{tcr}}$). At the low productivity boundary, $\phi = 0$, Assumption 1 (iv) implies $\lambda^u_{\text{tcr}}(0) = 0$. Assuming a non-binding cap for the lowest productivity firms (i.e., $\bar{\lambda}_{\text{tcr}} > 0$), we have $\lambda^u_{\text{tcr}}(0) < \bar{\lambda}_{\text{tcr}}$. Provided the cap is reachable in the relevant range—$\bar{\lambda}_{\text{tcr}} < \lambda^u_{\text{tcr}}(1)$, a non-degeneracy condition strictly stronger than $\theta \in (r_e, r_i)$—the Intermediate Value Theorem yields at least one solution ϕ^*_{tcr} to the equality. Where $\lambda^u_{\text{tcr}}(\phi)$ is strictly increasing at the crossing (i.e. $c^{\text{tcr}}_{\lambda\phi} < 0$ there), this cutoff is unique. The TCR constraint is thus binding if and only if $\phi \geq \phi^*_{\text{tcr}}$. □

A.2 Proposition 2: Critical Productivity Threshold for ESR

Proof. Let the desired per-unit-capital deduction on the ESR-slack branch be

$$P(\phi) \;\equiv\; r_e \;+\; (r_i - r_e)\,\lambda^u_{\text{esr}}(\phi),$$

where $\lambda^u_{\text{esr}}(\phi)$ is the unique unconstrained misreporting share defined by $c^{\text{esr}}_{\lambda}(\lambda^u_{\text{esr}}(\phi), \phi) = t(r_i - r_e)$ (cf. (2)). Similarly, suppose that the ESR cap per unit of capital is

$$Q(\phi) \;\equiv\; \gamma\,\phi\,\frac{f(k(\phi))}{k(\phi)} \;=\; \gamma\,\phi\,\text{AP}(k(\phi)),$$

where $k(\phi)$ is the firm's capital choice on the ESR-slack branch (well-defined by strict concavity) and $\text{AP}(k) \equiv f(k)/k$ is the average product of capital. A productivity cutoff $\phi^*_{\text{esr}} \in (0, 1)$ that separates constrained and unconstrained firms corresponds to a unique interior zero of the function

$$G(\phi) \;\equiv\; P(\phi) \;-\; Q(\phi).$$

ESR binds where $G(\phi) > 0$ (desired deduction exceeds the cap) and is slack where $G(\phi) < 0$. We can prove the proposition in the following steps.

Step 1 (Regularity and signs of slopes). By Assumption 1 (i)-(iii), $\lambda^u_{\text{esr}}(\phi)$ is well-defined, unique, and non-decreasing with bounded slope. Consequently, the slope of the desired deduction is

$$P'(\phi) = (r_i - r_e)\lambda^{u\prime}_{\text{esr}}(\phi) \in [0, (r_i - r_e)\rho_{\text{esr}}].$$

The slope of the ESR cap is given by the derivative of $Q(\phi)$

$$Q'(\phi) = \gamma\Big(\text{AP}(k(\phi)) + \phi\,\text{AP}'(k(\phi))\,k'(\phi)\Big).$$

Because the production function is strictly concave $f'' < 0$, the average product of capital is decreasing $\text{AP}'(k) = \dfrac{f'(k)k - f(k)}{k^2} < 0$. Moreover, along the slack branch $k'(\phi) \geq 0$ (derived in the text). The slope $Q'(\phi)$ is thus *a priori ambiguous* in sign. It consists of a positive direct effect ($\gamma\,\text{AP} > 0$) and a non-positive indirect effect ($\gamma\,\phi\,\text{AP}'\,k'(\phi) \leq 0$) resulting from capital adjustment. Consequently, the slope of the difference function $G(\phi)$ is sign-indeterminate under the stated assumptions

$$G'(\phi) \;=\; P'(\phi) \;-\; Q'(\phi).$$

Neither global monotonicity nor single-crossing of $G(\phi)$ is guaranteed.

Step 2 (Counterexamples within the assumptions). We now demonstrate three configurations, each consistent with $f'(k) > 0$, $f''(k) < 0$ and Assumption 1, that rule out a unique interior cutoff.

(a) ESR binds everywhere (no interior zero). Choose parameters that yield a *tight cap*, such as small $\gamma > 0$. Provided $r_i - r_e > 0$ and avoidance costs are not excessively steep (allowing $\lambda^u_{\text{esr}}(\phi) > 0$), the desired deduction $P(\phi)$ remains uniformly high $P(\phi) \geq r_e$. The cap $Q(\phi) = \gamma\,\phi\,\text{AP}(k(\phi))$, however, is uniformly small because γ is small and AP is bounded. Thus $G(\phi) = P(\phi) - Q(\phi) > 0$ for all ϕ, and ESR binds for all firms.

(b) ESR binds only at the bottom (reversed monotone partition). Note first that at $\phi = 0$, $\lambda^u_{\text{esr}}(0) = 0$ gives $P(0) = r_e > 0$, while $Q(0^+) = \gamma\,\phi\,\text{AP}(k(\phi)) \to 0$ (or $\to \gamma r_e$ under an Inada f). For the policy-relevant range $\gamma < 1$ (e.g. Uganda's $\gamma = 0.30$), $G(0^+) = r_e > 0$ in the non-Inada case and $G(0^+) = r_e(1-\gamma) > 0$ under Inada; in either regime $G(0^+) > 0$, so ESR *necessarily* binds near $\phi = 0$. Now work in the non-Inada regime, where $Q(0^+) \to 0 < r_e = P(0)$, with a steep avoidance cost ($\lambda^u_{\text{esr}}(\phi) \approx 0$, so $P(\phi) \approx r_e$) and γ chosen so that the rising cap eventually exceeds the (flat) desired level, $Q(1) > r_e$. Then $G(\phi) > 0$ at the bottom and $G(\phi) < 0$ above, so ESR binds on a low-ϕ interval and is slack above: a monotone partition that is the *reverse* of the TCR pattern (ESR binds iff $\phi \le \phi^*_{\text{esr}}$). This already breaks any presumption that ESR mimics TCR's top-binding structure.

(c) Multiple crossings (non-unique interior zeros). Take a strictly concave f for which $\text{AP}(k)$ falls rapidly with k, and parameters yielding $k'(\phi) > 0$ (as in the text). Then the cap $Q(\phi) = \gamma\,\phi\,\text{AP}(k(\phi))$ can be *hump-shaped*: increasing at low ϕ (the direct ϕ effect dominates) but decreasing at high ϕ (the decline in AP from rising $k(\phi)$ dominates). Meanwhile $P(\phi)$ rises smoothly with bounded slope. For suitable choices of $(\gamma, r_i - r_e, c)$ allowed by Assumption 1, the two curves can intersect *twice*, yielding two distinct interior roots of $G(\phi)$. This results in a *non-monotone* binding set: since $G(0^+) > 0$, the achievable pattern has ESR binding at low *and* high ϕ but slack in the middle (bind–slack–bind), violating the requirements for uniqueness of an interior cutoff.

Step 3 (Conclusion). Under the stated assumptions $G'(\phi)$ is sign-indeterminate and the binding set can be (a) the whole support, (b) a bottom interval (the reverse of the TCR pattern), or (c) a non-contiguous bind–slack–bind union. The existence of a *unique interior* $\phi^*_{\text{esr}} \in (0,1)$ that creates a top-binding monotone partition of firms by productivity (as under TCR) is therefore *not guaranteed*. □

A.3 Proposition 3: Optimal Tax Policy Under TCR

Proof. Under TCR, the allowable interest deduction is $\text{Ded}(\phi) = \min\{I_{\text{rep}}(\phi),\, \theta\,k(\phi)\}$, where $I_{\text{rep}} = r_e k + (r_i - r_e)\lambda k$ is the reported interest claim. Let $b(\phi) \equiv \phi f(k(\phi)) - \text{Ded}(\phi)$ be the tax base (taxable profit) of firm of type ϕ and $B \equiv \int_0^1 b(\phi)\,h(\phi)\,d\phi$ the aggregate tax base. Government chooses t and θ to maximize social welfare

$$W = \int_0^1 [\,\hat{\pi}(\phi) + \mu\,\tau(\phi)\,]\,h(\phi)\,d\phi, \tag{14}$$

where $\hat{\pi}(\phi) = [\,\phi\, f(k^{j*}) - r_e\, k^{j*}] \;-\; \tau(\phi) \;-\; C^j(\lambda^{j*},\, k^{j*},\, \phi)$ is the maximized after-tax profit net of avoidance cost and $\tau(\phi) = t\, b(\phi)$ is the tax liability. Firms optimize (k, λ) taking (t, θ) as given.

A.3.1 Optimal corporate tax rate t^*

By the envelope theorem, the welfare derivative with respect to t simplifies to

$$\frac{dW}{dt} \;=\; (\mu - 1)\, B \;+\; \mu\, t\, \frac{dB}{dt},$$

where dB/dt includes all behavioral responses (real k, avoidance λ, and any measure-zero regime switching at ϕ^*_{tcr}). Define the (compensated) semi-elasticity of the aggregate base as

$$\varepsilon_B \;\equiv\; -\frac{1}{B}\frac{dB}{dt} \;>\; 0.$$

Then setting $dW/dt = 0$ yields the optimal tax rule

$$t^* \;=\; \frac{\mu - 1}{\mu} \cdot \frac{1}{\varepsilon_B}$$

It is important to note that the aggregate elasticity ε_B is a weighted sum of firm-level elasticities. To compute these weights, consider that

$$-\frac{1}{B}\frac{dB}{dt} \;=\; -\frac{1}{\int_0^1 b\, h} \int_0^1 \frac{db}{dt}\, h \;=\; \int_0^1 \underbrace{\frac{b(\phi)}{B}}_{\omega(\phi)} \underbrace{\left(-\frac{1}{b(\phi)}\frac{db}{dt}\right)}_{\varepsilon_b(\phi)} h(\phi)\, d\phi,$$

so that

$$\varepsilon_B \;=\; \int_0^1 \omega(\phi)\, \varepsilon_b(\phi)\, h(\phi)\, d\phi, \qquad \omega(\phi) = \frac{b(\phi)}{B}.$$

The aggregate base elasticity is the base-share weighted average of firm-level elasticities $\varepsilon_b(\phi)$. Firms contributing a larger share of the total tax base matter more for revenue; their behavioral response to t is correspondingly more important for the optimal rate. □

A.3.2 Optimal deduction limit θ^*

Proof. Proposition 1 shows that under TCR a critical productivity threshold ϕ^*_{tcr} exists such that only firms with $\phi \geq \phi^*_{\text{tcr}}$ are constrained. Using this result, we define the following constrained set

$$\mathcal{C} \;\equiv\; \{\, \phi \in [0,1] \;:\; \phi \geq \phi^*_{\text{tcr}} \,\}\,.$$

We then write $dW/d\theta = 0$ by summing the mechanical and behavioral effects over $\mathcal{C}$.

Mechanical effect. For $\phi \in \mathcal{C}$ the deduction equals $\text{Ded}(\phi) = \theta k$. The mechanical change in welfare is

$$\frac{\partial W}{\partial \theta}\Big|_{\text{mech}} = \int_{\mathcal{C}} [t\,\partial\text{Ded}/\partial\theta - \mu t\,\partial\text{Ded}/\partial\theta]\, h(\phi)\, d\phi = -\,t(\mu - 1)\underbrace{\int_{\mathcal{C}} k(\phi)\, h(\phi)\, d\phi}_{K_{\mathcal{C}}}\,.$$

Behavioral effect The firm's constrained capital FOC is

$$(1-t)\,\phi f'(k(\phi)) \;=\; r_e \;-\; t\,\theta \;+\; \tilde{c}(\phi),$$

where $\tilde{c}(\phi)$ is the *per-unit capital* avoidance/resource cost at the cap.[19] The derivative of the constrained firm's base w.r.t. k is

$$\frac{\partial b}{\partial k} = \phi f'(k) - \theta = \frac{r_e - \theta + \tilde{c}(\phi)}{1-t}.$$

Hence the behavioral welfare effect is

$$\mu t \int_{\mathcal{C}} \frac{r_e - \theta + \tilde{c}(\phi)}{1-t}\; \frac{dk(\phi)}{d\theta}\; h(\phi)\, d\phi.$$

Sufficient statistics form. Let $\kappa_\theta(\phi) \equiv \dfrac{dk(\phi)}{d\theta} \geq 0$ be the sensitivity of constrained capital to the cap (a looser cap raises capital, $dk/d\theta > 0$, matching the intuition below), and define

$$K_{\mathcal{C}} \;\equiv\; \int_{\mathcal{C}} k(\phi)\, h(\phi)\, d\phi, \qquad \mathcal{K}'_\theta \;\equiv\; \int_{\mathcal{C}} \kappa_\theta(\phi)\, h(\phi)\, d\phi, \qquad \bar{c}_{\kappa,\theta} \;\equiv\; \frac{\displaystyle\int_{\mathcal{C}} \tilde{c}(\phi)\, \kappa_\theta(\phi)\, h(\phi)\, d\phi}{\mathcal{K}'_\theta}.$$

[19] This is a reduced-form way to encode that binding TCR removes the marginal tax value of misreporting beyond the cap; evaluated at the cap, resource costs per unit of capital enter the user cost as $\tilde{c}(\phi)$.

Setting $dW/d\theta = 0$ gives

$$-\,t(\mu-1)\,K_{\mathcal{C}} \;+\; \mu t\,\frac{r_e-\theta+\bar{c}_{\kappa,\theta}}{1-t}\,\mathcal{K}'_{\theta} \;=\; 0,$$

or equivalently

$$\frac{r_e-\theta^*+\bar{c}_{\kappa,\theta}}{1-t} \;=\; \frac{\mu-1}{\mu}\cdot\frac{K_{\mathcal{C}}}{\mathcal{K}'_{\theta}}$$

Aggregation and weights. The behavioral side aggregates with *response weights* proportional to $\kappa_\theta(\phi)$:

$$\int_{\mathcal{C}}\frac{r_e-\theta+\tilde{c}(\phi)}{1-t}\,\frac{dk}{d\theta}\,h = \frac{1}{1-t}\int_{\mathcal{C}}(r_e-\theta+\tilde{c}(\phi))\,\kappa_\theta(\phi)\,h = \frac{r_e-\theta+\bar{c}_{\kappa,\theta}}{1-t}\,\mathcal{K}'_{\theta},$$

with $\bar{c}_{\kappa,\theta} = \int w_\kappa(\phi)\,\tilde{c}(\phi)\,h(\phi)\,d\phi$ and

$$w_\kappa(\phi) \;=\; \frac{\kappa_\theta(\phi)}{\mathcal{K}'_{\theta}}$$

i.e. constrained firms that are *more cap-sensitive* get more weight in the behavioral cost. The mechanical side aggregates with *capital weights* $w_k(\phi) = k(\phi)/K_{\mathcal{C}}$ over the constrained set, reflecting that a tighter cap linearly scales the deduction by k. □

Intuition. The optimal tax rate formula is the classic inverse-elasticity rule: when the aggregate tax base is less responsive, the planner can set a higher rate and vice versa. The optimal deduction cap equates marginal efficiency cost of the cap to its marginal revenue benefit. The LHS of the formula is the user-cost wedge per unit of capital at the cap, where $\bar{c}_{\kappa,\theta}$ is the response-weighted per-unit avoidance cost constrained firms must bear to sit at the cap. Making the cap tighter raises the effective price of capital for constrained firms and destroys surplus at the rate of this wedge times the induced fall in their capital. The RHS of the formula is the MVPF-scaled mechanical revenue per unit of behavioral response. A large $K_{\mathcal{C}}$ (big mechanical gains) or a small $\mathcal{K}'_{\theta}$ (little behavioral erosion) pushes toward a tighter cap.

A.4 Proposition 4: Optimal Tax Policy under ESR

Proof. Under ESR, the allowable interest deduction is

$$\mathrm{Ded}(\phi) \;=\; \min\{I_{\mathrm{rep}}(\phi), \gamma\,\phi\,f(k(\phi)),\}$$

where $I_{\text{rep}} = r_e\, k + (r_i - r_e)\lambda\, k$ is the reported interest claim. Let $b(\phi) \equiv \phi f(k(\phi)) - \text{Ded}(\phi)$ be the firm's tax base and $B \equiv \int_0^1 b(\phi)\, h(\phi)\, d\phi$ the aggregate base. Government chooses t and γ to maximize social welfare

$$W \;=\; \int_0^1 [\,\hat{\pi}(\phi) + \mu\, \tau(\phi)\,]\, h(\phi)\, d\phi, \tag{15}$$

where $\hat{\pi}(\phi) = [\,\phi\, f(k^{j*}) - r_e\, k^{j*}]\; - \;\tau(\phi)\; - \;C^j(\lambda^{j*},\, k^{j*},\, \phi)$ is the maximized after-tax profit net of avoidance cost and $\tau(\phi) = t\, b(\phi)$ is the tax liability. Firms optimize (k, λ) taking (t, γ) as given.

Let $\mathcal{C}_{\text{esr}} \subset [0, 1]$ denote the measurable set of productivities at which ESR binds

$$\mathcal{C}_{\text{esr}} \equiv \{\, \phi \in [0,1] : \gamma\, \phi\, f(k(\phi)) \leq [r_e + (r_i - r_e)\lambda(\phi)]k(\phi)\}\,.$$

A.4.1 Optimal corporate tax rate t^*

The structure of the optimal tax rate problem remains the same as for TCR. The optimal tax rates solves

$$\frac{dW}{dt} \;=\; (\mu - 1)\, B \;+\; \mu\, t\, \frac{dB}{dt} = 0,$$

where dB/dt includes all behavioral responses (real k, avoidance λ, and any measure-zero regime changes). Define the (compensated) semi-elasticity of the aggregate base:

$$\varepsilon_B \;\equiv\; -\frac{1}{B}\frac{dB}{dt} \;>\; 0.$$

FOC $dW/dt = 0$ yields

$$t^* \;=\; \frac{\mu - 1}{\mu} \cdot \frac{1}{\varepsilon_B}.$$

A.4.2 Optimal deduction limit γ^*

We now hold t fixed and vary γ to find its welfare maximizing value. Because any change in γ affects constrained firms only $\phi \in \mathcal{C}_{\text{esr}}$, the mechanical and behavioral effects on welfare produced by a small change in γ can be written as the following.

Mechanical effect. For $\phi \in \mathcal{C}_{\text{esr}}$, $\text{Ded}(\phi) = \gamma\, \phi f(k)$, so at fixed choices

$$\frac{\partial W}{\partial \gamma}\Big|_{\text{mech}} = \int_{\mathcal{C}_{\text{esr}}} [t\, \partial \text{Ded}/\partial\gamma - \mu t\, \partial \text{Ded}/\partial \gamma]\, h(\phi)\, d\phi = -\, t(\mu - 1) \underbrace{\int_{\mathcal{C}_{\text{esr}}} \phi f(k(\phi))\, h(\phi)\, d\phi}_{Y_{\mathcal{C}}}.$$

Behavioral effect. When ESR binds, misreporting is inframarginal ($\partial b/\partial \lambda = 0$), and the capital FOC is

$$(1 - t + t\gamma)\, \phi f'(k(\phi)) \;=\; r_e + \tilde{c}(\phi),$$

where $\tilde{c}(\phi)$ is the per-unit capital avoidance cost at the ESR cap. Differentiating w.r.t. γ gives

$$\frac{dk(\phi)}{d\gamma} \;=\; -\,\frac{t\, \phi f'(k(\phi))}{(1 - t + t\gamma)\, \phi f''(k(\phi))} \;>\; 0 \quad (\text{since } f'' < 0).$$

The base derivative w.r.t. k is $\partial b/\partial k = (1 - \gamma)\phi f'(k)$. Hence the behavioral welfare effect is

$$\mu t \int_{\mathcal{C}_{\text{esr}}} (1 - \gamma)\, \phi f'(k(\phi))\, \frac{dk(\phi)}{d\gamma}\; h(\phi)\, d\phi.$$

Using $\phi f'(k) = \dfrac{r_e + \tilde{c}(\phi)}{1 - t + t\gamma}$ on $\mathcal{C}_{\text{esr}}$, this term becomes

$$\mu t\, (1 - \gamma) \int_{\mathcal{C}_{\text{esr}}} \frac{r_e + \tilde{c}(\phi)}{1 - t + t\gamma}\, \frac{dk(\phi)}{d\gamma}\, h(\phi)\, d\phi.$$

Sufficient-statistics form. Similar to earlier defining

$$\mathcal{K}'_\gamma \;\equiv\; \int_{\mathcal{C}_{\text{esr}}} \kappa_\gamma\, h(\phi)\, d\phi, \qquad \bar{c}_{\kappa,\gamma} \;\equiv\; \frac{\displaystyle\int_{\mathcal{C}_{\text{esr}}} \tilde{c}(\phi)\, \kappa_\gamma(\phi)\, h(\phi)\, d\phi}{\mathcal{K}'_\gamma},$$

and setting $dW/d\gamma = 0$ yields

$$-\, t(\mu - 1)\, Y_{\mathcal{C}} \;+\; \mu t\, (1 - \gamma)\, \frac{r_e + \bar{c}_{\kappa,\gamma}}{1 - t + t\gamma}\, \mathcal{K}'_\gamma \;=\; 0,$$

or equivalently

$$\frac{1 - \gamma^*}{1 - t + t\gamma^*} \;=\; \frac{\mu - 1}{\mu} \cdot \frac{1}{(r_e + \bar{c}_{\kappa,\gamma})} \cdot \frac{Y_{\mathcal{C}}}{\mathcal{K}'_\gamma}.$$

Aggregation and weights. The mechanical effect aggregates with weights proportional to EBITDA ($\phi f(k(\phi))$ over the constrained set. The behavioral effects aggregates with weights proportional to the capital sensitivity $\kappa_\gamma(\phi) \equiv \frac{dk(\phi)}{d\gamma}$. The optimal cap balances the mechanical revenue gain from tightening the cap against the behavioral cost of reduced investment. □

Intuition. The formula for the optimal tax rate is unchanged. For the ESR cap, the optimal γ^* tightens the cap until the MVPF-weighted mechanical revenue from constrained EBITDA exactly offsets the deadweight loss from raising the user cost of capital, where the deadweight loss is higher when constrained capital is very responsive ($\mathcal{K}'_\gamma$ large) or when avoidance is resource-intensive ($\bar{c}_{\kappa,\gamma}$ large).

A.5 Proposition 5: Revenue-Neutral Reform from TCR to ESR

Proof.

A.5.1 Local reform criterion

We seek the condition under which a marginal reform that loosens the TCR cap ($d\theta > 0$) and tightens the ESR cap ($d\gamma < 0$) is welfare-improving while holding revenue constant. The welfare change is

$$dW = \frac{\partial W}{\partial \theta} d\theta + \frac{\partial W}{\partial \gamma} d\gamma.$$

Imposing revenue neutrality, $\frac{\partial R}{\partial \theta} d\theta + \frac{\partial R}{\partial \gamma} d\gamma = 0$, i.e. $d\gamma = -\frac{\partial R/\partial \theta}{\partial R/\partial \gamma}\, d\theta$, the change in welfare can be written as

$$dW = \left(\frac{\partial W}{\partial \theta} - \frac{\partial W}{\partial \gamma} \frac{\partial R/\partial \theta}{\partial R/\partial \gamma} \right) d\theta.$$

Since the reform loosens the TCR cap ($d\theta > 0$), $dW > 0$ requires the term in parentheses to be positive

$$\frac{\partial W}{\partial \theta} - \frac{\partial W}{\partial \gamma} \frac{\partial R/\partial \theta}{\partial R/\partial \gamma} > 0.$$

Loosening the TCR cap lowers revenue, so $\partial R/\partial \theta < 0$; dividing by it reverses the inequality

$$\frac{\partial W/\partial \theta}{\partial R/\partial \theta} < \frac{\partial W/\partial \gamma}{\partial R/\partial \gamma}. \tag{16}$$

This pins down the local revenue-neutral welfare comparison: the marginal welfare loss per revenue dollar from loosening the TCR cap (LHS) must be smaller than that from tightening the ESR cap (RHS).

A.5.2 A sufficient-statistics test

Substituting the revenue-neutrality condition and rearranging, inequality (16) is equivalent to

$$\frac{\text{Behavioral cost of } \gamma \text{ tightening}}{\text{Mechanical revenue gain of } \gamma \text{ tightening}} < \frac{\text{Behavioral cost of } \theta \text{ loosening}}{\text{Mechanical revenue gain of } \theta \text{ loosening}}.$$

The reform loosens the TCR cap and tightens the ESR cap at unchanged revenue. It therefore improves welfare if and only if the shadow deadweight cost of the marginal *tightening* of the ESR cap is less than the shadow deadweight cost of the marginal *loosening* of the TCR cap.

The shadow cost of loosening the TCR cap as derived in section A.3 above is

$$\frac{\text{behavioral cost}}{\text{mechanical gain}} = \frac{\mu}{\mu - 1} \cdot \frac{r_e - \theta + \bar{c}_{\kappa,\theta}}{1 - t} \cdot \frac{\mathcal{K}'_\theta}{K_\mathcal{C}}.$$

For ESR, the shadow cost as derived in section A.4 is

$$\frac{\mu}{\mu - 1} \cdot \frac{1 - \gamma}{1 - t + t\gamma} \cdot \frac{(r_e + \bar{c}_{\kappa,\gamma})\,\mathcal{K}'_\gamma}{Y_\mathcal{C}}.$$

Substituting the expressions for shadow costs into inequality (16) and simplifying yields the welfare comparison formula

$$\frac{1 - \gamma}{1 - t + t\gamma} \cdot \frac{(r_e + \bar{c}_{\kappa,\gamma})\,\mathcal{K}'_\gamma}{Y_\mathcal{C}} < \frac{r_e - \theta + \bar{c}_{\kappa,\theta}}{1 - t} \cdot \frac{\mathcal{K}'_\theta}{K_\mathcal{C}}.$$

□

A.6 Welfare Test: Derivations and Computation

This appendix formalizes the welfare-test computation summarized in Section VII. Proposition 5 states that a small revenue-neutral reform that loosens the TCR cap and tightens the ESR cap raises welfare if and only if

$$\underbrace{\frac{1 - \gamma}{1 - t + t\gamma} \cdot \frac{(r_e + \bar{c}_{\kappa,\gamma})\,\mathcal{K}'_\gamma}{Y_\mathcal{C}}}_{\text{ESR marginal deadweight cost}} < \underbrace{\frac{r_e - \theta + \bar{c}_{\kappa,\theta}}{1 - t} \cdot \frac{\mathcal{K}'_\theta}{K_\mathcal{C}}}_{\text{TCR marginal deadweight cost}} . \tag{17}$$

In the following, we show how we compute or calibrate different inputs to this inequality using our empirical estimates.

A.6.1 Identification of $\mathcal{K}'_\gamma$ from Treatment 1

The model defines

$$\mathcal{K}'_\gamma \;\equiv\; \int_{\mathcal{C}_{\text{esr}}} \frac{\partial K_i}{\partial \gamma}\, h(\phi)\, d\phi,$$

the aggregate sensitivity of ESR-constrained capital to a marginal loosening of the cap. The 2018 reform shifts the effective cap from non-binding (under the prior TCR regime) to $\gamma_{\text{post}} = 0.30$. Treating the reform as a finite difference

$$\widehat{\mathcal{K}'_\gamma} \;\approx\; \frac{\widehat{\beta}_K^{\text{DiD},\,T_1} \cdot N_{T_1}}{\gamma_{\text{post}} - \gamma_{\text{pre}}^{\text{eff}}}, \tag{18}$$

where $\widehat{\beta}_K^{\text{DiD},\,T_1}$ is the firm-level DiD coefficient on the capital stock from equation (12) estimated on the Treatment 1 sample (i.e., $\widetilde{\mathcal{C}}^{\text{esr}}$), $N_{T_1} = |\widetilde{\mathcal{C}}^{\text{esr}}|$ is the number of firms in the set, and $\gamma_{\text{pre}}^{\text{eff}}$ is the effective pre-reform cap. In our setting, before 2018 when the TCR regime was in place the interest-to-EBITDA ratio of MNEs was not formally restricted. The institutional pre-reform cap was therefore effectively unbounded. But the partial derivative $\partial K_i/\partial\gamma$ that the above formula seeks to approximate is well-defined only in a region where the cap is binding. To stay as close to our theoretical model as possible, we use three complementary normalizations for $\gamma_{\text{pre}}^{\text{eff}} =$ and then confirm that our welfare verdict remains unaltered across all these normalizations.

(i) $\gamma_{\text{pre}}^{\text{eff}}$ = pre-reform mean I/EBITDA for the Treatment 1 sample (the cap that would have just bound given pre-reform behavior);

(ii) $\gamma_{\text{pre}}^{\text{eff}} = 1$ (full deductibility upper bound; conservative);

(iii) $\gamma_{\text{pre}}^{\text{eff}}$ = pre-reform median I/EBITDA (alternative central tendency).

We report (i) as our preferred specification with (ii) and (iii) as sensitivities. The same finite-difference logic applies to $\widehat{Y'_\gamma}$, which replaces $\widehat{\beta}_K^{\text{DiD}}$ with $\widehat{\beta}_{\text{EBITDA}}^{\text{DiD}}$ in (18).

A.6.2 Identification of $\mathcal{K}'_\theta$ from Treatment 2

By symmetry

$$\mathcal{K}'_\theta \;\equiv\; \int_{\mathcal{C}_{tcr}} \frac{\partial K_i}{\partial \theta}\, h(\phi)\, d\phi$$

is identified from Treatment 2: MNEs that were TCR-constrained pre-reform and become unconstrained when the equity-ratio test is abolished. The reform corresponds to $\theta^{\text{eff}}_{\text{post}} > \theta_{\text{pre}}$ (effective removal of the cap), so

$$\widehat{\mathcal{K}'_\theta} \;\approx\; \frac{\widehat{\beta}_K^{\text{DiD},\,T_2} \cdot N_{T_2}}{\theta^{\text{eff}}_{\text{post}} - \theta_{\text{pre}}}, \tag{19}$$

where $\theta^{\text{eff}}_{\text{post}}$ is bounded above by the user-cost ceiling derived from (4).

The DiD estimate of $\widehat{\beta}_K^{\text{DiD},\,T_2}$ is a precisely estimated null: the point estimate is small in magnitude and statistically indistinguishable from zero across the four normalizations of capital we consider (total assets, net book value, fixed assets, intangible assets; see Appendix F). We therefore set $\widehat{\mathcal{K}'_\theta} \approx 0$ in the welfare-test computation.

A.6.3 Aggregates $K_{\mathcal{C}}$ and $Y_{\mathcal{C}}$

Both aggregates are computed on the pre-reform-defined sets and averaged over the pre-reform period:

$$\widehat{K}_{\mathcal{C}} \;=\; \frac{1}{T_{\text{pre}}} \sum_{i \in \widetilde{\mathcal{C}}^{\text{tcr}},\, t<2018} K_{it}, \tag{20}$$

$$\widehat{Y}_{\mathcal{C}} \;=\; \frac{1}{T_{\text{pre}}} \sum_{i \in \widetilde{\mathcal{C}}^{\text{esr}},\, t<2018} \text{EBITDA}_{it}. \tag{21}$$

Sample restrictions and treatment-set definitions match those in Section IV. The empirical patterns underlying these aggregates are shown in Figure G.I and discussed in Section VII.

A.6.4 The avoidance-cost wedges

The avoidance-cost terms entering the welfare inequality are response-weighted averages of the per-unit-of-capital resource cost borne by constrained firms at their shifting choice

$$\bar{c}_{\kappa,\gamma} \;\equiv\; \frac{\displaystyle\int_{\mathcal{C}_{\text{esr}}} \tilde{c}(\phi)\, \kappa_\gamma(\phi)\, h(\phi)\, d\phi}{\mathcal{K}'_\gamma}, \qquad \kappa_{\gamma,i} \equiv \frac{\partial K_i}{\partial \gamma}, \tag{22}$$

with $\bar{c}_{\kappa,\theta}$ defined analogously over $\widetilde{\mathcal{C}}^{\text{tcr}}$. The level of these costs depends on how MNEs adjust their profit shifting behavior as the interest limitation cap begins to bind. They could shut down their profit shifting activity completely ($\lambda_i^* = 0$) in which case the avoidance cost will shrink to zero. Or they can keep shifting at the maximum the cap allows ($\lambda_i^* = \widetilde{\lambda}_i > 0$) in which case the per-unit avoidance cost will be $c^{\text{esr}}(\widetilde{\lambda}_i, \phi_i) > 0$.

These two extreme cases provide the bounds on the avoidance costs. But in our setting data show that interest deductions among Treatment 1 firms drop sharply (Section IV and Figures IV–V). This implies that under ESR the behavior of MNEs is closer to the first case: constrained firms respond to the cap primarily by reducing reported intragroup interest claims rather than by sitting at the cap. We therefore assume $\bar{c}_{\kappa,\gamma} \approx 0$ for our welfare analysis.

For the calibration of $\bar{c}_{\kappa,\theta}$, the TCR cap binds on the deductible interest rate θk directly. Constrained firms under TCR shift up to $\lambda_i^* = \widetilde{\lambda}_i^{\text{tcr}} \in (0, 1)$. Assuming a quadratic avoidance technology $c^j(\lambda, \phi) = \dfrac{\kappa(\phi)}{2}\lambda^2$ with $\kappa(\phi)$ recovered from the unconstrained shifting first-order condition $c^j_\lambda(\lambda^u, \phi) = t(r_i - r_e)$ (so $\kappa(\phi) = t(r_i - r_e)/\lambda^u$), the per-unit cost at the TCR-binding choice is $c^{\text{tcr}}(\widetilde{\lambda}_i^{\text{tcr}}, \phi_i) = \dfrac{1}{2} t(r_i - r_e)\,(\widetilde{\lambda}_i^{\text{tcr}})^2/\lambda^u$. Since $\widetilde{\lambda}_i^{\text{tcr}} \le \lambda^u$, this is bounded above by $\dfrac{1}{2} t(r_i - r_e)\widetilde{\lambda}_i^{\text{tcr}}$; the calibration below reports that conservative upper bound, obtained at $\widetilde{\lambda}^{\text{tcr}} = \lambda^u$. Calibrating with the scenarios used for the user-cost elasticity below ($r_i - r_e \in \{0.03, 0.08, 0.12\}$ and $\widetilde{\lambda}^{\text{tcr}} \in \{0.25, 0.40, 0.55\}$) yields $\bar{c}_{\kappa,\theta}$ in the range 0.001 to 0.010 in *proportional-of-r_e* units. These magnitudes are small relative to $\theta - r_e$ in the welfare formula and therefore not a leading driver of the welfare comparison.

We calibrate r_e at the average commercial-bank corporate lending rate in Uganda over 2014–2017 (BoU statistics). The intragroup rate r_i is unobserved and enters only through the spread $r_i - r_e$, which we calibrate at three values $\{0.03, 0.08, 0.12\}$ with $\lambda^u \in \{0.25, 0.40, 0.55\}$ respectively. The middle scenario corresponds to the empirical share of related-party loans in total borrowing among Treatment 1 firms in the pre-reform period (approximately 0.40).

A.6.5 Plugging into the welfare inequality

Substituting the estimated and calibrated values into (17) yields, under all three calibration scenarios

$$\text{LHS}_{\text{esr}} > \text{RHS}_{\text{tcr}}.$$

In all cases, ESR's marginal deadweight cost exceeds TCR's. The result operates through two independent channels. First, $\widehat{\mathcal{K}'_\theta} \approx 0$ makes the right-hand side essentially zero. Second, the smaller denominator $\widehat{Y}_{\mathcal{C}} \approx$ UGX 85 billion amplifies the left-hand side: any non-zero behavioral response on the ESR margin translates into a large per-unit-of-revenue deadweight cost. Both channels push the comparison in the same direction. Sensitivity analysis (varying $\gamma^{\text{eff}}_{\text{pre}}$ across normalizations (i)–(iii) and $r_i - r_e$ across $\{0.03, 0.08, 0.12\}$) does not flip the sign of the comparison.

A.7 Implied User-Cost Elasticity

We define user cost elasticity for outcome Y as $\varepsilon_{Y,u} \equiv \frac{\Delta Y/Y_0}{\Delta u/u_0}$, where u is the user cost implied by our model. Under the calibrated avoidance technology, the pre-reform user cost for a constrained firm is

$$\rho_0 = r_e - \frac{1}{2} \cdot \frac{t(r_i - r_e)\lambda^u}{1-t}. \tag{23}$$

This expression reflects that the constrained firm enjoys a marginal tax shield from intragroup borrowing offset by the avoidance cost it bears. The post-reform user cost under the first scenario discussed above ($\lambda^* = 0$) is

$$\rho_1 = \frac{r_e}{1 - t + t\gamma}, \tag{24}$$

which reflects the loss of the marginal tax shield on the additional unit of capital. The proportional wedge is $\Delta u/u_0 = (\rho_1 - \rho_0)/\rho_0$, which depends on the calibration of $r_i - r_e$ and λ^u. Combined with the proportional change in capital from our DiD, $\widehat{\beta}^{\text{DiD}}_K / \bar{K}^{\text{pre}}_{T_1}$, this delivers $\widehat{\varepsilon}_{K,u}$.

B Institutional Context

This section describes the institutional features that underpin our theoretical and empirical frameworks, focusing on how MNEs shift profits through debt and how interest limitation rules constrain this behavior.

B.1 Profit Shifting Through the Debt Channel

Interest paid by a company is a tax-deductible expense. This interest deductibility can be used by MNEs to shift profits from high- to low-tax jurisdictions. Figure B.IV illustrates the simplest arrangement through which such profit shifting may occur (please see notes below the figure for the details of how these schemes work). Three conditions are jointly necessary for such profit shifting to be beneficial: (i) interest payments must be tax deductible; (ii) a positive tax-rate differential must exist across affiliates; and (iii) withholding taxes on cross-border interest must not eliminate the differential. Uganda, with one of the highest statutory corporate tax rates in the world (Figure B.I), satisfies all three conditions, making debt-based profit shifting from Uganda potentially profitable.

In practice, the arrangements MNEs use are considerably more complex than simple intercompany loans. The OECD identifies three principal channels through which debt-based profit shifting can occur: placing disproportionate third-party debt in high-tax affiliates, using intercompany loans to generate deductions exceeding the group's actual third-party interest expense, and using third-party or intercompany financing to fund the generation of tax-exempt income (OECD, 2015). Regardless of the specific channel, the consequence for the host country is the same: erosion of the domestic tax base.

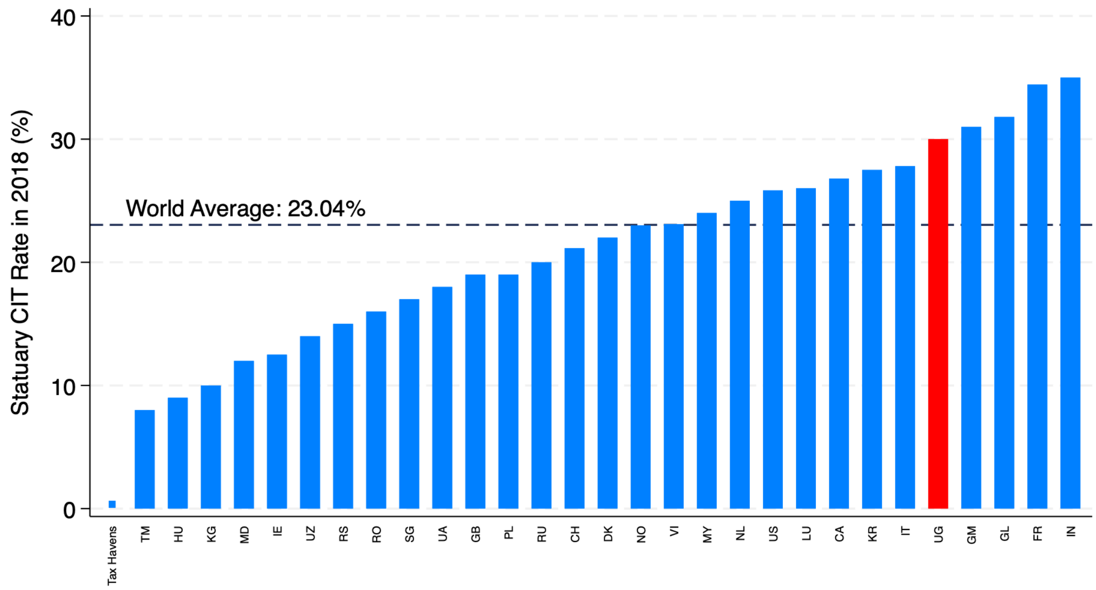
B.2 Interest Limitation Rules

To curb profit shifting through the debt channel, countries impose interest limitation rules (ILRs). These rules disallow deductions on the portion of interest deemed *excessive*. There are two canonical forms of such rules, TCR and ESR, each of which has distinct economic properties. Because the TCR scales linearly with capital, it imposes a flat ceiling per unit of capital that does not vary with firm profitability. As Proposition 1 shows, this generates a unique productivity cutoff ϕ^*_{tcr} such that the cap binds only for firms above this threshold, concentrating distortions on the most productive (and most aggressive) affiliates. But the flat structure creates well-documented avoidance opportunities. MNEs can manipulate the rule by inflating intragroup interest rates (since the cap limits debt volume but not interest rates), injecting equity through hybrid instruments that are treated as equity for ILR purposes but generate deductible payments for tax purposes, or restructuring balance sheets across affiliates (Johannesen, 2014; OECD, 2015).

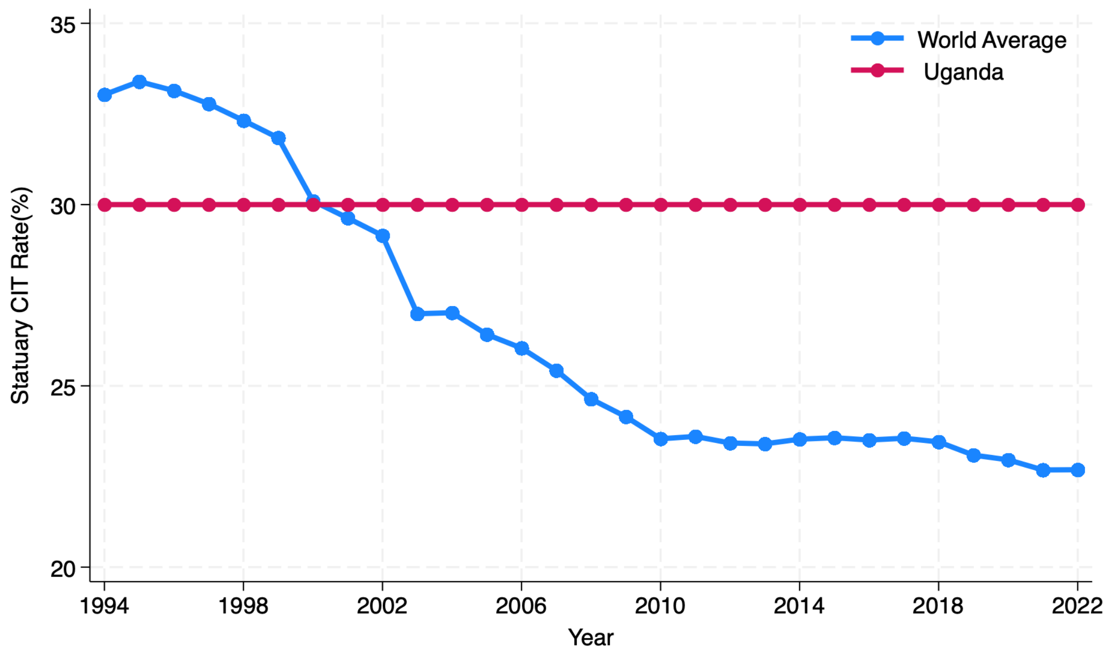
The ESR cap scales with firm profitability, linking the deduction to the level of economic activity. As Proposition 2 demonstrates, this endogenous movement of the cap means that the binding set is no longer guaranteed to be a monotone function of productivity, and the incidence of the rule across the firm-size distribution is an empirical question. The profitability linkage also makes the ESR harder to manipulate: increasing the deduction requires increasing reported earnings, which raises the tax base. But earnings-based caps introduce volatility—the deduction fluctuates with the business cycle—and firms with temporarily depressed or negative earnings may face binding constraints even without engaging in profit shifting.

FIGURE B.I: **CORPORATE INCOME TAX RATE – UGANDA VS. WORLD**

A: Distribution in 2018

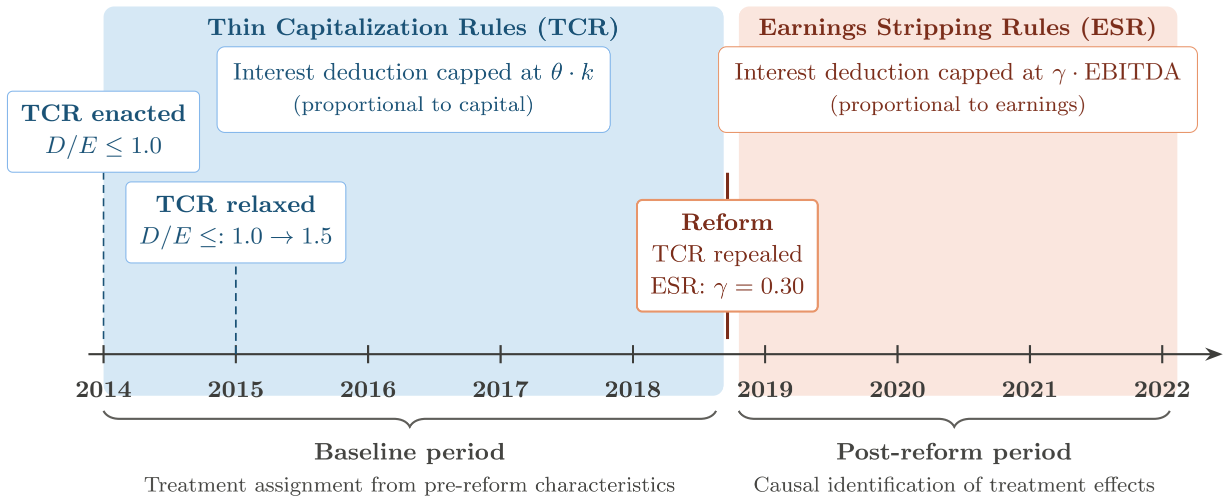


B: Historic Evolution



Notes: This figure compares Uganda's corporate income tax (CIT) rate with that of other countries. Panel A shows that in 2018, Uganda had one of the highest statutory tax rates at 30 percent, while the global average was 23.04 percent. We do not exclude tax havens in calculating the global average. Panel B illustrates that over the past three decades Uganda's CIT rate has remained fixed at 30 percent. This is in sharp contrast to the global trend where the average CIT rate has declined from 39.6 percent to 22.7 percent. These figures are based on data from the Tax Foundation, which aggregates information from multiple sources including the OECD, PwC, and KPMG (Tax Foundation, 2022).

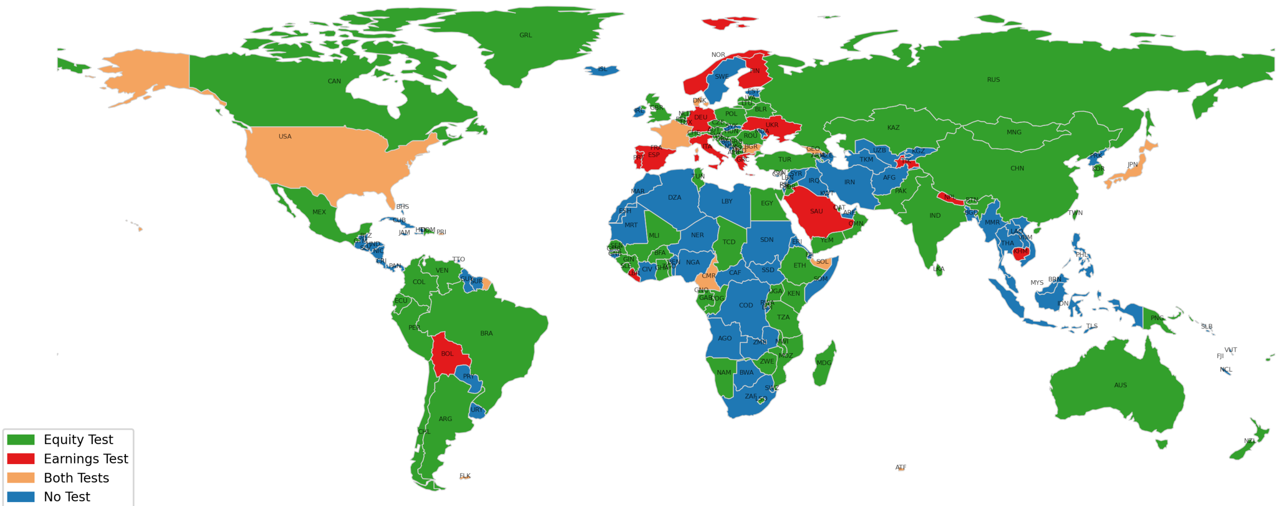
FIGURE B.II: **INTEREST LIMITATION RULES IN UGANDA**



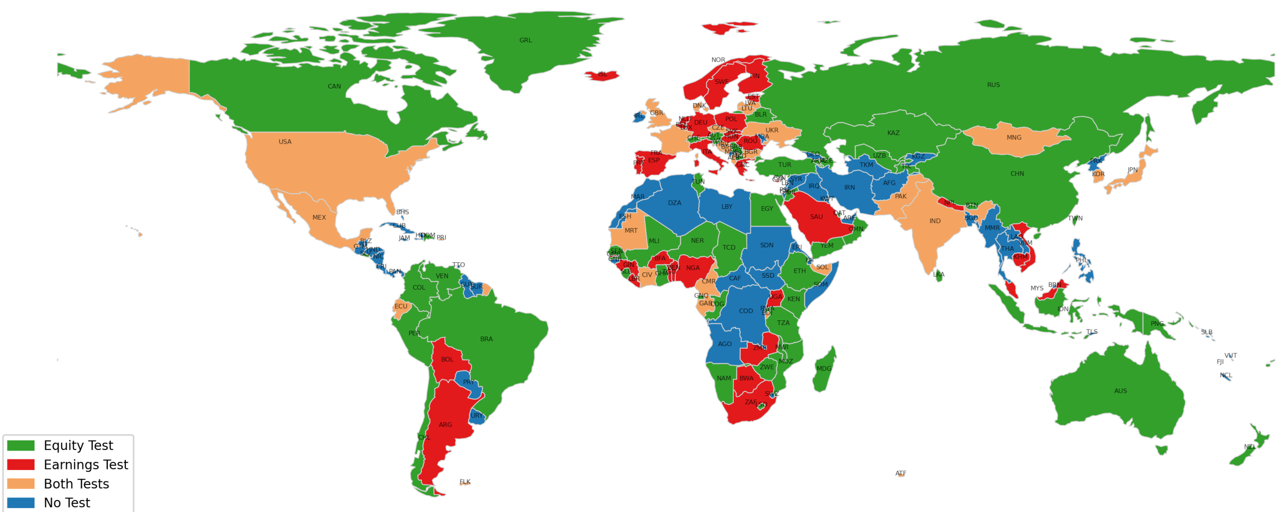
Notes: The figure maps the statutory evolution of interest limitation rules in Uganda to our empirical design. The shaded bands indicate the regime in effect: Thin Capitalization Rules (TCR, blue) and Earnings Stripping Rules (ESR, coral). Under the TCR, interest deductions were capped proportionally to capital through a debt-to-equity limit. The initial limit was set at 1.0 and was relaxed to 1.5 in June 2015. The landmark reform of June 2018 repealed the TCR and introduced the ESR, capping deductions at 30% of EBITDA.

Figure B.III: **Interest Limitation Rules Around the World**

A: 2014



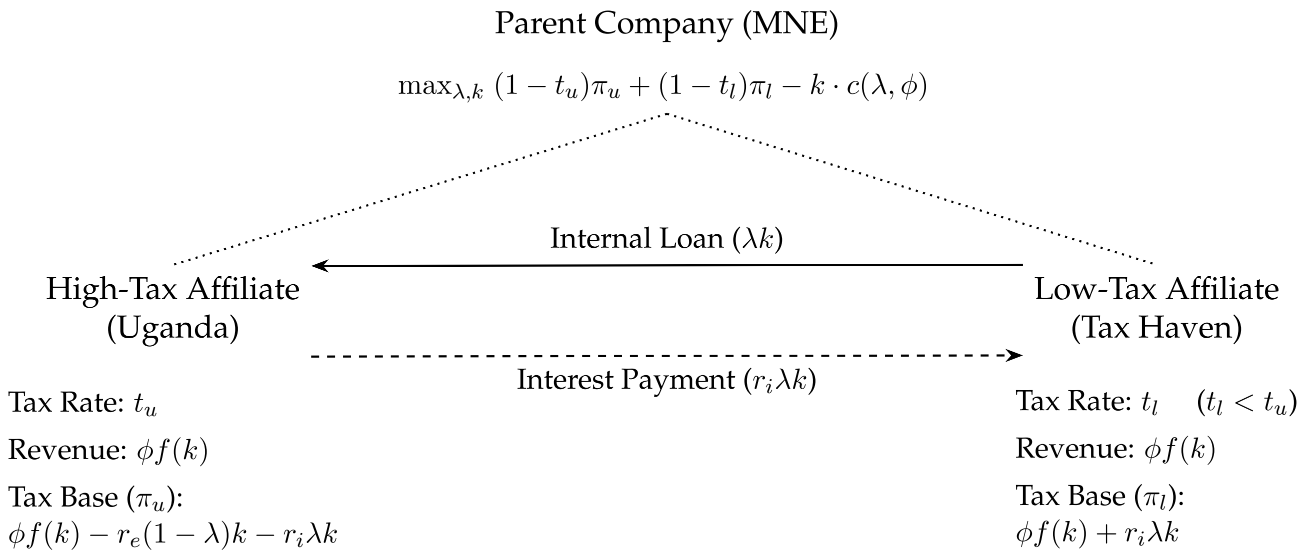
B: 2020



Notes: This figure illustrates the evolution of interest limitation rules globally between 2014 and 2020, using data from the Research School of International Taxation's International Tax Institutions database (Wamser *et al.*, 2024). The figure shows that during this period, many countries implemented Action 4 of the BEPS framework, transitioning from the TCR to the ESR as their primary interest limitation rule. However, it also highlights that a significant number of countries continue to rely on the TCR, while some have yet to implement any interest limitation rule at all, a trend particularly prevalent among countries in Africa.

FIGURE B.IV: **USING INTERNAL DEBT FOR PROFIT SHIFTING**

A: Intragroup Debt Structure



B: Tax Implications of the Interest Flow

Entity	Change in Tax Base	Change in Tax Liability
High-Tax Affiliate (Uganda)	Falls by $r_i\lambda k$	Falls by $t_u(r_i\lambda k)$
Low-Tax Affiliate (Tax Haven)	Rises by $r_i\lambda k$	Rises by $t_l(r_i\lambda k)$
Consolidated MNE	Net Change = 0	Net Tax Saving = $(t_u - t_l)r_i\lambda k$

Notes: The figure illustrates the simplest possible arrangement through which an MNE could shift profits out of Uganda. A parent MNE has two affiliates, one in Uganda, indexed by u, and another in a low-tax country, indexed by l. The Ugandan affiliate borrows from the low-tax subsidiary, paying interest on the outstanding debt. This arrangement reduces the tax liability of the Ugandan affiliate by t_u, increases the tax liability of the low-tax affiliate by t_l, and increases the global profits of the MNE by $t_u - t_l$ per dollar of interest flowing between the two affiliates. In the extreme case, where the low-tax jurisdiction is a tax haven with a tax rate near zero, the global profits of the MNE will increase by 30 cents for every dollar of interest expense claimed in Uganda.

C Data

C.1 Data Cleaning

The administrative tax returns data used in this project was supplied by the Uganda Revenue Authority (URA). For a detailed description of how this firm panel was constructed please see McNabb *et al.* (2022). Initially, the dataset included both individual and non-individual income tax returns. As the focus of our analysis is on incorporated firms, all individual returns were dropped. The raw data also contained some duplicate observations where every row in the data was exactly the same. We retained only one of these duplicate observations. Where a return was revised, only the most recent return for the relevant accounting period was retained. When firms changed their accounting periods, resulting in duplicate observations for a single calendar year, the shorter period was dropped as it provided a cleaner panel with each year representing a 12-month period. Furthermore, we dropped observations for which the information on *financial year* was missing. Consistent with the legislation that both TCR and ESR did not apply to financial and insurance sector firms, we dropped all firms belonging to these sectors. We also dropped observations reporting negative interest expenses.

C.2 Definition of Variables

- **Carry Forward.** The total of a firm's unused deductions, losses, or credits carried from previous tax periods into future tax periods to reduce taxable income or tax liability.

- **Cost of Sales.** The direct costs attributable to the production of the goods and services sold by a firm in a given year. This includes expenses such as raw materials, direct labor, and manufacturing overhead.

- **Current Liability.** Financial obligations of a firm that are due to be settled within one year.

- **Debt.** The total amount of a firm's financial obligations, constructed by summing current liabilities and loan funds in a given year.

- **Debt/Equity.** A financial ratio that measures a firm's leverage by dividing its total debt by its total equity. This ratio indicates the relative proportion of debt and equity used to finance the company's assets.

- **Deductions.** Allowable amounts subtracted from a firm's total income to determine the taxable income, including expenses such as business costs, depreciation, and other qualifying expenditures in a given year.

- **Disallowed Deductions.** Expenses that are not permitted by the revenue authority to be subtracted from a firm's total income when calculating taxable income in a given year.

- **EBITDA.** A measure of a firm's operating performance over a given year, calculated as earnings before interest, taxes, depreciation, and amortization are deducted (equivalently, net income with these four items added back).

- **Effective Tax Rate (ETR).** The ratio of a firm's tax liability to its profit before tax in a given year. This rate reflects the actual percentage of earnings that a firm pays in taxes after accounting for all deductions, credits, and adjustments. We take the effective tax rate to be zero if profit before tax is not positive.

- **Equity.** The value of shareholder funds in a firm in a given year. This represents the owners' residual interest in the company after all liabilities have been deducted from total assets.

- **Exports.** The value of goods and services sold by a firm to foreign customers during a given year.

- **Financial Expense.** The total cost incurred by a firm in a given year for all financial obligations, including interest expense, bank charges, and other fees associated with borrowing and financial transactions.

- **Fixed Assets.** Tangible assets owned by a firm used in its operations to generate income, including property, plant, and equipment.

- **Gross Profit.** The difference between a firm's total sales and the cost of sales in a given year, representing the firm's profit from core operational activities before deducting operating expenses, taxes, and interest.

- **Imports.** The value of goods and services purchased by a firm from foreign suppliers for use in its operations or for resale during a given year.

- **Intangible Assets.** Non-physical assets owned by a firm that provide economic benefits, such as patents, trademarks, copyrights, goodwill, and brand recognition.
- **Interest Expense.** The cost incurred by a firm for borrowed funds, including interest payments on loans, bonds, and other debt instruments during a given year.
- **Interest Expense/EBITDA.** A financial ratio that measures a firm's ability to pay interest on its debt by dividing its interest expense by its EBITDA. Interest expense is the cost incurred by the company for borrowed funds, while EBITDA represents earnings before interest, taxes, depreciation, and amortization.
- **Loans.** The total amount of money that a firm has borrowed from external sources, including banks, financial institutions, and other lenders, which must be repaid over time with interest.
- **Net Book Value.** The total value of fixed assets after accounting for accumulated depreciation in a given year. Fixed assets refer to long-term tangible assets used in a company's operations, while accumulated depreciation is the total amount of depreciation expense that has been recorded against these assets over time.
- **Non-Interest Financial Expense.** The total cost incurred by a firm for financial obligations that do not involve interest payments, including bank fees, service charges, transaction fees, and other similar costs associated with financial operations during a given tax period.
- **Other Direct Costs.** Production-related expenses directly attributable to goods or services that are reported separately from, and therefore not included in, the cost of sales.
- **Profit After Tax.** The net income, in a given year, of a firm after all taxes have been deducted from the profit before tax.
- **Profit Before Tax.** The gross income of the company for the year less total allowable deductions under the Income Tax Act.

- **Related (Unrelated) Party Loans.** The sum of secure and unsecured loans from related (unrelated) parties in a given year. "Related party" follows the statutory definition of "associate" in Section 3 of the Income Tax Act, which covers an entity's controlling owners (holding $\geq$ 50% of voting power), their relatives, and any partnership or trust they control. For a domestic standalone firm, related party means its controlling shareholders and directors and their relatives. Its related-party loans therefore consist primarily of shareholder and director loans rather than inter-company borrowing.

- **Sales.** The value of all goods and services supplied by a firm in a given year.

- **Secure Loans.** Loans that are backed by collateral, meaning the borrower pledges an asset as security for the loan.

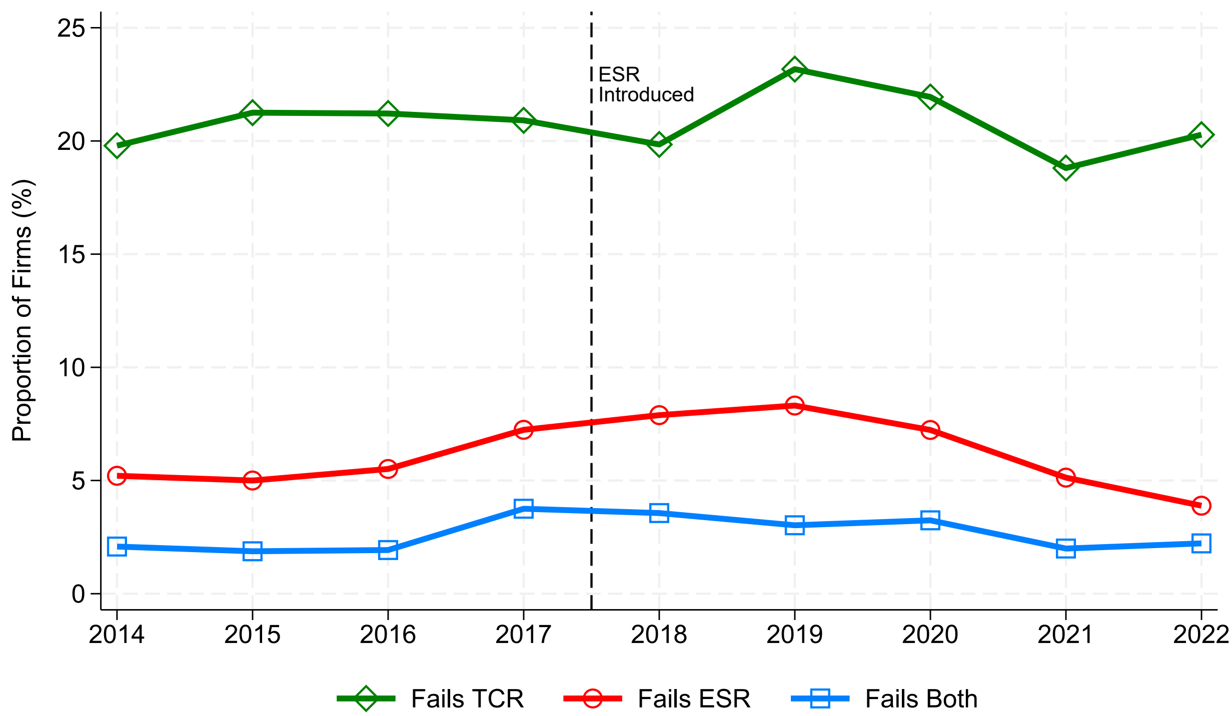
- **Tax Liability.** The total amount of tax that a firm is obligated to pay to the revenue authority for a given year, after accounting for all taxable income, deductions, credits, and other adjustments.

- **Total Assets.** The sum of net book value of fixed assets, deferred assets, available balance, and investments in a given year. Deferred assets are costs that have been paid but not yet expensed, available balance refers to liquid funds readily accessible for use, and investments include financial assets or stakes held in other entities.

- **Unsecure Loans.** Loans that are not backed by collateral, relying solely on the borrower's creditworthiness and reputation.

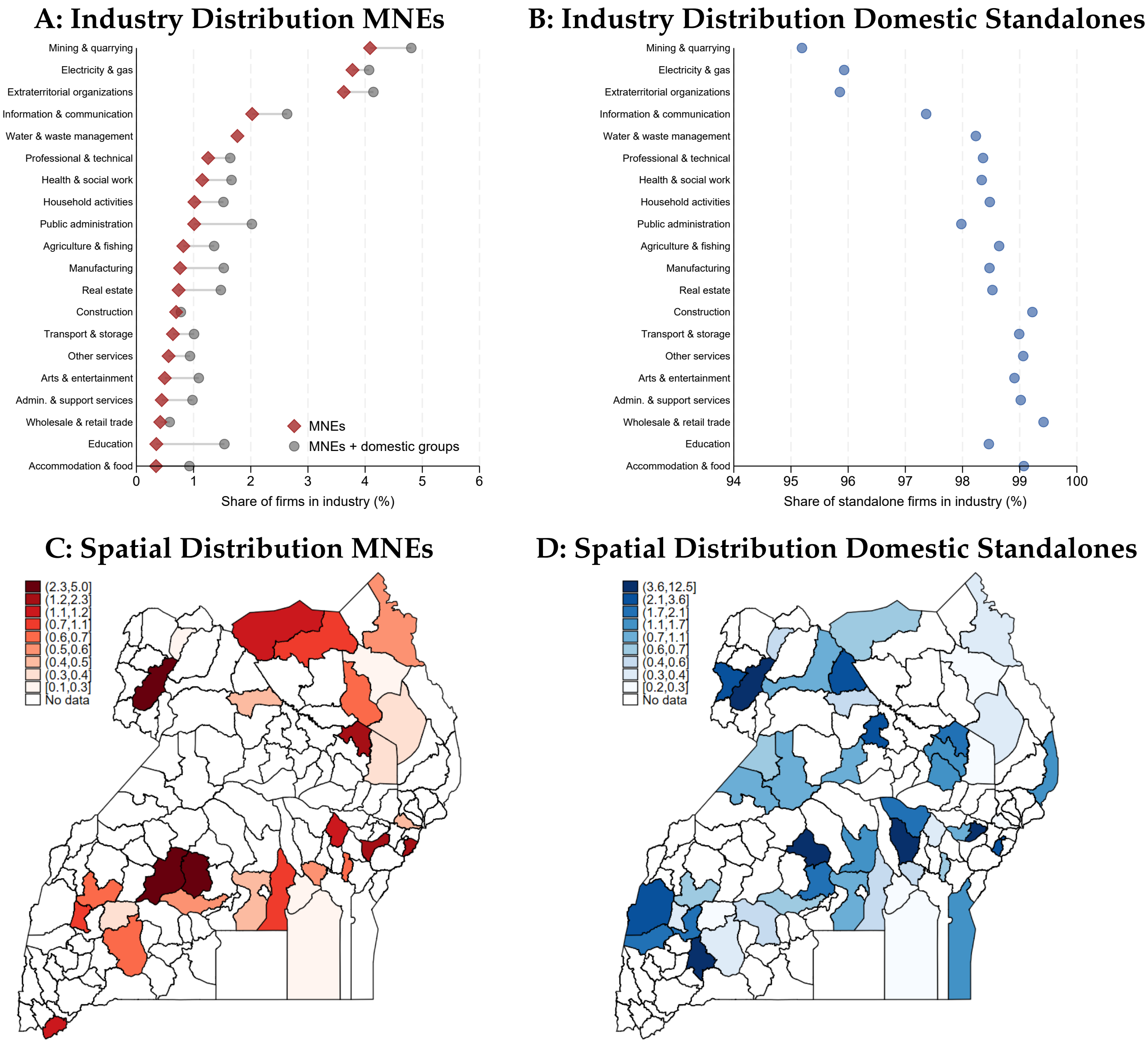
- **Wages.** The total compensation paid to employees by a firm for their labor, including salaries, hourly pay, bonuses, and other forms of remuneration during a given year.

Figure C.I: **Proportion of MNEs Failing Interest Limitation Rules**



Notes: This figure illustrates the proportion of MNEs that fail the TCR, the ESR, or both tests in a given year. Under the tax code, an MNE fails the TCR if its debt to equity ratio exceeds 1.5, and an MNE fails the ESR if its interest expenses to EBITDA ratio exceeds 0.3. In this figure, we allow for doughnut holes below these thresholds to be consistent with the definitions in our empirical analysis. We accordingly treat a firm to fail the TCR if its debt to equity ratio exceeds 1.3 and fail the ESR if its interest expenses to EBITDA ratio exceeds 0.2. Each marker shows the proportion of MNEs failing one, two, or both tests in the corresponding year.

FIGURE C.II: INDUSTRIAL AND SPATIAL DISTRIBUTION OF FIRMS



Notes: This figure compares the industry and spatial distribution of MNEs and domestic standalones. Panel A compares the percentage of MNEs and domestic standalones across the top 20 industries in our data. Panel B displays the percentage of domestic standalones within those same industries. Industry ranks are determined by the total number of firms in each industry. For a detailed description of industry labels, please refer to Table C.II. Panel C plots the percentage of MNEs in each Ugandan district, while Panel D plots the percentage of domestic standalones in each district. This visual breakdown helps to highlight that MNEs are not concentrated in few industries or geographical areas only.

TABLE C.I: SUMMARY STATISTICS

	MNEs		Domestic Groups		Domestic Standalones	
	Mean	SD	Mean	SD	Mean	SD
	(1)	(2)	(3)	(4)	(5)	(6)
A: Earnings						
Sales	4.51	9.53	1.75	5.77	1.03	4.23
Cost of Sales	3.34	7.58	1.23	4.80	0.81	3.48
Gross Profit	1.31	2.32	0.59	1.57	0.23	0.86
EBITDA	0.22	0.82	0.14	0.57	0.05	0.30
Profit Before Tax	-0.04	0.63	-0.01	0.41	0.00	0.22
Profit After Tax	-0.07	0.58	-0.03	0.37	-0.00	0.20
B: Debt						
Loans	1.79	3.89	1.05	2.85	0.34	1.59
Interest Expense	0.05	0.15	0.03	0.11	0.01	0.06
Financial Expenses	0.18	0.34	0.08	0.23	0.02	0.12
Loan Related Parties	0.70	1.56	0.39	1.07	0.12	0.61
Loan Unrelated Parties	0.11	0.54	0.15	0.61	0.05	0.34
Unsecured Loans	0.74	1.76	0.49	1.34	0.16	0.74
Secured Loans	0.45	1.37	0.31	1.10	0.11	0.63
C: Tax Liability						
Deductions	0.51	0.98	0.25	0.66	0.08	0.36
Disallowed Deductions	0.08	0.14	0.02	0.08	0.01	0.04
Carry Forward	-0.15	1.14	-0.09	0.82	0.00	0.40
Tax Liability	0.07	0.19	0.03	0.13	0.02	0.08
D: Real Activity						
Wages	0.01	0.04	0.01	0.03	0.00	0.02
Imports	1.33	4.33	0.78	3.40	0.63	2.72
Exports	0.40	0.89	0.10	0.46	0.05	0.32
Other Direct Costs	0.49	1.05	0.14	0.56	0.07	0.38
E: Balance Sheet						
Equity	1.06	3.48	0.85	2.74	0.24	1.33
Assets	3.19	6.29	2.13	5.15	0.57	2.53
Intangible Assets	0.01	0.02	0.00	0.01	0.00	0.01
Fixed Assets	3.14	6.76	2.21	5.61	0.60	2.73
Liabilities	2.18	3.73	0.89	2.44	0.27	1.30
F: Firm Characteristics						
Kampala	0.53	0.50	0.51	0.50	0.56	0.50
#Observations (Firm-Year)	3,251		1,459		295,187	

Notes: The table presents the summary statistics of our data. We report the mean and standard deviation of important variables reported by firms in their corporate tax returns, separately for the three types of firms. For the precise definitions of variables displayed here, please see section C.2 in the appendix.

TABLE C.II: **INDUSTRY DESCRIPTION**

Industry Label	Industry Description
(1)	(2)
1	Wholesale and retail trade; repair of motor vehicles and motorcycles
2	Construction
3	Other service activities
4	Professional, scientific and technical activities
5	Human health and social work activities
6	Agriculture, forestry and fishing
7	Manufacturing
8	Education
9	Administrative and support service activities
10	Information and communication
11	Transportation and storage
12	Accommodation and food service activities
13	Real estate activities
14	Arts, entertainment and recreation
15	Electricity, gas, steam and air conditioning supply
16	Mining and quarrying
17	Water supply; sewerage, waste management and remediation activities
18	Public administration and defence; compulsory social security
19	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
20	Activities of extraterritorial organizations and bodies

Notes: This table presents the detailed description of the 20 industries shown in the panels A and B of the Fig C.II. Column (2) provides the detailed description of the industry indicated on the y-axis of the plot. Industry ranks are generated according to total numbers of firms in each industry.

D Additional Results on Profit Shifting by MNEs Using the Debt Channel

TABLE D.I: **DO MNES USE DEBT TO SHIFT PROFITS?**

Outcomes (y_i):	Loans	Interest Expenses	Non-Interest Financial Expenses	Deductions	Before Tax Profits	Loans Related Parties	Loans Unrelated Parties
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MNE	2.618	5.909	2.103	3.983	-24.025	3.475	0.413
	(0.386)	(1.036)	(0.326)	(0.576)	(5.901)	(0.437)	(0.328)
Observations	5,676	5,676	5,676	5,676	5,676	5,676	5,676
Control Mean	988.648	23.089	53.654	171.657	15.051	383.371	340.049
Matched on	Industry, Location, Assets and Revenue						

Notes: This table replicates the analysis from Table I using a matched sample of MNEs and domestic firms. The matched sample is created using propensity score matching. To construct this sample, we drop Domestic Groups and run a logit regression of an MNE dummy on annual sales and assets, including industry, district, and year fixed effects. Using the predicted propensity scores from this regression, we match observations one-to-one to create a matched sample of 5,676 observations. We then estimate the regression specification (13) on this matched sample. Each outcome is regressed, controlling for the total assets and revenue of the firm, with industry and location fixed effects included. Here, *industry* refers to the 2-digit industry classification of the firm, and *location* refers to the sub-district where the firm is located. For details on the industries and locations used in our sample, please refer to Figure C.II. The outcomes are normalized by the control mean (reported in the last row of the table), allowing the estimated coefficients to represent the average value of the outcome among MNEs as a multiple of the average value of the outcome among domestic firms. For precise definitions of the seven variables used in this analysis, please see section C.2 in the appendix.

TABLE D.II: **EXTENSIVE MARGIN: ARE MNES MORE LIKELY TO REPORT LOSSES OR ZERO PROFITS?**

	Outcome: $\mathbb{1}(\text{Effective Tax Rate} = 0)$				
	(1)	(2)	(3)	(4)	(5)
MNE	0.227***	0.249***	0.248***	0.217***	0.206***
	(0.0162)	(0.0161)	(0.0161)	(0.0165)	(0.0165)
Size controls		✓	✓	✓	✓
Firm level controls			✓	✓	✓
Industry × Year fixed effects				✓	✓
Location fixed effects					✓
Observations	299,884	299,884	299,884	287,331	287,314

Notes: The table reports linear probability model estimates from regressions where we regress an indicator that the effective tax rate is zero in a given year on an indicator for MNE. The omitted category is domestic standalones. Size controls include total assets and annual sales. Industry denotes the 2-digit industry classification; location denotes the sub-district the firm is located in. Firm level controls include firm age, tangibility, and debt ratio, where tangibility is defined as the ratio between fixed assets and total assets of the company and debt ratio as the ratio of all loans to assets of the company. The sample covers all firm-year observations from 2014 to 2022 containing MNEs and domestic standalones. The decline in observations in columns (4) and (5) reflects singleton fixed-effect groups. Standard errors are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels..

TABLE D.III: **INTENSIVE MARGIN: AETR GAP CONDITIONAL ON POSITIVE PROFITS**

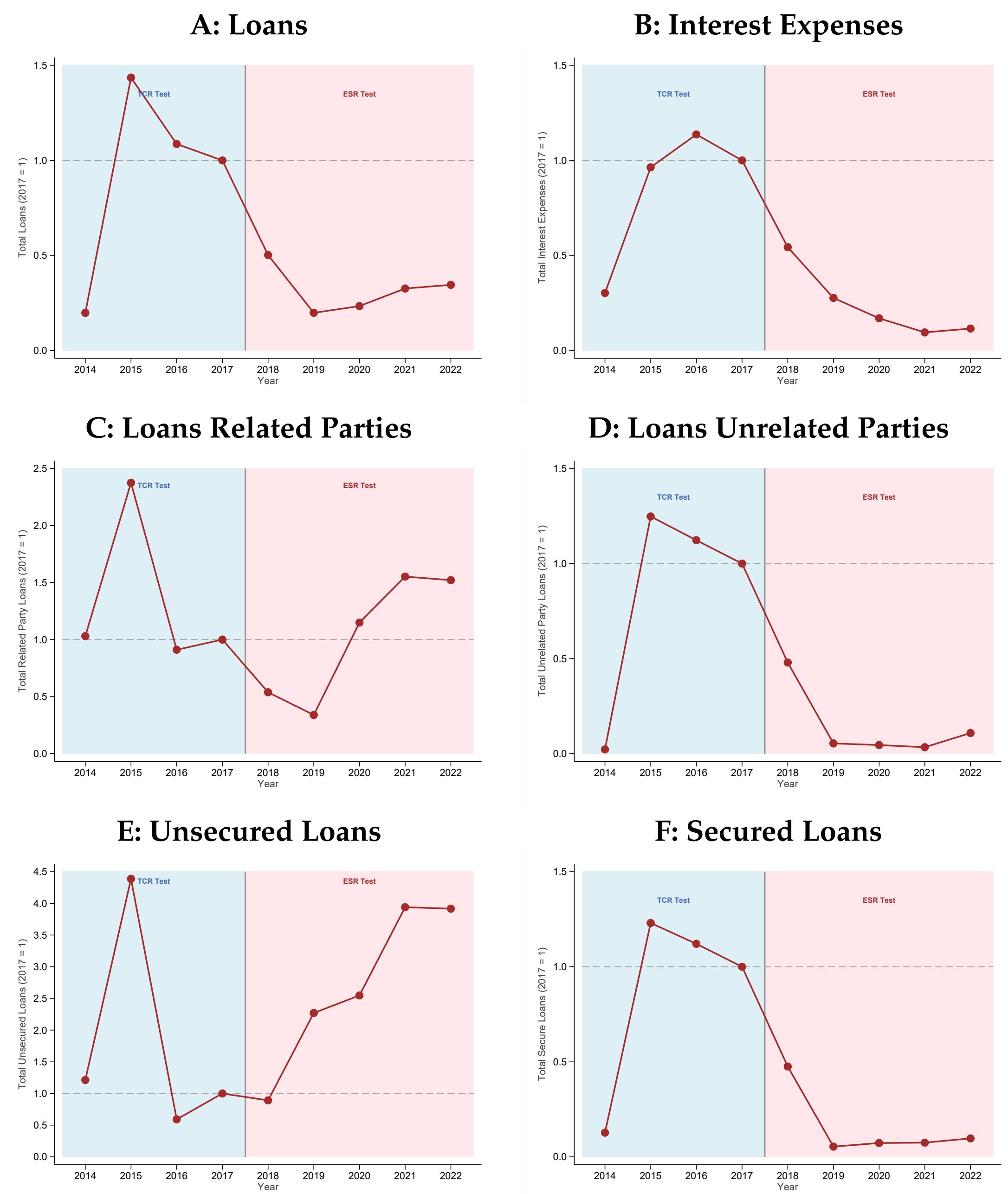
	Outcome: $\mathbb{1}$(Effective Tax Rate=0 | Reported Profit > 0)				
	(1)	(2)	(3)	(4)	(5)
MNE	-0.0563***	-0.0464***	-0.0462***	-0.0406***	-0.0394***
	(0.00778)	(0.00745)	(0.00742)	(0.00716)	(0.00721)
Size controls		✓	✓	✓	✓
Firm level controls			✓	✓	✓
Industry × Year fixed effects				✓	✓
Location fixed effects					✓
Observations	113,068	113,068	113,068	109,594	109,534

Notes: The table reports linear probability model estimates from equations where we regress an indicator that in a given year the effective tax rate is zero conditional on reported profits being positive on an indicator for MNE. The omitted category is domestic standalones. Size controls include total assets and annual sales. Industry denotes the 2-digit industry classification; location denotes the sub-district the firm is located in. Firm level controls include firm age, tangibility, and debt ratio, where tangibility is defined as the ratio between fixed assets and total assets of the company and debt ratio as the ratio of all loans to assets of the company. The sample covers all firm-year observations from 2014 to 2022 containing MNEs and domestic standalones. The decline in observations in columns (4) and (5) reflects singleton fixed-effect groups. Standard errors are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

E Robustness & Sensitivity

This section presents results on the robustness of our results.

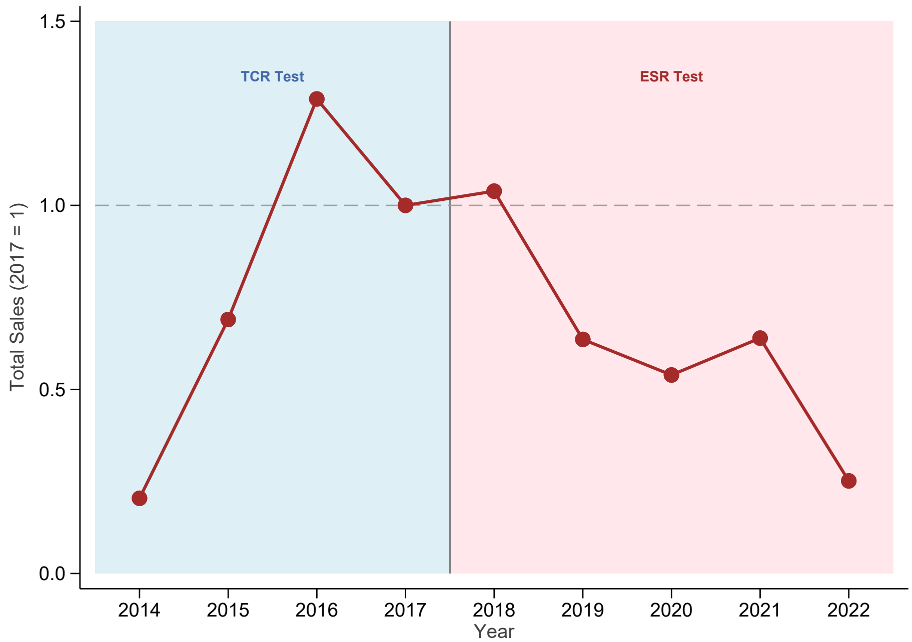
FIGURE E.I: **IMPACTS OF TREATMENT 1 ON AGGREGATES**



Notes: The figure illustrates the evolution of aggregate outcomes reported by MNEs affected by Treatment 1. Each panel plots the annual aggregate value of the indicated outcome, summed across MNEs in the Treatment 1 group and indexed to its 2017 value (horizontal dashed line at 1.0). Blue shading denotes the pre-reform Thin Capitalization Rule (TCR) regime (2014–2017); coral shading denotes the post-reform Earnings Stripping Rule (ESR) regime (2018–2022); the vertical line marks the 2018 reform date. For the exact definitions of outcomes displayed here please see Appendix C.2.

FIGURE E.II: **IMPACTS OF TREATMENT 1 ON AGGREGATES**

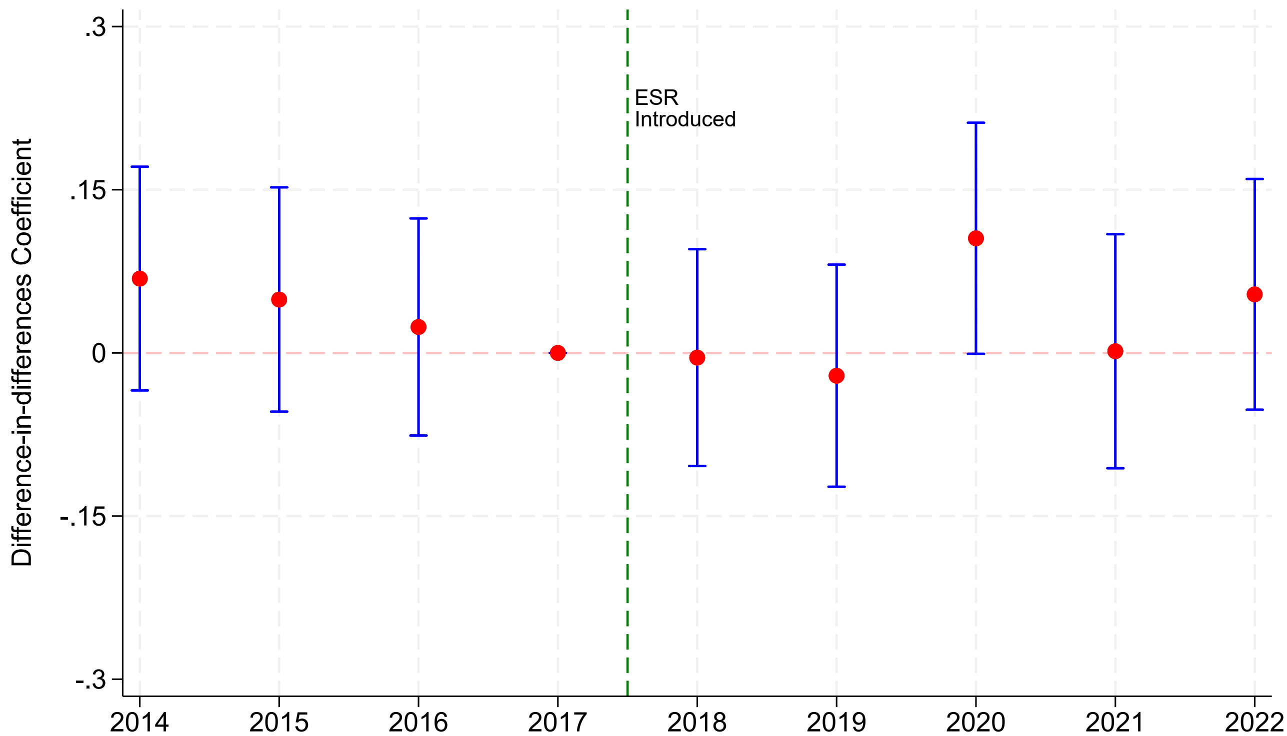
A: Sales



B: Wages

Notes: The figure illustrates the evolution of aggregate outcomes reported by MNEs affected by Treatment 1. Each panel plots the annual aggregate value of the indicated outcome, summed across MNEs in the Treatment 1 group and indexed to its 2017 value (horizontal dashed line at 1.0). Blue shading denotes the pre-reform Thin Capitalization Rule (TCR) regime (2014–2017); coral shading denotes the post-reform Earnings Stripping Rule (ESR) regime (2018–2022); the vertical line marks the 2018 reform date. For the exact definitions of outcomes displayed here please see Appendix C.2.

FIGURE E.III: **SUBSTITUTION TOWARD MANAGEMENT FEE?**



Notes: The figure plots the results from our event study specification corresponding to model (12), illustrating the impacts of the introduction of ESR on on intra-group management fee reported by MNEs in their tax returns. The sample here comprises only MNEs in the Treatment 1 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average interest expenses to EBITDA ratio during the baseline years of 2014–2017 was greater than 0.2, while their debt to equity ratio never exceeded 1.3 in any of these years. These firms were close to failing the ESR but were never at risk of failing the TCR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions.

Table E.I: Impacts of Treatment 1 – Robustness

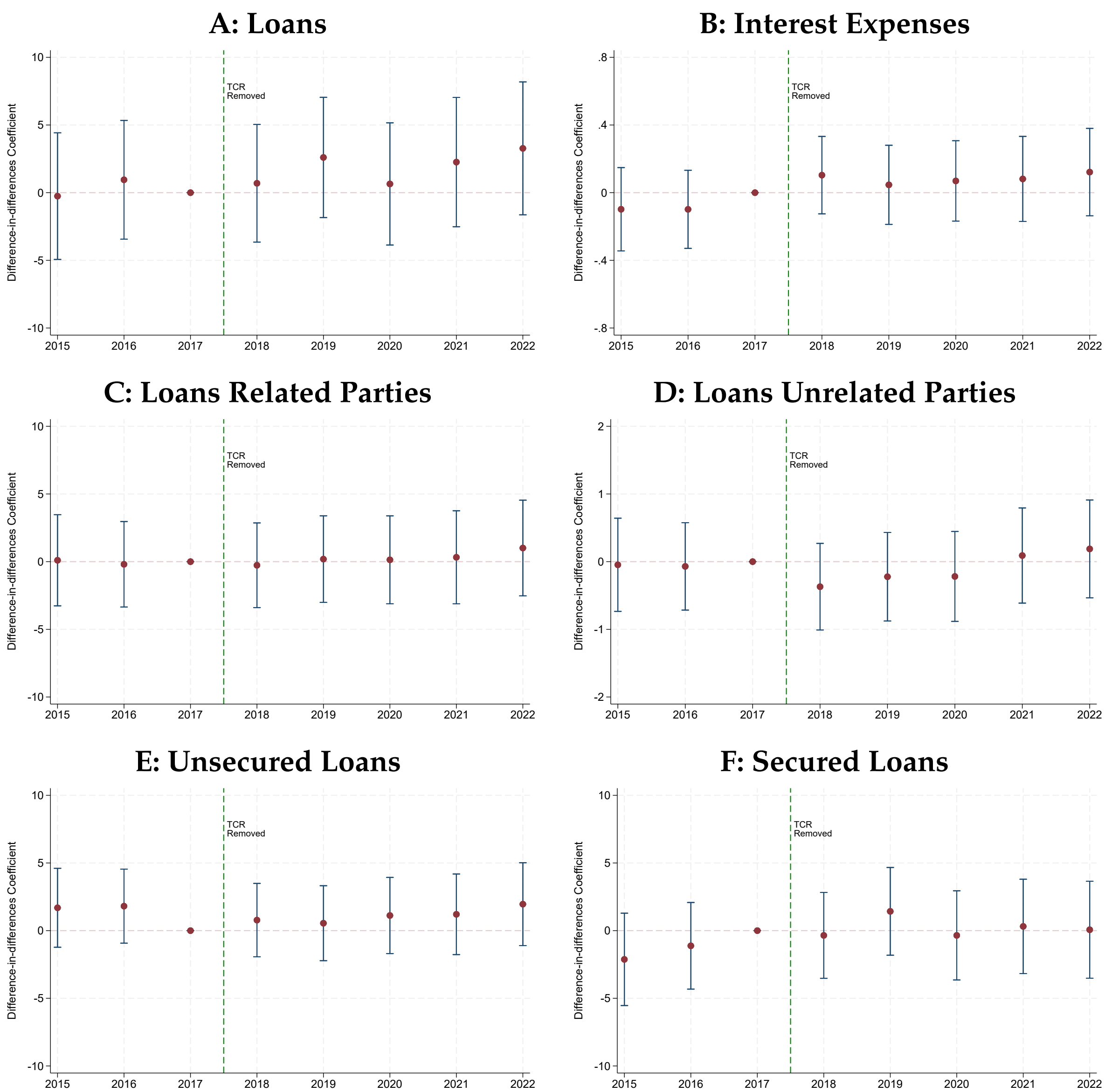
Outcomes (y_i):	Loans	Interest Expenses	Financial Expenses	Loans Related Parties	Loans Unrelated Parties	Secure Loans	Unsecure Loans
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
treat × after	-13.489***	-1.014***	-1.052*	-2.734***	-1.594**	-5.753***	1.019
	(4.522)	(0.350)	(0.567)	(1.033)	(0.711)	(2.002)	(1.271)
Observations	1,423	1,423	1,423	1,423	1,423	1,423	1,423
Baseline Mean	19.5	1.3	2.3	7.0	1.6	7.7	3.2
Effect Size as % of Baseline Mean	-69.3	-79.8	-45.7	-38.8	-98.7	-74.7	32.2
Randomization p-value	0.009	0.022	0.095	0.087	0.049	0.014	0.562
Conley-Taber p-value	0.000	0.009	0.098	0.054	0.004	0.001	0.526
Conley-Taber (FP) p-value	0.004	0.122	0.250	0.120	0.084	0.010	0.657
Fixed Affects:	Firm; Year; Industry × Year						

Notes: The table explores the robustness of our inference procedure. We replicate the analysis in Table II but now use three inference procedures specifically designed for settings with few treated units. The last three rows of the able report p-values from these approaches. *Randomization* is the design-based p-value from 2,000 permutations that reassign treatment across firms within the estimating sample. *Conley-Taber* is the placebo-based p-values using the approach developed by Conley & Taber (2011). This approach evaluates the estimate against the distribution of placebo effects obtained by assigning treatment to randomly drawn groups of control firms of the same size as the treated group. Its validity thus rests on the large pool of control firms rather than on the number of treated units. *Conley-Taber (FP)* applies the heteroskedasticity correction of Ferman & Pinto (2019) on Conley-Taber estimates, rescaling each placebo effect by the ratio of the treated to the placebo-group residual standard deviation (firm-level residual standard deviations winsorized at the 5th and 95th percentiles). It is the most conservative of the three approaches.

F Impacts of Treatments 2

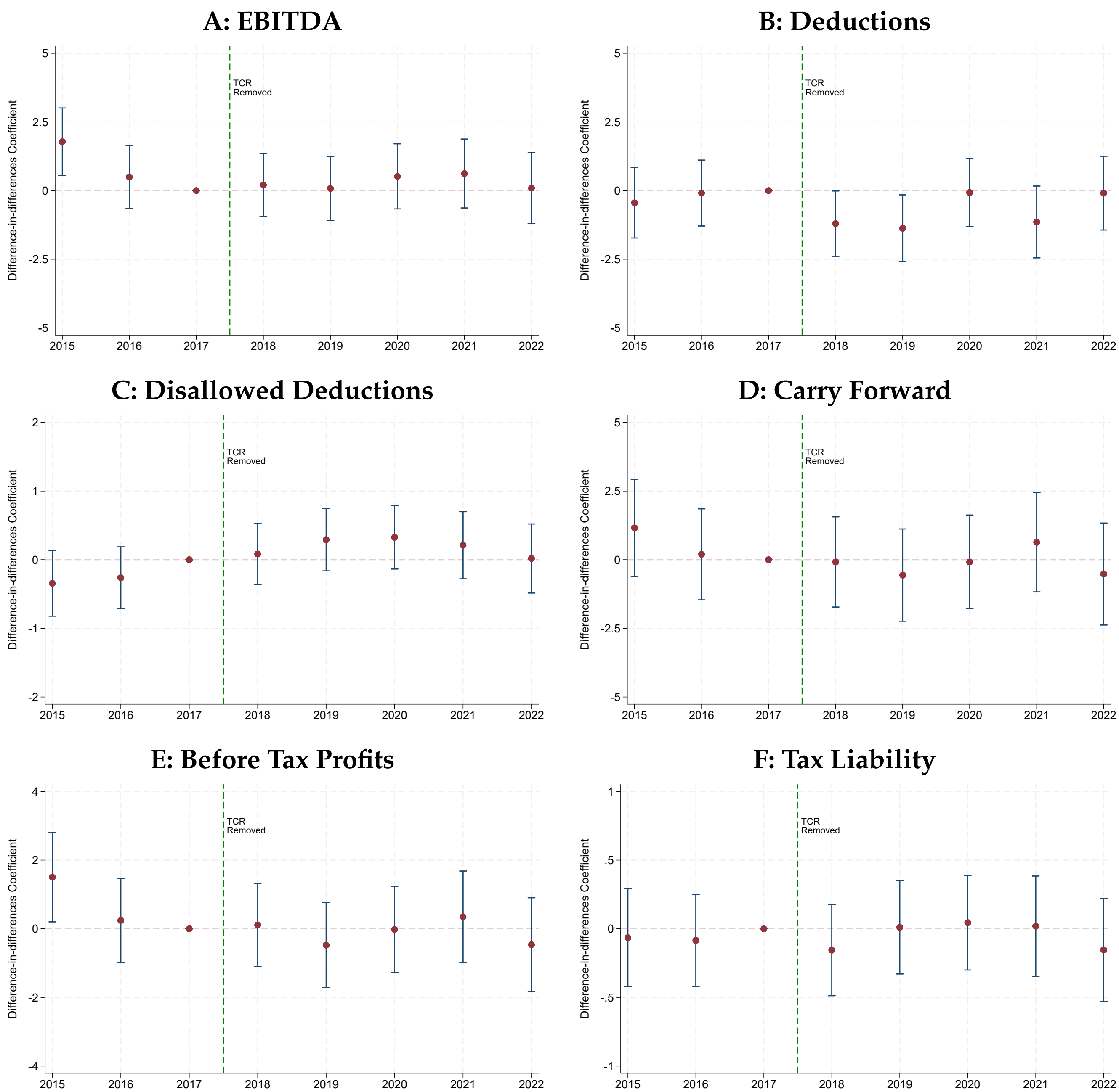
This section presents results on the impacts of the Treatment 2.

FIGURE F.I: **IMPACTS OF TREATMENT 2 – TCR REMOVED**



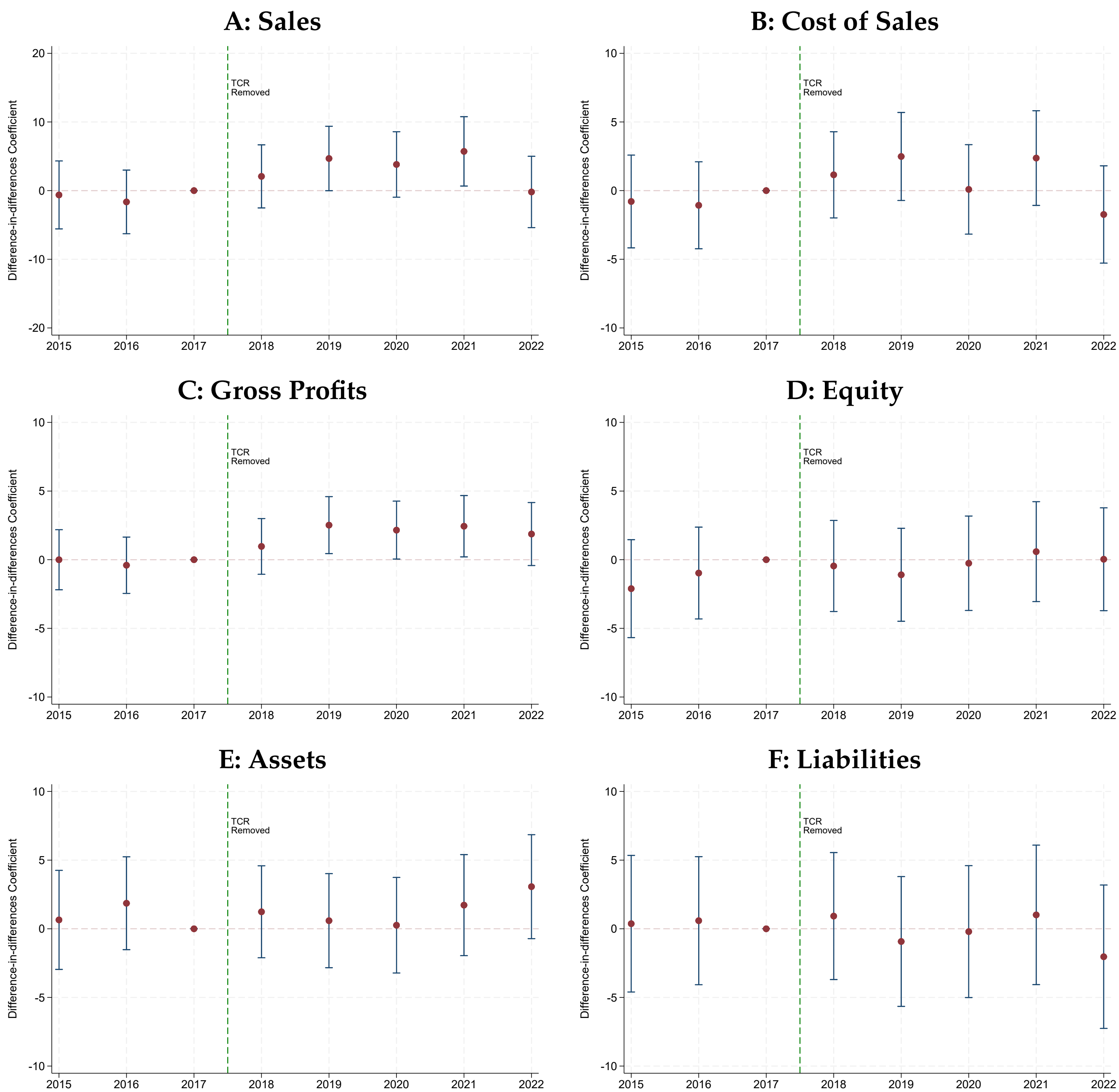
Notes: The figure plots the results from our event study specification corresponding to model (12), illustrating the impacts of the removal of TCR on MNEs. The sample here comprises only MNEs in the Treatment 2 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average debt to equity ratio during the baseline years of 2014–2017 was greater than 1.3, while their interest expenses to EBITDA ratio never exceeded 0.2 in any of these years. These firms were close to failing the TCR but were never at risk of failing the ESR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please refer to section C.2.

FIGURE F.II: **IMPACTS OF TREATMENT 2 – TCR REMOVED**



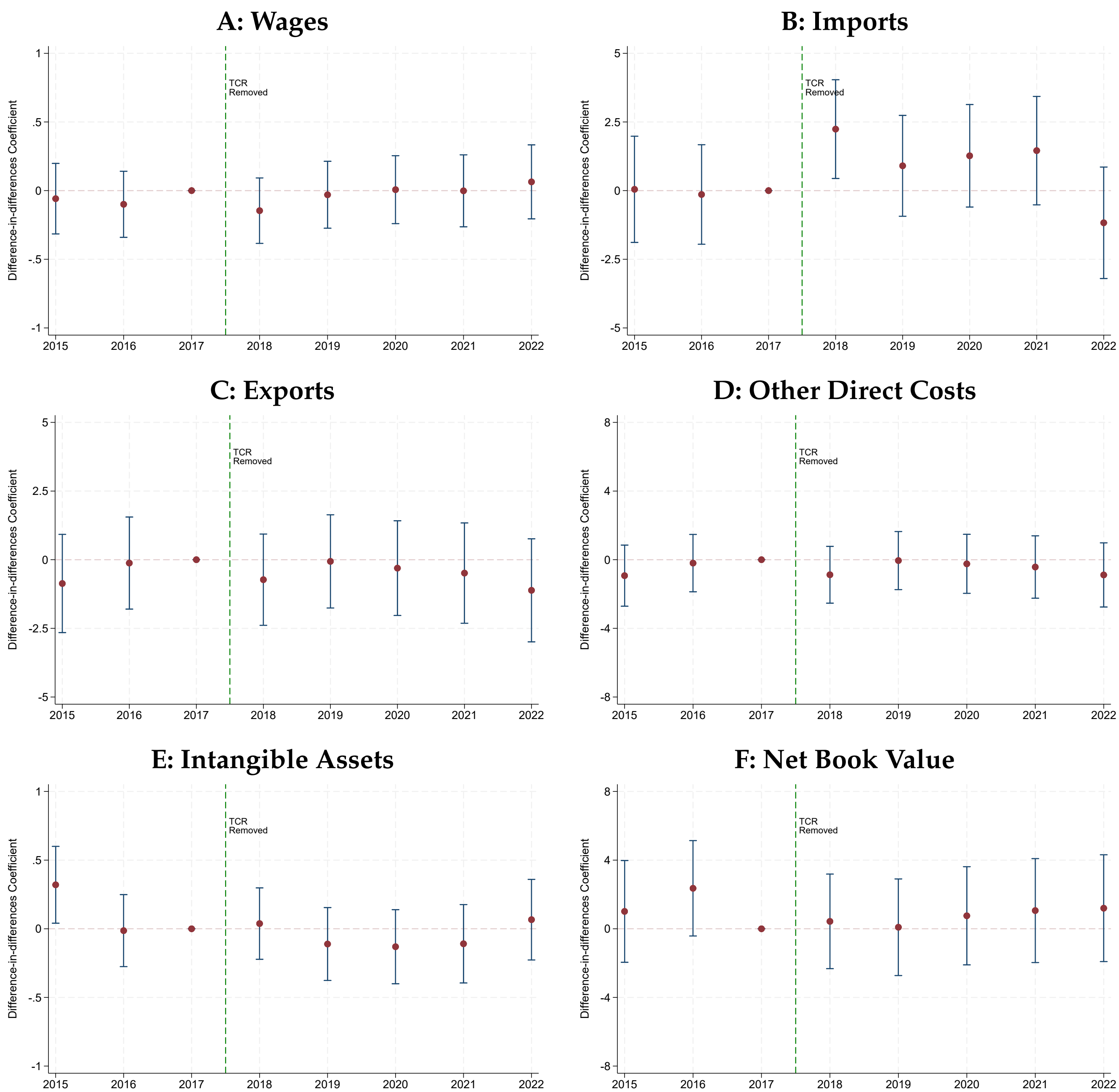
Notes: The figure plots the results from our event study specification corresponding to model (12), illustrating the impacts of the removal of TCR on MNEs. The sample here comprises only MNEs in the Treatment 2 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average debt to equity ratio during the baseline years of 2014–2017 was greater than 1.3, while their interest expenses to EBITDA ratio never exceeded 0.2 in any of these years. These firms were close to failing the TCR but were never at risk of failing the ESR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please refer to section C.2.

FIGURE F.III: **IMPACTS OF TREATMENT 2 – TCR REMOVED**



Notes: The figure plots the results from our event study specification corresponding to model (12), illustrating the impacts of the removal of TCR on MNEs. The sample here comprises only MNEs in the Treatment 2 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average debt to equity ratio during the baseline years of 2014–2017 was greater than 1.3, while their interest expenses to EBITDA ratio never exceeded 0.2 in any of these years. These firms were close to failing the TCR but were never at risk of failing the ESR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please refer to section C.2.

FIGURE F.IV: **IMPACTS OF TREATMENT 2 – TCR REMOVED**

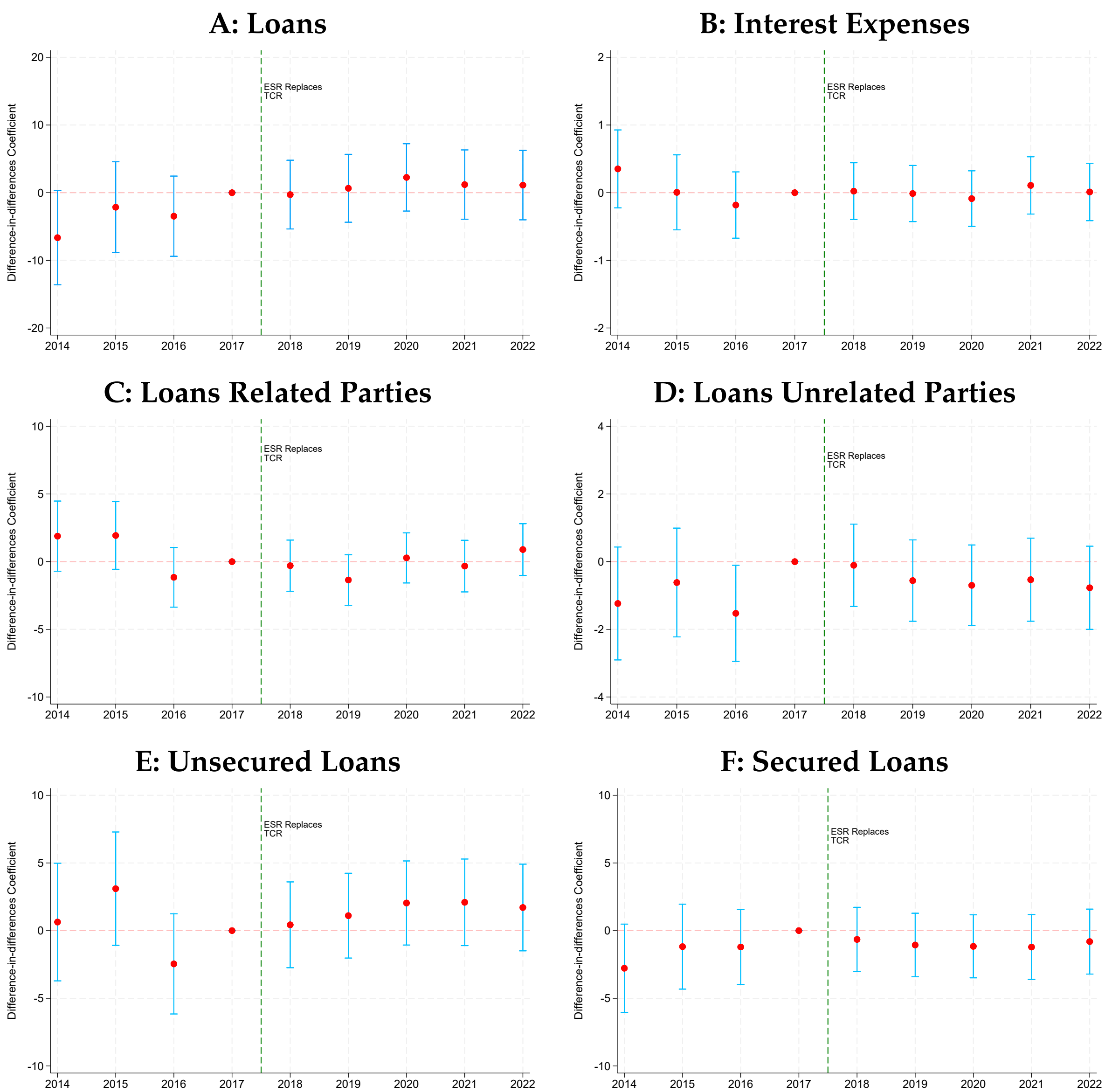


Notes: The figure plots the results from our event study specification corresponding to model (12), illustrating the impacts of the removal of TCR on MNEs. The sample here comprises only MNEs in the Treatment 2 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average debt to equity ratio during the baseline years of 2014–2017 was greater than 1.3, while their interest expenses to EBITDA ratio never exceeded 0.2 in any of these years. These firms were close to failing the TCR but were never at risk of failing the ESR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please refer to section C.2.

G Impacts of Treatments 3

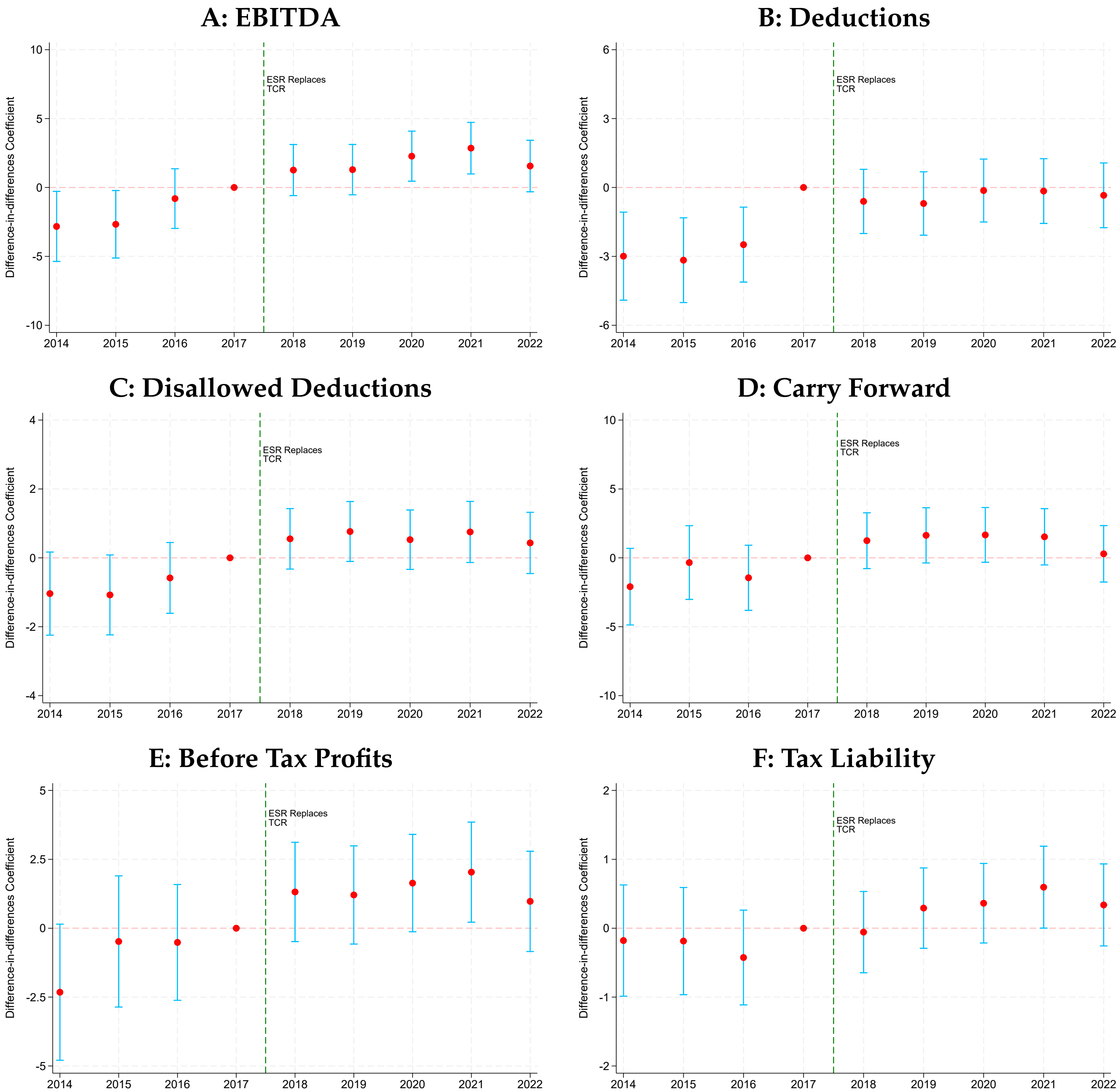
This section presents results on the impacts of the Treatment 3.

FIGURE G.I: **IMPACTS OF TREATMENT 3 – TCR REPLACED WITH ESR**



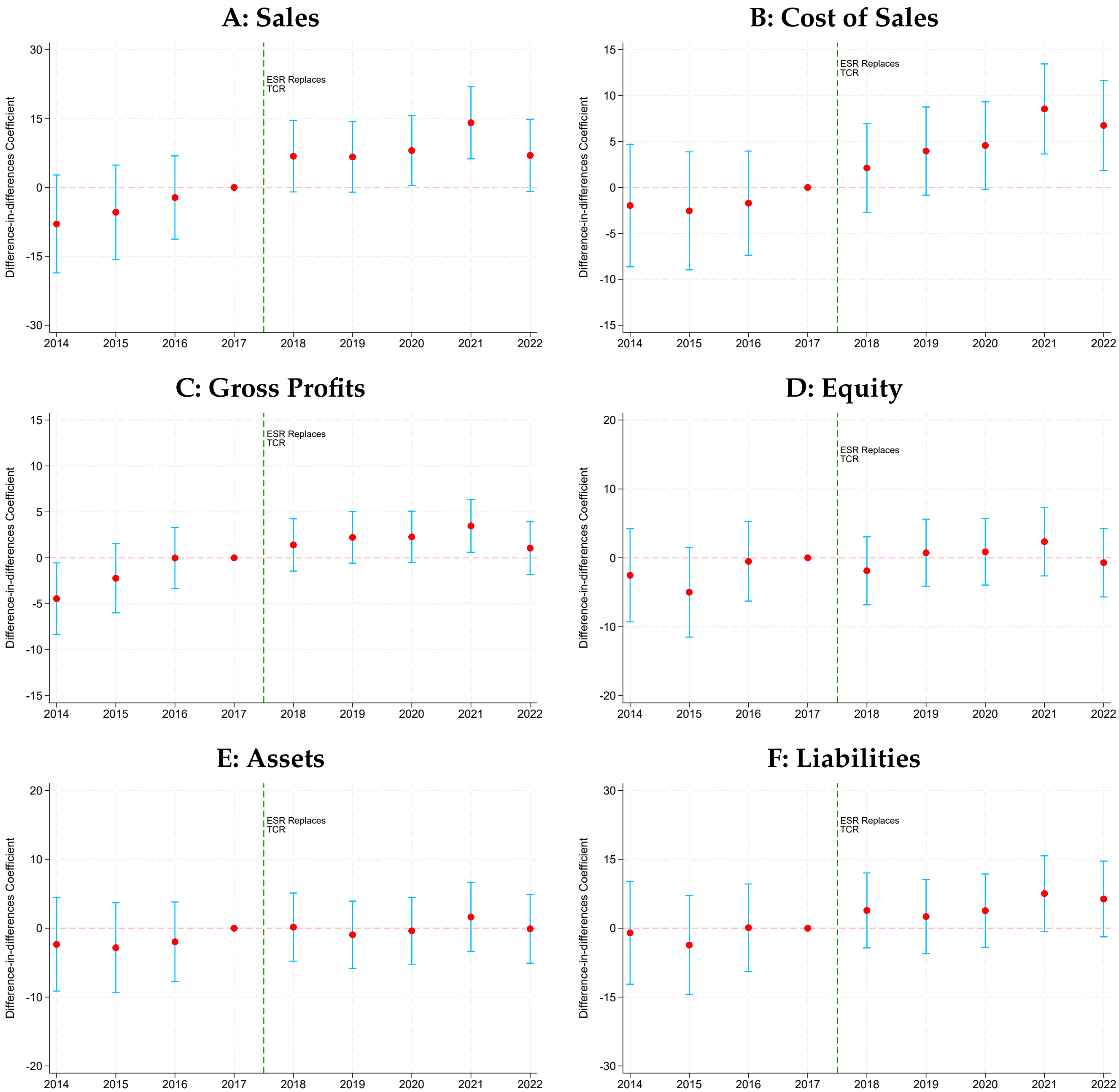
Notes: The figure plots the results from our event study specification corresponding to model (12), illustrating the impacts of transitioning from a binding TCR to a binding ESR on MNEs. The sample here comprises only MNEs in the Treatment 3 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average debt to equity ratio during the baseline years of 2014–2017 was greater than 1.3, while their interest expenses to EBITDA ratio during these years was greater than 0.2. These firms were close to failing both the TCR and the ESR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please refer to section C.2.

FIGURE G.II: **IMPACTS OF TREATMENT 3 – TCR REPLACED WITH ESR**



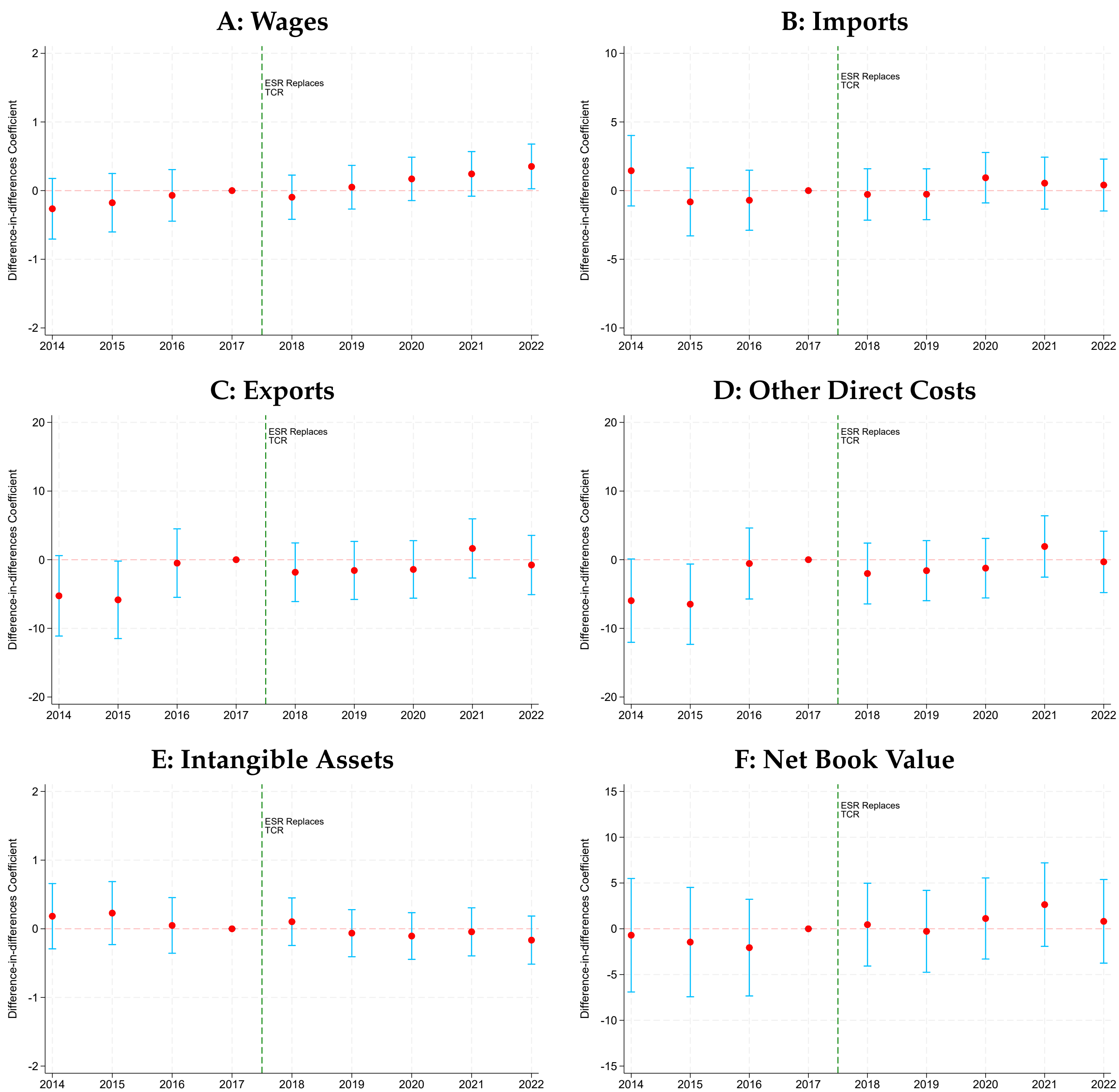
Notes: The figure plots the results from our event study specification corresponding to model (12), illustrating the impacts of transitioning from a binding TCR to a binding ESR on MNEs. The sample here comprises only MNEs in the Treatment 3 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average debt to equity ratio during the baseline years of 2014–2017 was greater than 1.3, while their interest expenses to EBITDA ratio during these years was greater than 0.2. These firms were close to failing both the TCR and the ESR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please refer to section C.2.

FIGURE G.III: **IMPACTS OF TREATMENT 3 – TCR REPLACED WITH ESR**



Notes: The figure plots the results from our event study specification corresponding to model (12), illustrating the impacts of transitioning from a binding TCR to a binding ESR on MNEs. The sample here comprises only MNEs in the Treatment 3 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average debt to equity ratio during the baseline years of 2014–2017 was greater than 1.3, while their interest expenses to EBITDA ratio during these years was greater than 0.2. These firms were close to failing both the TCR and the ESR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please refer to section C.2.

FIGURE G.IV: **IMPACTS OF TREATMENT 3 – TCR REPLACED WITH ESR**



Notes: The figure plots the results from our event study specification corresponding to model (12), illustrating the impacts of transitioning from a binding TCR to a binding ESR on MNEs. The sample here comprises only MNEs in the Treatment 3 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average debt to equity ratio during the baseline years of 2014–2017 was greater than 1.3, while their interest expenses to EBITDA ratio during these years was greater than 0.2. These firms were close to failing both the TCR and the ESR. The control group consists of MNEs that were never at risk of failing either test. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please refer to section C.2.

TABLE G.I: **IMPACTS OF TREATMENT 3 – TCR REPLACED WITH ESR**

Outcomes (y_i):	Loans	Interest Expenses	Financial Expenses	Loans Related Parties	Loans Unrelated Parties	Secure Loans	Unsecure Loans
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
treat × after	5.495**	0.266	0.790***	0.124	0.968	1.569	1.245*
	(2.153)	(0.166)	(0.254)	(0.625)	(0.628)	(1.023)	(0.725)
treat × after × TI ↑	-14.666	-1.662*	-2.603**	-3.832	-4.887	-9.951*	1.006
	(9.445)	(0.963)	(1.319)	(2.750)	(3.112)	(5.251)	(5.298)
Observations	2,015	2,015	2,015	2,015	2,015	2,015	2,015
Baseline Mean (UGX Billions)	3.9	0.8	1.2	0.9	1.1	1.7	1.1
Fixed Affects:	Firm; Year; Industry × Year						

Notes: The table reports the results from our augmented difference-in-differences model corresponding to (12), estimating the impacts of transitioning from a binding TCR to a binding ESR on MNEs. The sample here comprises only MNEs in the Treatment 3 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average debt to equity ratio during the baseline years of 2014–2017 was greater than 1.3, while their interest expenses to EBITDA ratio during these years was greater than 0.2. These firms were close to failing both the TCR and the ESR. The control group consists of MNEs that were never at risk of failing either test. The dummy variable TI ↑ indicates MNEs for whom the interest deduction disallowed by the ESR at the baseline exceeded that by the TCR. The outcomes are measured in levels, expressed as UGX Billions. The last row reports the baseline mean of the outcomes in the treatment group in UGX billions. Robust standard errors are in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels. For precise definitions of the outcomes used here, please refer to section C.2.

TABLE G.II: **IMPACTS OF TREATMENT 3 – TCR REPLACED WITH ESR**

Outcomes (y_i):	EBITDA	Deductions	Disallowed Deductions	Carry Forward	Tax Liability	Profits Before Tax	Profits After Tax
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
treat × after	2.045***	1.299*	0.679**	0.498	0.658**	0.893	0.739
	(0.646)	(0.774)	(0.307)	(0.726)	(0.307)	(0.711)	(0.575)
treat × after × TI ↑	4.879	-0.680	2.494	9.518**	-1.382	6.655	6.402*
	(4.212)	(2.587)	(1.830)	(4.391)	(1.394)	(4.175)	(3.568)
Observations	2,015	2,015	2,015	2,011	2,011	2,015	2,011
Baseline Mean (UGX Billions)	1.7	2.3	1.0	-0.1	0.3	0.0	-0.1
Fixed Affects	Firm; Year; Industry × Year						

Notes: The table reports the results from our augmented difference-in-differences model corresponding to (12), estimating the impacts of transitioning from a binding TCR to a binding ESR on MNEs. The sample here comprises only MNEs in the Treatment 3 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average debt to equity ratio during the baseline years of 2014–2017 was greater than 1.3, while their interest expenses to EBITDA ratio during these years was greater than 0.2. These firms were close to failing both the TCR and the ESR. The control group consists of MNEs that were never at risk of failing either test. The dummy variable TI ↑ indicates MNEs for whom the interest deduction disallowed by the ESR at the baseline exceeded that by the TCR. The outcomes are measured in levels, expressed as UGX Billions. The last row reports the baseline mean of the outcomes in the treatment group in UGX billions. Robust standard errors are in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels. For precise definitions of the outcomes used here, please refer to section C.2.

TABLE G.III: **IMPACTS OF TREATMENT 3 – TCR REPLACED WITH ESR**

Outcomes (y_i):	Sales	Cost of Sales	Gross Profits	Assets	Liabilities	Equity	Net Book Value
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
treat × after	10.093***	6.777***	3.174***	3.766**	4.260	3.721**	4.254***
	(2.807)	(2.218)	(0.869)	(1.652)	(3.074)	(1.828)	(1.547)
treat × after × TI ↑	4.306	-5.339	-0.850	-15.180	6.338	-14.412	-15.768*
	(14.914)	(6.646)	(6.510)	(9.346)	(14.280)	(9.396)	(8.648)
Observations	2,015	2,015	2,015	2,015	2,015	2,015	2,015
Baseline Mean (UGX Billions)	16.3	10.7	6.2	12.9	10.6	7.3	11.1
Fixed Affects	Firm; Year; Industry × Year						

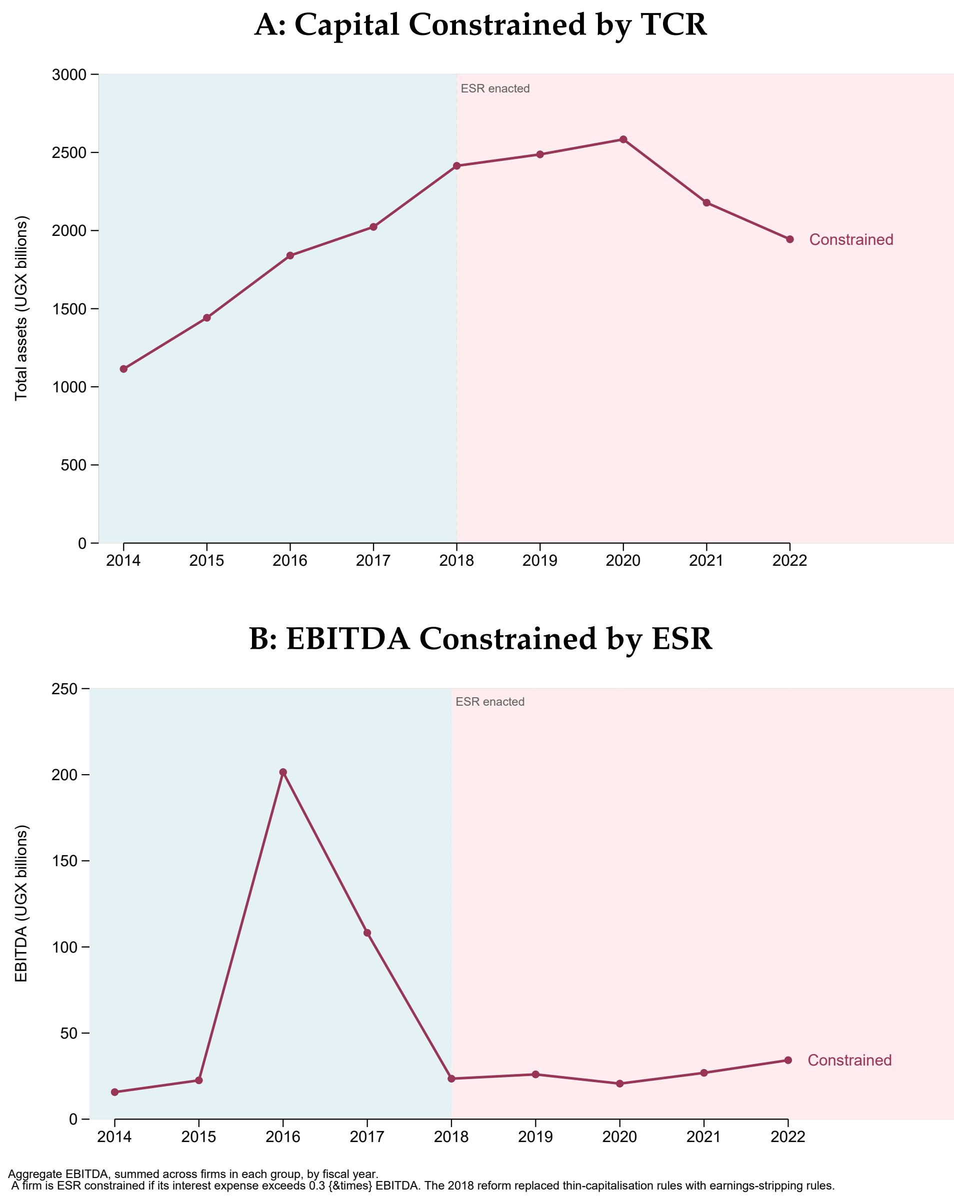
Notes: The table reports the results from our augmented difference-in-differences model corresponding to (12), estimating the impacts of transitioning from a binding TCR to a binding ESR on MNEs. The sample here comprises only MNEs in the Treatment 3 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average debt to equity ratio during the baseline years of 2014–2017 was greater than 1.3, while their interest expenses to EBITDA ratio during these years was greater than 0.2. These firms were close to failing both the TCR and the ESR. The control group consists of MNEs that were never at risk of failing either test. The dummy variable TI ↑ indicates MNEs for whom the interest deduction disallowed by the ESR at the baseline exceeded that by the TCR. The outcomes are measured in levels, expressed as UGX Billions. The last row reports the baseline mean of the outcomes in the treatment group in UGX billions. Robust standard errors are in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels. For precise definitions of the outcomes used here, please refer to section C.2.

Table G.IV: **Impacts of Treatment 3 – TCR Replaced with ESR**

Outcomes (y_i):	Wages	Imports	Exports	Other Direct Costs	Intangible Assets	Fixed Assets	Shareholder Capital
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
treat $\times$ after	0.229*	-0.034	0.968	1.356	-0.167*	4.070	-0.569*
	(0.119)	(0.776)	(1.444)	(1.515)	(0.088)	(3.194)	(0.303)
treat $\times$ after $\times$ TI $\uparrow$	-0.164	2.185	-0.557	-0.939	0.300	-20.567	-2.118
	(0.109)	(2.975)	(10.706)	(11.156)	(0.601)	(20.908)	(2.403)
Observations	2,015	2,015	2,015	2,015	2,015	2,015	2,011
Baseline Mean (UGX Billions)	0.0	2.4	3.9	4.0	0.3	20.8	1.6
Fixed Affects	Firm; Year; Industry $\times$ Year						

Notes: The table reports the results from our augmented difference-in-differences model corresponding to (12), estimating the impacts of transitioning from a binding TCR to a binding ESR on MNEs. The sample here comprises only MNEs in the Treatment 3 and Control cells illustrated in Figure I. The treatment group comprises MNEs whose average debt to equity ratio during the baseline years of 2014–2017 was greater than 1.3, while their interest expenses to EBITDA ratio during these years was greater than 0.2. These firms were close to failing both the TCR and the ESR. The control group consists of MNEs that were never at risk of failing either test. The dummy variable TI $\uparrow$ indicates MNEs for whom the interest deduction disallowed by the ESR at the baseline exceeded that by the TCR. The outcomes are measured in levels, expressed as UGX Billions. The last row reports the baseline mean of the outcomes in the treatment group in UGX billions. Robust standard errors are in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels. For precise definitions of the outcomes used here, please refer to section C.2.

Figure G.I: **Capital and EBITDA Constrained Sets**



Notes: The figure plots the aggregate value of the relevant tax base for each constrained set, by fiscal year. Panel A shows total assets at TCR-constrained MNEs—firms whose pre-reform debt-to-equity ratio exceeds 1.5—and Panel B shows EBITDA at ESR-constrained MNEs—firms whose pre-reform interest-to-EBITDA ratio exceeds 0.30. Light-blue shading denotes the pre-reform Thin Capitalization Rule (TCR) regime (2014–2017); light-pink shading denotes the post-reform Earnings Stripping Rule (ESR) regime (2018–2022); the vertical line marks the 2018 reform date. The two series anchor the aggregates $K_{\mathcal{C}}$ and $Y_{\mathcal{C}}$ that enter the welfare comparison in Section VII.