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Intended and unintended consequences of anti-avoidance rules

Evidence from Uganda

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Abstract: Aggressive profit shifting by multinational enterprises (MNEs) is a growing concern for domestic resource mobilization in developing economies. This paper evaluates the revenue and welfare consequences of a flagship tax avoidance rule that has been implemented in more than 45 countries to prevent profit shifting by MNEs through the debt channel. Our focus is Uganda, a representative developing country that implemented the rule in 2018. Exploiting administrative data comprising the universe of corporate tax returns, we find that the rule does not significantly increase profits reported by MNEs in Uganda or prevent base erosion by them in Uganda. As an unintended consequence, however, the implementation of the rule leads to a contraction in real economic activity, reducing the turnover, employment, and trade of treated MNEs. We highlight the limited targeting efficiency of the rule, questioning its overall effects on welfare.

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1   Introduction

Economic activity is becoming increasingly concentrated within large multinational enterprises (MNEs). These firms and their affiliates now dominate global production, accounting for over one-third of world output and two-thirds of international trade (Cadestin et al. 2018). The increasing concentration of economic activity means that countries are increasingly reliant on revenue from MNEs. This is especially true in developing countries, where corporate tax rates are higher and the need to mobilize domestic resources is greater (Bachas et al. 2022; IMF 2019). But a growing body of evidence suggests that MNEs can easily avoid paying local taxes by shifting profits to low-tax jurisdictions, thereby depriving high-tax countries of due taxes on a large part of their tax base (see e.g. Bilicka 2019; Clausing 2020; Tørsløv et al. 2023).

To prevent profit shifting by MNEs, countries use anti-avoidance rules. But these rules can be double-edged swords: although they counter tax avoidance, they may also increase the cost of capital, thereby reducing investment in the host country (Grubert and Slemrod 1998; Suárez Serrato 2018). The optimality of tax-avoidance rules thus depends not only on how effective they are against tax avoidance, but also on how they impact domestic economic activity. While many studies estimate these avoidance and real effects separately, only a few do so in a unified manner. This paper addresses this gap in the literature. We focus on a flagship anti-avoidance rule recommended by the OECD in 2015 and implemented by more than 45 countries by 2019. Exploiting its implementation in Uganda in 2018, we estimate the rule's intended consequences on tax avoidance and its unintended consequences on economic activity.

The rule we exploit is based on Action 4 of the Base Erosion and Profit Shifting framework (OECD 2015). Its purpose is to reduce tax avoidance by MNEs through the debt channel. The interest paid by a company on its outstanding debt is a tax-deductible expense, a provision MNEs exploit to shift profits out of high-tax countries. They load their high-tax affiliates with internal and external debt, thereby inflating interest expenses and reducing taxable profits in high-tax countries. In its extreme version, all such debt is internal, borrowed from affiliates based in tax havens so that the interest income flowing to the lending affiliate also escapes taxation.

Countries use interest limitation rules to prevent profit shifting through this channel. These rules are either based on an *equity test*, which disallows interest deduction of a company if its debt-to-equity ratio exceeds a set limit, or on an *earnings test*, which disallows interest deductions of a company if its interest expenses-to-earnings ratio exceeds a set limit. The OECD's Action 4 recommends that the main interest limitation rule of a country must be based on the latter rather than the former test. By 2019, around 45 countries had implemented this recommendation, while others still used the old equity-based test, and some used no rule at all.

Uganda implemented Action 4 in 2018, introducing a new rule that disallows interest deduction of a company to the extent that it exceeds 30 per cent of the company's earnings before interest, taxes, depreciation, and amortization (EBITDA). The reform replaced the earlier rule based on an equity test, which disallowed interest deduction on the part of debt that exceeded 1.5 times the equity of the company. By replacing the equity test with the earnings test, the reform creates rich variation that can be used to tease out the causal effects we are interested in. Importantly, it creates three distinct treatments. At the baseline, some firms were well below the equity test threshold but close to the earnings test threshold. These firms thus experienced the introduction of the earnings test as a treatment. Similarly, depending on their baseline levels of interest, debt, equity, and earnings, other firms experienced the removal of the equity test, the replacement of the equity test with an earnings test, or no treatment at all.

We use the standard difference-in-differences framework to estimate our causal effects. Our model compares outcomes of treated and untreated MNEs to isolate the causal effect of each treatment separately.

The main assumption underlying our model is not random assignment into control and treatment groups, but rather that the two groups would have evolved similarly had there been no rule change. Our results are always supported by corresponding event studies, which show the evolution of outcomes before and after the reform and validate our empirical strategy.

We use administrative data provided by the Uganda Revenue Authority (URA). The data cover all corporate tax returns filed in Uganda from 2014 to 2022. To our knowledge, this is the richest dataset that has been used for such a study. We observe balance sheet, income statement, and tax computations of the company along with important firm characteristics such as industry and location. With these data, we can trace the effects of the three treatments on 28 different outcomes, offering a complete picture of the MNEs' real and avoidance responses to the reform.

Our initial results explore whether MNEs use debt to shift profits out of Uganda. Examining this question is important because the anti-avoidance rule we study can have a meaningful impact only if MNEs do use debt for profit shifting. To explore this question, we use two strategies. First, we follow Bilicka (2019) to compare debt, interest expenses, and related outcomes between MNEs and similar domestic firms. Specifically, we run regressions of these outcomes on firm-type dummies, controlling for total sales and assets of the firm and including both industry and location fixed effects. We find that, on average, MNEs report nearly four times higher loans and deduct four times higher interest expenses than similar domestic firms. But, surprisingly, they report 25 times lower profits compared to domestic counterparts. The difference in the level of indebtedness of the two groups is largely driven by the loans from related parties rather than the loans from unrelated parties, a finding consistent with the story of using debt as an instrument of profit shifting. In the second strategy, we follow Bachas et al. (2023) to compare the effective tax rate paid by MNEs and domestic firms after controlling for any differences in firm size. We find that, on average, MNEs pay nearly 50 per cent lower effective tax rate than standalone firms at every level of firm size. The effective tax rate paid by MNEs ranges between one-sixth and one-third of the statutory tax rate and between one-third and two-thirds of the tax rate proposed under the global minimum tax. In combination, the results from the two strategies strongly suggest that MNEs indeed use debt to shift profits out of Uganda.

We next estimate the avoidance and real effects of the interest limitation rule we exploit. We find that the introduction of the earnings test induces sharp responses among the treated firms. Loans reported and interest expenses claimed by these firms reduce by nearly 80 per cent. Importantly, however, these reductions do not translate into higher profits reported in Uganda or higher taxes paid in Uganda. In fact, the tax liability of the treated firms falls, with the fall driven both by firms reporting lower earnings and by firms drawing down carry-forward balances. As an unintended consequence, the real economic activity of these firms contracts sharply. Their sales decline, assets shrink, and liabilities rise, leading to a nearly 20 per cent drop in net book value. In contrast, our second treatment—the removal of the equity test—does not produce any significant response. In general, all 28 outcomes of these firms, capturing both avoidance and real activities, continue to evolve on pre-existing trends, with no break observed up to five years after the reform. This finding is consistent with the proposition that MNEs can easily circumvent interest limitation rules based on an equity test (OECD 2015).

The results from our third treatment are in line with those from the first two treatments. Firms in this group behave exactly similar to those in the first treatment if the transition from the equity test to the earnings test means an increase in the treatment intensity, with more of their interest expenses getting disallowed under the latter test. The responses move in the opposite direction when the transition results in a reduction in treatment intensity.

Our final set of results explore why the two anti-avoidance rules fail to achieve their objective. We find that these rules apply to only a small number of firms: the equity test affects around 20 per cent of MNEs, and the earnings test impacts just 3–6 per cent of MNEs. This limited applicability may not be

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an issue in itself because we know that profit shifting is a top-heavy phenomenon. In other words, the two tests could still be effective if they target the right kind of firms. But the targeting efficiency of these tests is poor as well. On average, they target the same proportion of firms across the interest expense distribution and thus are not more likely to target firms with *excessive* interest expenses. Finally, even when these tests bind, they rarely result in an immediate tax consequence because firms are either in a loss position or have a carry-forward balance to offset any increase in current tax liability. Largely for these reasons, it is not surprising that the anti-avoidance rules fail to result in higher profits reported in Uganda or higher taxes paid in Uganda, despite negatively impacting the real economic activity in the country.

This paper contributes to three strands of literature. First, we add to studies that show how MNEs use internal and external debt to avoid paying taxes in high-tax countries. In general, the level of debt observed in MNEs is much higher than in similar domestic firms (see e.g. Bilicka 2019 for the UK; Desai et al. 2004 for the United States; and Buettner et al. 2012 for Germany).[1] While higher debt levels could arise for non-tax reasons (Huizinga et al. 2008; Møen et al. 2011), their correlation with corporate tax rates suggests profit shifting as the primary motivation. To our knowledge, ours is the first study to show that in developing countries such differences could be even starker, jeopardizing revenue from a very important tax base for the already-stretched public finances of these countries.

Second, we contribute to the literature that examines the economic consequences of anti-avoidance measures. Increasing profit shifting by MNEs has prompted a coordinated global response. This effort—led by the OECD through its BEPS (Base Erosion Profit Shifting) framework—is aimed at ensuring that profits are taxed where the economic activities generating them occur. However, the evidence on the effectiveness of these anti-avoidance measures remains mixed. For example, the Tax Cuts & Jobs Act of 2017, which imposed restrictions on the interest deductions of MNEs similar to those studied in this paper, was found to reduce the leverage of treated companies by about US$126 million per firm (Carrizosa et al. 2022). Similarly, Bilicka (2019) finds that foreign MNEs in the UK reduced their net debt by 78 per cent—an effect similar to ours in magnitude—in response to the implementation of the Worldwide Debt Cap.[2] On the other hand, Bustos et al. (2022) estimate that strengthening transfer pricing enforcement in Chile was entirely ineffective in reducing MNEs' transfers to low-tax countries or increasing their tax payments. Instead, it stimulated investment in sophisticated tax planning, thereby benefiting tax consultants at the expense of taxpayers. Our results are closer to the second extreme. The implementation of Action 4 causes a strong reduction in both loans and interest expenses of the treated firms, yet these adjustments result in neither higher profits reported in Uganda nor higher taxes paid there. Our results also contrast with Jamal (2024), who in a cross-country setting involving many developed countries finds that implementing Action 4, on average, results in higher tax payments while having negative, unintended impacts on real activity. The absence of a revenue response in our context likely reflects the lower enforcement capacity of Uganda, highlighting that policy lessons from developed countries are not always applicable in developing countries.

By raising the effective cost of capital, anti-avoidance measures may stifle investment and real economic activity in the host country (Grubert and Slemrod 1998; Hines and Rice 1994). The third strand of literature we contribute to estimates these unintended consequences of anti-avoidance measures. For instance, Suárez Serrato (2018) finds that limiting profit shifting opportunities to Puerto Rico caused the treated MNEs in the United States to reduce their global investment by 10 per cent and their US employment by 6.7 per cent. Similar negative effects on real activity are documented by Bilicka et al. (2021), Carrizosa

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[1] Please also see Blouin et al. (2014) and De Mooij and Hebous (2018) for other examples of tax-motivated debt shifting, and Dharmapala and Riedel (2013), Cristea and Nguyen (2016), Liu et al. (2020), Wier (2020), and Garcia-Bernardo et al. (2022) for examples of profit shifting by MNEs in general.

[2] This policy, introduced in 2010, was similar to ours, disallowing interest expense on debt above a fixed percentage of the worldwide debt of the group.

et al. (2022), and de Mooij and Liu (2021).[3] To our knowledge, none of the existing studies examine these effects in a developing country, where investment is important for raising productivity and living standards. Our results from Uganda are in line with these studies, showing that the implementation of Action 4 caused the treated firms to contract. This contraction is observed across almost all variables signalling real activities, including sales, cost of sales, wages, imports, and exports.

The paper proceeds as follows. Section 2 describes important features of our environment, including how debt-based profit shifting works and how interest limitation rules counter it, focusing especially on Uganda. Section 3 builds a conceptual framework setting up trade-offs involved in switching from an equity test to an earnings test. Section 4 describes our empirical strategy and data. Sections 5–7 present our results and Section 8 concludes.

2   Context

In this section, we describe the institutional features of our environment, focusing especially on how MNEs shift profits using debt, and highlighting regulations and policies that influence these activities.

2.1   Profit shifting through thin capitalization

The interest paid by a company on its outstanding debt is a tax-deductible expense in most jurisdictions. While this encourages the use of debt in place of equity finance,[4] a more critical consequence of the policy is that it allows MNEs to shift profits from high-tax to low-tax countries, eroding the tax bases of the former countries. Figure 1 illustrates the simplest arrangement through which such profit shifting could occur. A parent MNE has two affiliates, one in Uganda (a high-tax country with a corporate tax rate of 30 per cent) and the other in a low-tax country. The Ugandan affiliate can borrow from the low-tax subsidiary, paying interest on the outstanding debt. A dollar of interest flowing between the two affiliates in this way 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 $t_u - t_l$. In the extreme case, where the low-tax jurisdiction is a tax haven with a tax rate of nearly zero, the global profits of the MNE will increase by 30 cents for every dollar of interest expense claimed in Uganda.

There are three conditions under which profit shifting through debt is beneficial for the MNE: (1) the interest and interest-like payments must be tax deductible;[5] (2) there must be a difference in tax rates across affiliates; and (3) the interest payments must not be subject to significant withholding taxes. Uganda, with one of the highest corporate tax rates in the world,[6] meets these conditions, making profit shifting through the debt channel feasible. Our simple example in Figure 1 also illustrates that holding investment fixed, the potential tax saving from profit shifting depends on the difference in the statutory tax rates rather than the effective tax rates, which are usually lower (please see Grubert and Mutti 1991 for details).

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[3] Also see Desai and Dharmapala (2009), Blouin et al. (2014), and Jamal (2024) for the real effects of anti-avoidance rules.

[4] This occurs because dividends and other equity returns are not tax deductible.

[5] Interest-like payments include those that are linked to the financing of an entity and are determined by applying a fixed or variable percentage to an actual or notional principal over time.

[6] See Figure 3 to compare the Ugandan corporate tax rate with that of the rest of the world.

Figure 1: Using debt for profit shifting
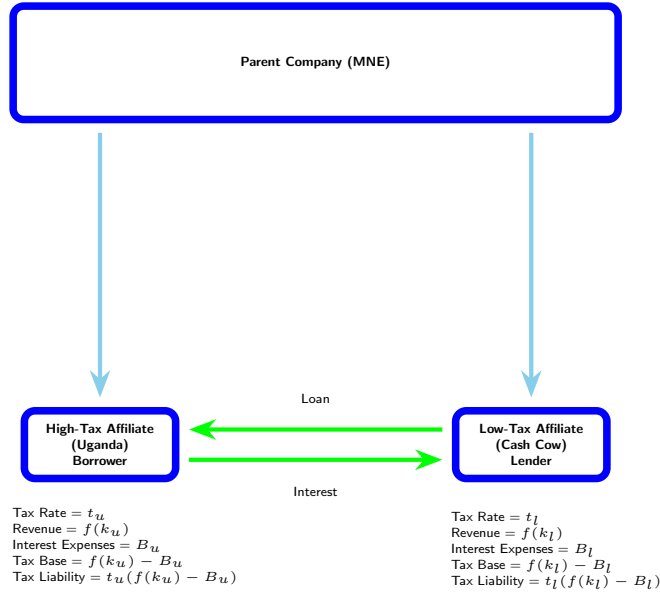
Note: the figure illustrates the simplest possible arrangement through which an MNE could shift profits out of Uganda. A parent MNE has two affiliates, one in Uganda, indexed by u, and another in a low-tax country, indexed by l. The Ugandan affiliate borrows from the low-tax subsidiary, paying interest 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.

Source: authors' illustration.

In practice, the schemes MNEs use for profit shifting are far more complicated than the one shown in Figure 1. The OECD identifies three primary channels through which such profit shifting could occur (OECD 2015):

1. MNEs placing higher levels of third-party debt in high-tax countries.
2. MNEs using inter-affiliate loans to generate interest deductions in excess of their actual third-party interest expense.
3. MNEs using third-party or inter-affiliate financing to fund the generation of tax-exempt income.

Regardless of the channel used, placing debt in the Ugandan affiliate will have the same consequence of eroding local revenues. A related point on the debt channels is that MNEs' internal and external borrowings usually move together (for evidence, see e.g. Bilicka et al. 2021; Blouin et al. 2014). This is particularly important because policies affecting internal borrowing of MNEs may also impact their external borrowing, despite the different consequences these borrowings have for their worldwide capital, investment, and profits.

How often do MNEs use debt for profit shifting? Bilicka (2019) finds that MNEs in the UK report 13.5 percentage points higher debt than comparable domestic firms. This explains 40 per cent of the difference in profits to assets ratio (which likely captures tax avoidance) between MNEs and domestic firms. Importantly, profit shifting through the channel is found to be increasing even when tax rates were falling. For the United States, Desai et al. (2004) estimate that affiliate-level debt of MNEs averages around 55 per cent of assets, with nearly 20 per cent of it coming from US parents alone. Buettner and Wamser (2013) report similar numbers for Germany. Globally, the corporate debt of non-financial companies has increased by nearly 50 per cent in the last decade, to just under US$9 trillion (Carrizosa

et al. 2022). All these estimates are from rich countries and we are not aware of any similar study from a developing country, although there is evidence of general profit shifting from these countries. For example, Tørsløv et al. (2023) estimate that in 2015 Chile lost the equivalent of 20 per cent of MNEs' corporate tax revenue due to profit shifting.

It is important to emphasize that tax avoidance is not always the only consideration behind a company's choice of financial policies. Companies may use debt as a disciplining device for overspending managers, and they may need to balance the benefits of excessive leverage against the risk of lower bankruptcy costs it entails (Huizinga et al. 2008; Møen et al. 2011). These non-tax motivations for leverage are, however, unlikely to change sharply around the time of the reforms we exploit to identify tax-motivated debt shifting.

2.2   Interest limitation rules

To stop profit shifting through the debt channel, countries implement some form of interest limitation rules. The purpose of these rules is to ensure that profits are taxed in the jurisdiction where economic activity takes place and value is created (OECD 2015). These rules disallow interest deduction on the part of the debt deemed excessive. There are two main tests to determine what constitutes *excessive* debt. The first test disallows interest deductions on the portion of debt that exceeds a fixed fraction of the company's equity. Rules based on this test are known as *thin capitalization rules* or *fixed ratio rules* and were the principal anti-avoidance measure in use until 2005 (Buettner et al. 2012). The second test disallows interest deductions that exceed a fixed proportion of the company's earnings. Rules based on this test are called *earnings stripping rules* and are becoming increasingly common as the main anti-avoidance instrument against debt-based profit shifting. For simplicity, we refer to the two rules by the test they are based on, calling the former the *equity test* and the latter the *earnings test* throughout this paper. This terminology is not perfect, and we use it for brevity only.

Each of these tests has its own advantages and disadvantages. Because debt and equity are less volatile than earnings, the equity test affords a degree of certainty to MNEs, helping them plan their future financing needs better. But it can be manipulated easily by MNEs. For example, they can manipulate the interest rates on debt as the test limits the debt but not interest expenses. In addition, MNEs can manipulate the test by injecting more equity into a particular affiliate or by using hybrid instruments.[7] The earnings test, on the other hand, is likely more difficult to manipulate. It links an affiliate's interest deduction to its earnings, meaning that MNEs can increase their deductions in a country by only increasing their earnings in the country. Since earnings and taxable income are correlated, increasing earnings necessarily involves paying higher taxes.[8] Another advantage of the earnings test is that it aligns the ability to deduct interest expenses with activities that generate taxable income and create value. For these reasons, the OECD recommends that the earnings test must be the main interest limitation rule for countries (OECD 2015).

Despite this recommendation, many countries still use the equity test as their main interest limitation rule, while others do not use any rule at all.[9] Figure 2 shows the distribution of these rules across the world. Uganda was one of the earliest countries to implement Action 4 of the BEPS framework, reforming its anti-avoidance regime from the equity test to the earnings test. Many countries in the

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[7] Another difficulty with the equity test is how to define debt and equity. Hybrid instruments, for example, have features of both debt and equity and can be classified equally as redeemable preference shares, debt, or equity. They give rise to deductible interest expense but no corresponding taxable income (Johannesen 2014).

[8] Any attempt to move profits out of the country will necessarily reduce interest deductions in the country because the two are linked. Under the assumption that increasing earnings will result in an increase in taxable income, it is unlikely that the level of earnings will be manipulated in order to increase the interest deductions in a country.

[9] Please see Webber (2010) for a survey of interest limitation rules around the world.

Global South, including some of Uganda's neighbours in Sub-Saharan Africa, still use the equity test as their main interest limitation rule, while others, such as Democratic Republic of the Congo, do not use any rule at all (Wamser et al. 2024).

Figure 2: Interest limitation rules around the world

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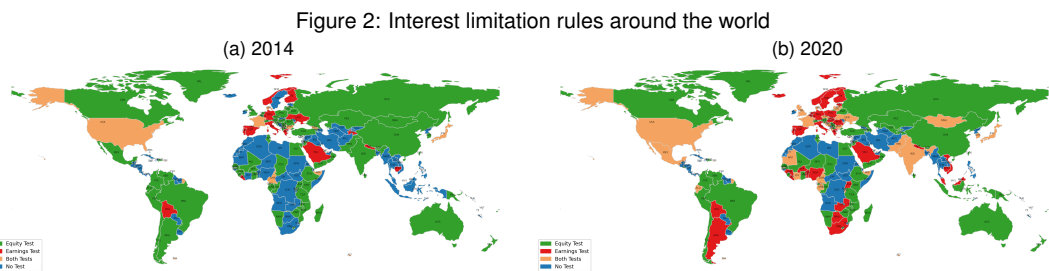
Note: this figure illustrates the evolution of interest limitation rules globally between 2014 and 2020, using data from the Research School of International Taxation's International Tax Institutions database (Wamser et al. 2024). The figure shows that during this period, many countries implemented Action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

Source: authors' illustration using data from Wamser et al. (2024) .

2.3   Taxation of corporate earnings in Uganda

Uganda is a lower-middle-income country with a GDP per capita of US$2,535 and a population of 46 million in 2021.[10] In recent decades, Uganda has been spending considerable effort to mobilize domestic revenues, and as a result its tax-to-GDP ratio has increased by nearly three-fold, rising from around 5 per cent in the 1980s to nearly 15 per cent in 2021 (McNabb 2017). The growth of corporate income tax has followed a similar trajectory, with revenue rising from around 0.34 per cent of GDP in 1995 to around 1 per cent of GDP in 2021. Figure 3 compares Uganda's corporate income tax rate with the rest of the world, showing that it is one of the highest in the world. It is also stable over time. While the world's average has been falling, Uganda's rate has remained constant at the high level of 30 per cent. Although there is no specific evidence from Uganda, Bachas et al. (2022) suggest that a key explanation for the rise in the tax-to-GDP ratio of developing countries is the increasing *effective* corporate tax rates in the post-1995 era of hyper-globalization. This captures the importance of the loss of corporate tax revenues through profit shifting to a representative developing country like Uganda.

Figure 3: Corporate income tax rate: Uganda vs. world

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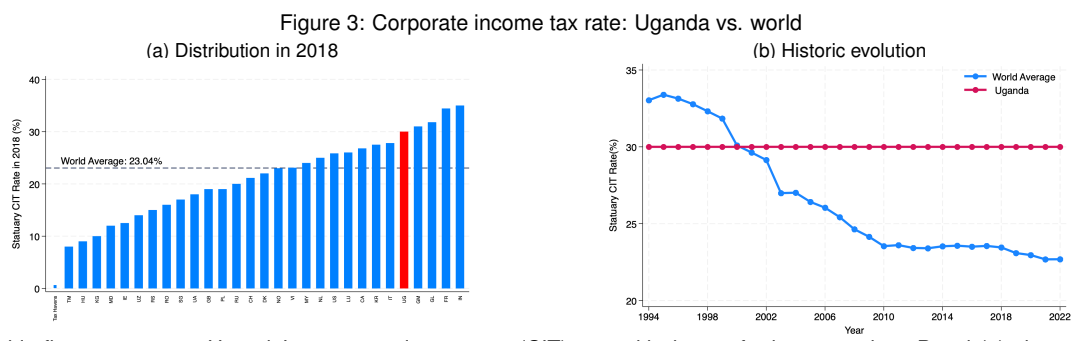
Note: this figure compares Uganda's corporate income tax (CIT) rate with those of other countries. Panel (a) shows that in 2018 Uganda had one of the highest statutory tax rates at 30 per cent, while the global average was 23.04 per cent. We do not exclude tax havens in calculating the global average.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

Source: authors' illustration based on data from Tax Foundation (2022)

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[10] The GDP per capita figure is in terms of PPP and is expressed in constant 2021 US dollars based on data from the World Bank's World Development Indicators database).

2.4   Interest limitation rules in Uganda

In this paper, we focus on the period between 2014 and 2022. Figure 4 illustrates the evolution of interest limitation rules in Uganda during this period. In 2014, Uganda had rules based on an equity test, which disallowed interest deductions for MNEs whose debt-to-equity ratio exceeded 1. This threshold was relaxed to 1.5 in 2015. These rules were marginal, meaning that the interest deductions were disallowed only on the portion of the debt that exceeded the fixed ratio of 1 or 1.5. The test applied exclusively to MNEs. Domestic groups with all affiliates located in Uganda were exempt, and the rules also did not apply to financial and banking sector MNEs. Additionally, the test did not apply if the MNE's debt did not exceed the arm's length debt amount, defined as the amount an *external* financial institution would be willing to lend to the MNE.

Figure 4: Interest limitation rules in Uganda
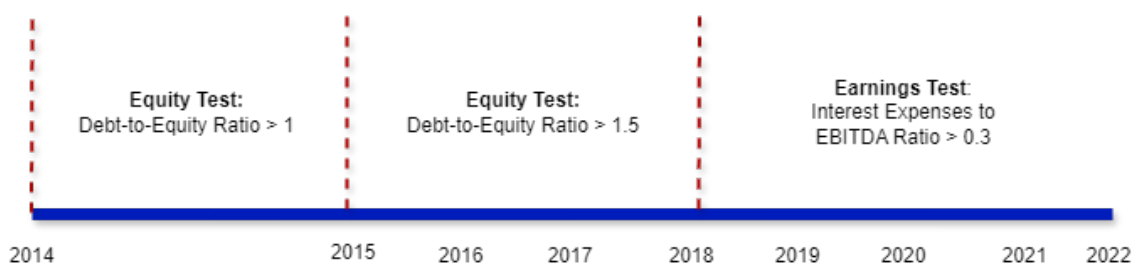
Note: the figure illustrates the timeline of interest limitation rules in Uganda. In 2014, the first year covered by our data, Uganda had rules based on the equity test, which disallowed the deduction of interest expenses on debt exceeding 1.0 times the firm's equity. This fixed ratio was relaxed to 1.5 in 2015. These rules applied exclusively to MNEs. In 2018, Uganda revised its interest limitation regime, replacing the equity test with an earnings test. The new rules extended to both MNEs and domestic groups, disallowing the deduction of interest expenses for companies whose interest expenses exceeded 30 per cent of their EBITDA.
Source: authors' illustration.

In 2018, Uganda reformed its interest limitation regime, replacing the equity test with an earnings test. The new rules applied to both MNEs and domestic groups, restricting interest deductions for companies whose *gross* interest expenses exceeded 30 per cent of their EBITDA. Similar to the previous rules, the deduction was disallowed only on the portion of interest expenses that exceeded this threshold. Because earning are more volatile than debt or equity, a disadvantage of earnings-based rules is that the ability to deduct interest fluctuates from year to year. Importantly, firms with negative earnings in a year cannot deduct interest expenses and may be required to pay taxes due to the interest disallowance. To mitigate this, earnings-based rules generally allow for some form of carry forward of the excess interest (OECD 2015). Uganda's provision allowed firms to carry forward the excess interest for up to three years. There was no *de minimis* threshold, so the rules applied to all MNEs and domestic groups, regardless of their size.[11] As before, the rules did not apply to firms in the finance, banking, and insurance sectors. The rules were applied using the standalone approach, which considers the leverage of each subsidiary separately rather than at the worldwide (MNE) level, an approach implemented in some other countries, such as the UK (Bilicka 2019).

The motivation behind the 2018 reform was to implement Action 4 of the BEPS framework, with the aim of providing stronger defence against tax avoidance by MNEs. This intention is clearly articulated in the URA's submission before a tax tribunal, where it stated the following as the motivation for implementing the new rule:

> Action 4 of BEPS proposed interventions to ensure that MNEs do not plan using interest deductions as a tool to erode the tax bases in jurisdictions where they operate. Uganda like

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[11] The purpose of a de minimis threshold is to exclude low-risk firms from the scope of interest limitation rules.

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 adapt the fixed ratio rule, which grant an entity interest claiming capacity based upon the level of its taxable income and therefore Uganda followed suit. (URA 2021)

The Ugandan financial year runs from 1 July to 30 June. In this paper, a year t refers to the financial year beginning from July $t-1$. In general, the accounting year of firms may not align with the tax year. Indeed, many firms—especially MNEs—maintain their accounts according to the calendar year, while others follow 'irregular' accounting years, such as from April to March. Firms file their tax returns six months after the end of their accounting year. In terms of the timing of the reform, the equity test was implemented on 29 June 2015 and was replaced with the earnings test on 21 June 2018. These reforms will start influencing firm behaviour from their announcement, and their effects will thus begin to appear from the accounting year ending after the announcement date. We observe the accounting year of firms in our data. The accounting year of nearly 50 per cent of MNEs ends after June. For these firms, the effects of the reform announced on 21 June 2018 will appear in the return filed for the tax year 2018. We therefore treat 2018 as the year when the latter reform—the main focus of our analysis—will start affecting behaviour.

3   Conceptual framework

In this section we develop a simple framework to highlight forces that may induce MNEs to use debt as an instrument to shift profits out of Uganda. The framework is based on the model in Mintz and Smart (2004). Its aim is to guide our empirical analysis, helping us develop predictions on how tax avoidance and real outcomes will evolve as Uganda switches its anti-avoidance regime from the equity test to the earnings test.

3.1   Tax-motivated debt shifting

Consider a firm with affiliates in N countries indexed by $i \in \{1,2,..,n\}$, one of which is Uganda. Each affiliate hires productive capital k_i at a rental rate r to generate revenue net of non-capital costs of $f_i(k_i)$. Each country operates a territorial system of corporate taxation, where the firm's local affiliate is taxed on its income net of any borrowing costs at a rate of t_i. The firm's tax liability in jurisdiction i is therefore

$$R_i = t_i(f_i(k_i) - B_i) \tag{1}$$

where B_i is the interest expense claimed in country i. To keep the exposition simple, we focus only on the internal capital market of the firm, assuming that it does not issue outside debt. This means that the interest expense claimed in one jurisdiction balances against the interest income claimed in others, such that $\Sigma_i B_i = 0$. It is easy to see from Equation 1 that the firm can reduce its worldwide tax bill by locating its debt in high-tax jurisdictions. Focusing on Uganda, which we index by u, the firm benefits from shifting its debt to Uganda from all jurisdictions where $(t_u - t_i) > 0$.

To prevent such tax-motivated shifting of debt, countries use interest limitation rules. These rules make it costly for firms to shift debt across jurisdictions. For example, firms may have to spend money on socially wasteful tax planning to manipulate their debt to equity mix across various subsidiaries. In addition, there might be legal costs arising from challenges from tax authorities or real costs from shifting debt across entities (Hines and Rice 1994; Suárez Serrato 2018). We capture these considerations by assuming that reporting a borrowing expense of B_i incurs the resource cost of $C_i(B_i, k_i)$ to a firm

with capital k_i. For simplicity, we assume the cost function is homogeneous of degree one so that $C_i(B_i, k_i) = c_i(b_i)k_i$, where $b_i = B_i/k_i$ is the interest to capital ratio of affiliate i.

To capture the dependence of debt reallocation on the anti-avoidance regime chosen by the government, we follow Keen and Slemrod (2017) to introduce a continuously variable enforcement parameter α into the model. The cost function is now denoted as $c_i(b_i; \alpha)$, and it has the usual properties $c_i'(b_i; \alpha) > 0$ and $c_i''(b_i; \alpha) > 0$ except that we assume $c_i(b_i; \alpha) = 0$ for $b_i < 0$, implying that borrowing from an affiliate incurs cost but lending does not.

For a fixed investment profile $k = (k_1, k_2, \ldots, k_N)$, the firm uses inter-affiliate borrowing to maximize after-tax profits:[12]

$$\pi(r, t; \alpha) = \max_{b_i} \sum_i \left\{ (1 - t_i) f_i(k_i) - [r + c_i(b_i; \alpha) - t_i b_i] k_i \right\} \quad \text{s.t.} \quad \sum b_i k_i = 0 \tag{2}$$

Manipulating the FOCs of this problem, one can write the optimal borrowing function for the Ugandan affiliate as

$$c_u'(b_u; \alpha) = t_u - t_i \; \forall i \neq u. \tag{3}$$

Potentially, the Ugandan affiliate may borrow from any affiliate whose tax rate is lower than its own.[13] But borrowing from an affiliate with a higher tax rate is dominated by borrowing from another affiliate with a lower tax rate. Therefore, under the optimal plan the Ugandan affiliate would borrow only from the affiliate with the lowest tax rate.[14] Without loss of generality, we assume this jurisdiction to be 1 (likely a tax haven with $t_1 \approx 0$). Inverting the FOC, we can write the optimal borrowing function as

$$b_u = \varphi_u(t_u - t_1; \alpha) \equiv c_u'^{-1}(t_u - t_1; \alpha) \tag{4}$$

and the net benefit from debt reallocation as

$$\psi_u(t_u - t_1; \alpha) = (t_u - t_1)\varphi_u(t_u - t_1; \alpha) - c_u(\varphi_u(t_u - t_1; \alpha)) \tag{5}$$

In this setting, the Ugandan affiliate makes the following profits:

$$\pi_u(r, t_u - t_1; \alpha) = (1 - t_u) f_u(k_u) - [r - \psi_u(t_u - t_1; \alpha)] k_u \tag{6}$$

3.2 Switching to the earnings test

Using this simple setup, one can develop predictions on how debt, interest expenses, and profits of MNEs will evolve as the compliance regime transitions from the equity test to the earnings test. Critically, the direction of movement of these variables will depend on how the net benefit from reallocating debt to Uganda, $\psi_u(t_u - t_1; \alpha)$, compares in the two regimes.

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[12] A firm's financial policies are also affected by non-tax considerations, such as using debt as a disciplining device for overspending managers and balancing indebtedness against the probability of costly bankruptcy (see e.g. Huizinga and Laeven 2008; Møen et al. 2011). Here we abstract from such non-tax considerations.

[13] This is a general result arising even in far richer models. Holding investment fixed, if a company shifts a dollar of income from one foreign country to another, the potential tax saving depends upon the difference in the statutory corporate tax rates (see e.g. Grubert and Mutti 1991).

[14] Theoretically, in integrated world markets with free capital mobility, all firms will locate debt in the most tax-advantaged jurisdiction (Hodder and Senbet 1990). Practically, however, this corner solution is avoided for many reasons, including the thin capitalization rules that limit the tax deductibility of interest paid by firms deemed to have excessive debt (see Desai et al. 2004 for details).

While the existing literature provides little evidence, there are many reasons to expect that tax avoidance is more difficult and debt reallocation less beneficial under the earnings test than under the equity test. First, circumventing the equity test requires MNEs to adjust the financing policies of a single subsidiary only, which is relatively easy as they can achieve it through their internal capital market (OECD 2015).[15] Second, the equity test does not apply if the firm's debt—regardless of its debt-to-equity ratio—does not exceed the arm's length debt amount. Conditions involving arm's length principle are notoriously difficult to enforce because comparable arm's length transactions are rarely available. In Section 2 we discussed additional reasons why the tax avoidance costs could be higher and the net benefit from debt reallocation lower under the earnings test compared to the equity test.

To the extent that these costs increase after the reform, one can deduce the following from Equations 3–6:

> **Prediction 1:** *Interest expenses reported by MNEs will decrease after Uganda switches its compliance regime from the equity test to the earnings test.*

The result follows directly from Equation 4:

$$\Delta b_u(\alpha \to \alpha') = b_u(k, \alpha') - b_u(k, \alpha) = \{\varphi_u(t_u - t_1, \alpha') - \varphi_u(t_u - t_1, \alpha)\}k_u \tag{7}$$

where α' denotes the anti-avoidance regime based on the earnings test relative to the baseline regime α based on the equity test. To the extent that the marginal cost of tax avoidance is higher under the former regime, $c'_i(b_i; \alpha') > c'_i(b_i; \alpha)$, debt allocated to Uganda for tax purposes will be lower after the reform, reducing the interest expenses claimed in Uganda $\varphi_u(t_u - t_1, \alpha') < \varphi_u(t_u - t_1, \alpha)$ and resulting in $\Delta b_u(k, \alpha) < 0$. See Figure 5 for the intuition behind this result.

Figure 5: Interest limitation rules in Uganda
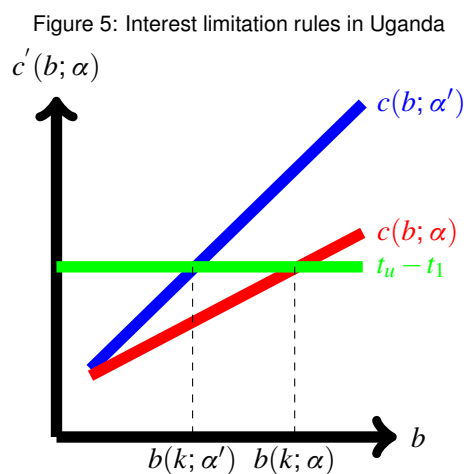
Note: the figure illustrates the intuition behind Prediction 1 developed in Section 3. Given that the deduction of interest expenses reduces the tax liability, the firm increases its deduction b to the extent that the marginal benefit of doing so, $t_u - t_l$, equals the marginal cost, $c'(b; \alpha)$. Switching from the equity test to the earnings test shifts the cost curve upwards, with the new curve $c(b; \alpha')$ represented by the blue line. As a result, all else being equal, the firm's deduction decreases to $b(k; \alpha')$.
Source: authors' illustration.

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[15] They could, for example, inject more equity into subsidiaries with higher debt-to-equity ratios. In addition, they could use hybrid debt instruments—instruments that are characterized as debt in one country and equity in others—to manipulate debt to equity mix in various subsidiaries. Recent evidence suggests that hybrids are the main drivers of tax base erosion and in some cases have been used to reduce tax payments by billions of dollars (Johannesen 2014).

3.3 Effect on real activity

By lowering the user cost of capital, profit shifting increases investment, and through this channel may impact other real variables as well. This can be seen from the FOC of Equation 2 with respect to capital:

$$f'_u(k_u) = \frac{r}{(1-t_u)} - \frac{\psi_u(t_u - t_1, \alpha)}{(1-t_u)} \tag{8}$$

The LHS of this equation is called the profit shifting adjusted cost of capital and is strictly lower than 1 without profit shifting (the first term in the RHS of the equation) as long as the net benefit of profit shifting is positive—that is, $\psi_u(t_u - t_1, \alpha) > 0$ (Grubert and Slemrod 1998).

As Uganda switches its anti-avoidance regime, to the extent that the costs of profit shifting rise, the net benefit of profit shifting would fall, and the adjusted cost of capital would rise, leading to a decrease in investment and other real activities. This also implies that the reform would have ambiguous effects on reported taxable profits:

$$\Delta\pi(\alpha \to \alpha') = \frac{\partial\pi}{\partial k}\Delta k(\alpha \to \alpha') + \frac{\partial\pi}{\partial b}\Delta b(\alpha \to \alpha') \tag{9}$$

The first of these effects is negative as the adjusted cost of capital rises, and the other is positive as the interest deduction falls. The net effect on profits will depend upon which of the two effects dominates.

> **Prediction 2:** *Investment by MNEs will fall and reported taxable profits may rise or fall after Uganda switches its compliance regime from the equity test to the earnings test.*

We take these predictions to the data and test them using the research design described next.

4 Research design

For our causal estimates, we exploit the 2018 reform, which replaced the equity test with the earnings test in Uganda. The reform creates three distinct treatments depending on which of the two tests the firm failed at the baseline. These treatments are illustrated in Figure 6. Treatment 1, which we refer to as 'Earnings test introduced', includes firms whose debt-to-equity ratio was consistently below the threshold of 1.5 in the baseline years (2014–17), meaning they were never at risk of failing the equity test. However, these firms were affected by the earnings test since their interest expenses to EBITDA ratio during the baseline years was close to the threshold of 0.3. As a result, these firms transition from being subject to no compliance regime to being subject to a regime where their interest expense deductions face the earnings test. Their responses will thus be informative on the effects induced by the introduction of the earnings test.

Treatment 2, on the other hand, consists of firms that were failing the equity test at the baseline but were never at risk of failing the earnings test. In other words, their debt-to-equity ratio during the pre-reform years was close to the threshold of 1.5, but their interest expenses to EBITDA ratio was well below the threshold of 0.3. Effectively, the treatment these firms experience is 'Removal of the equity test'. Any adjustment by these firms in terms of tax avoidance or real economic activity will be informative on the effectiveness of the equity test in curtailing tax avoidance and its impact on discouraging real economic activity.

Finally, Treatment 3 consists of firms that were failing both tests at the baseline. These firms transition from a compliance regime based on the equity test to one based on the earnings test. Their responses

will thus be informative on which of the two tests is more effective against tax avoidance and which places a greater burden on economic activity. It is important to note that firms experiencing Treatment 3 comprise two distinct groups. For some firms, the interest expense disallowed by the equity test at the baseline will be lower than that disallowed by the earnings test, meaning the treatment intensity will increase for these firms as they transition to the new regime. For others, the treatment intensity will move in the opposite direction. Therefore, estimating an average effect of this treatment makes no sense. The effects will work in opposite directions for the two groups, potentially cancelling each other out. We will therefore estimate the effects of this treatment separately for the two groups: those where the treatment intensity increases and those where it decreases.

Figure 6: Three treatments created by the reform

Fails Earnings Test

Interest Expenses to EBITDA Ratio > 0.3
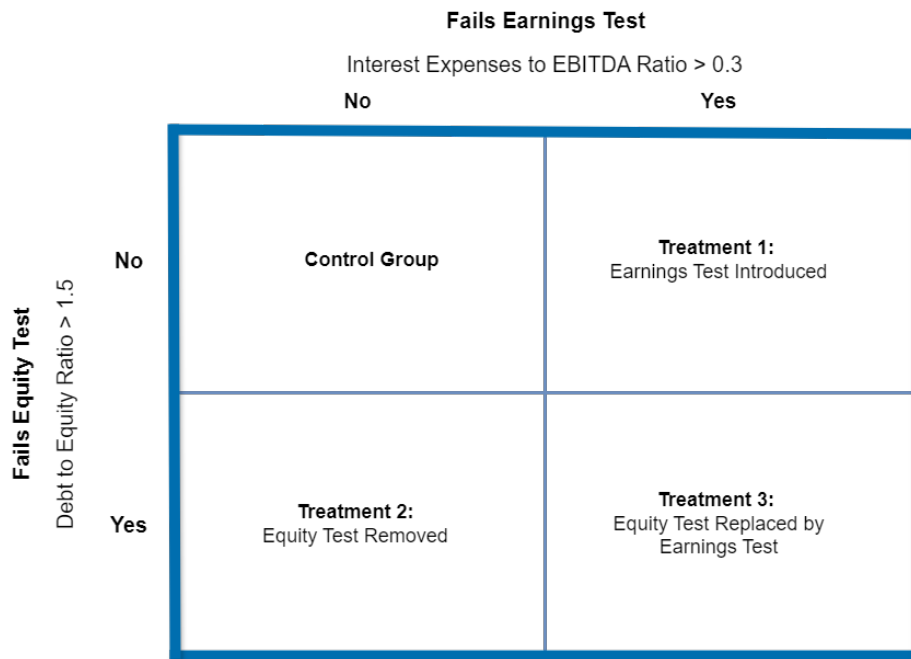
Note: the figure shows the three treatments created by the 2018 reform. The rows of the 4 × 4 table indicate whether a firm fails the equity test, meaning that its debt-to-equity ratio exceeds 1.5, while its columns indicate whether the firm fails the earnings test, meaning that its interest expenses to EBITDA ratio exceeds 0.3. Depending on which cell a firm fell into during the baseline years (2014–17), it will experience one of the three treatments created by the 2018 reform, which replaced the equity test with the earnings test. Firms that do not fail either test are designated as the control group.

Source: authors' illustration.

We use the standard event study and difference-in-differences frameworks to estimate the effects of these three treatments. Specifically, our event study specification is:

$$y_{ijt} = \alpha_i + \mu_t + \sum_{t \neq 2017} \beta_t D_i \cdot 1(\text{Year} = t) + \lambda_{jt} + \varepsilon_{it}, \tag{10}$$

where i, j, and t index the firm, industry, and year. The dummy variable D_i indicates that firm i experiences the relevant treatment, and λ_{jt} are the industry × year fixed effects. To estimate the effects of treatment k, we include in the sample only the firms affected by that treatment and those in the control group, dropping firms affected by the other two treatments. This approach ensures that the estimated effects are not contaminated by irrelevant treatments. Since the definitions of the treatment and control groups are invariant over time, our event study specification avoids the issues associated with two-way fixed effect models involving staggered treatment (Roth et al. 2023). Leads and lags of treatment × year interactions capture the dynamic effects of the treatment and any differences in pre-existing trends between the

compared groups. Our difference-in-differences specification is similar to this specification, except that we replace the treatment × year interactions with a single treatment × after interaction.

We estimate the effects of the three treatments on interest expenses, loans, and other outcomes reported in corporate tax returns. We measure these outcomes in levels, typically expressing them in UGX (Ugandan shillings) billions. There are several reasons why measuring the outcomes in levels is the right approach in our setup. First, our outcomes often take zero and negative values, making it impractical to use logs or log-like transformations. Doing so would conflate intensive and extensive margins and introduce arbitrary scale dependence into our estimates (Chen and Roth 2023). Second, the distinction between intensive and extensive margins is of no intrinsic interest in our setup. For example, whether a company's interest expense moves from 200 to 100 or from 100 to 0 has the same revenue consequence. Third, our outcomes do not exhibit decreasing returns in terms of revenue or welfare, so we do not need to place higher weight on the treatment effects of firms with low initial outcomes (logs and similar other concave transformations will do that). For example, in our setting a reduction in interest expenses from 100k to 99k is likely to have the same impact on revenue and welfare as a reduction from 150k to 149k.[16]

Measuring the outcomes in levels, however, may have two disadvantages. First, our estimates may be sensitive to outliers, whose impact is usually attenuated by log and log-like transformations. Second, the treatment effect in levels is not always easy to interpret. To address these issues, we winsorize our outcomes at the 1st and 99th percentiles to ensure that outliers do not significantly influence our estimations. To aid the interpretation of our treatment effects, we also report them in percentage terms by normalizing the treatment effect in levels with the baseline mean of the treatment group.[17]

4.1   Data

We use administrative data from the URA, which includes the universe of corporate tax returns filed in Uganda between 2014 and 2022. The data has a panel structure and we can track a firm over these nine years. Corporate tax returns are submitted electronically within six months of the end of the company's financial year. All companies must file CIT returns, although smaller firms—with an annual turnover of up to UGX150 million—can pay a presumptive tax, based on their turnover. 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 this firm panel can be found in McNabb et al. (2022).

We categorize firms in our panel into three types. The dummy variable *MNE* denotes foreign-controlled firms resident in Uganda. *Domestic group* refers to firms that, like MNEs, are part of a group of companies, but all affiliates of a domestic group are resident in Uganda, with no affiliates located in foreign countries. Finally, a *standalone* is a domestic firm that is not part of any group. Further details on the definitions of all variables we use are provided in Appendix A1. The Appendix also outlines the steps we use to clean the data for our empirical analysis.

Table 1 reports our summary statistics. We present the mean and standard deviation of 28 variables used in our empirical analysis, separately for the three types of firms. Our dataset comprises nearly 300,000 firm–year observations, of which 3,251 relate to MNEs, the main focus of our analysis. Not surprisingly, MNEs are larger than both domestic groups and standalones. They also have higher loan amounts, adjust more interest expenses, and have higher deductions. Figure 7 illustrates the industrial

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[16] We are making an implicit assumption here that the government cares only about revenue, regardless of whether this revenue comes from large or small firms. Since our focus is on MNEs, this assumption is plausible.

[17] This approach is now becoming standard in contexts where outcomes frequently take zero and negative values. See Brockmeyer and Hernandez (2016) for another application.

and spatial distribution of firms. MNEs are present in most industries and are spread throughout Uganda rather than being concentrated in specific industries or locations.
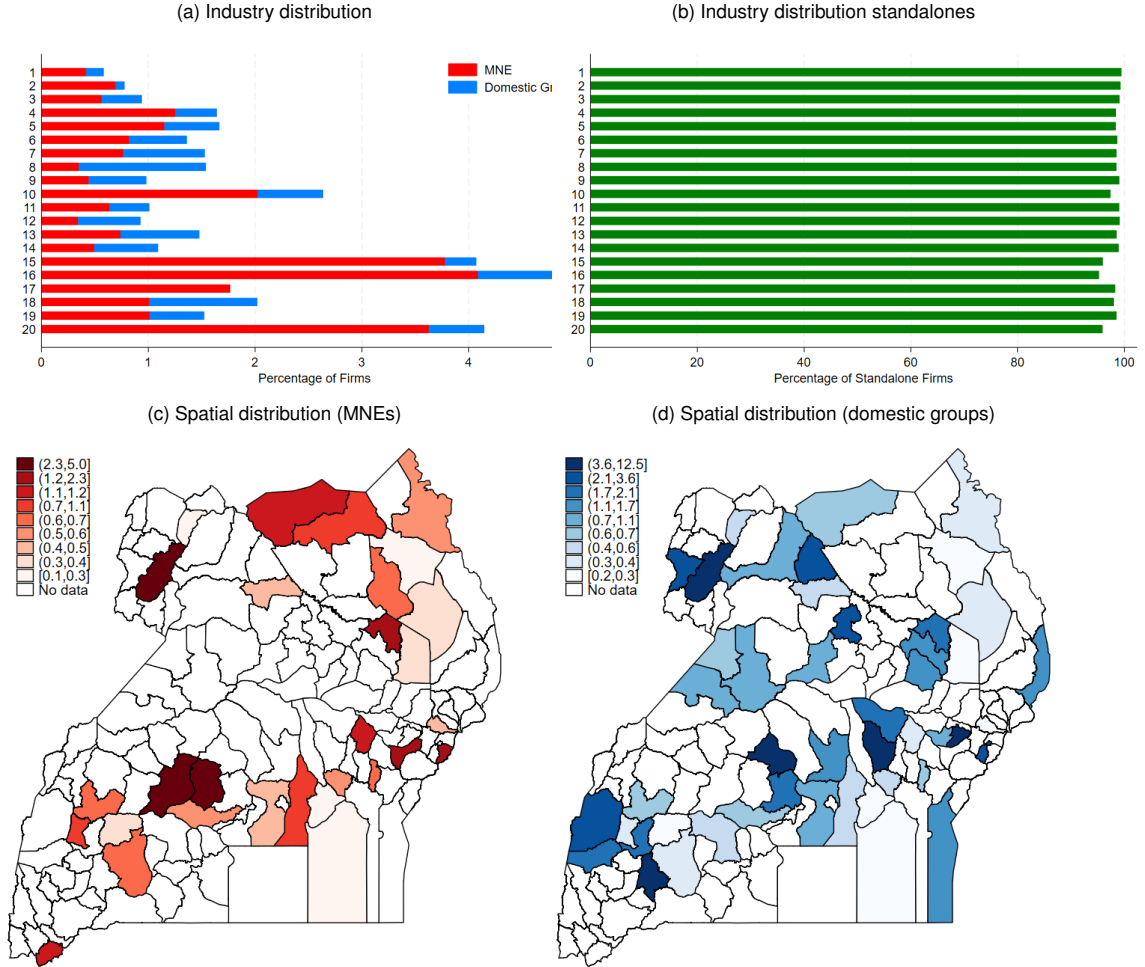
Table 1: Summary statistics I

	MNEs		Domestic groups		Domestic standalones	
	Mean (1)	SD (2)	Mean (3)	SD (4)	Mean (5)	SD (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
Shareholder capital	0.22	0.58	0.19	0.52	0.05	0.26
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	

Note: 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 Appendix A1.

Source: authors' calculations.

Figure 7: Industrial and spatial distribution of firms

(a) Industry distribution

(b) Industry distribution standalones

(c) Spatial distribution (MNEs)

(d) Spatial distribution (domestic groups)

Note: this figure illustrates the industry and spatial distribution of MNEs, domestic groups, and standalones. Panel (a) compares the percentage of MNEs and domestic groups across the top 20 industries in our data. Panel (b) displays the percentage of 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 A1. Panel (c) plots the percentage of MNEs in each Ugandan district, while panel (d) plots the percentage of domestic groups in each district. This visual breakdown helps to highlight that MNEs are not concentrated in a few industries or geographical areas only.

Source: authors' illustration.

5   Do MNEs use debt for profit shifting?

Before presenting our causal estimates on the effects of the anti-avoidance rules, it is important to examine if MNEs shift profits out of Uganda through the debt channel. This examination is important because the effectiveness of the anti-avoidance rules would be a moot question if profit shifting through the debt channel is insignificant.

To examine this, we compare loans, interest expenses, and other variables of MNEs with domestic groups and standalones. Because, on average, MNEs are larger than other firms, we compare firms of equal size, defined both by annual sales and assets. Specifically, we estimate the following equation:

$$y_{ijc} = \gamma + \xi_j + \eta_c + \delta\,\mathrm{MNE}_i + \varphi\,\mathrm{DG}_i + X'\Theta + \nu_{ijc} \tag{11}$$

16

Here, ξ_j and η_c are the industry and city fixed effects and X are time-varying controls (annual sales and assets). We omit the dummy for standalones and normalize the outcomes by the average value of the outcome for this omitted category. The coefficients on the two included dummy variables, therefore, show that the average value of the outcome among MNEs and domestic groups is $\hat{\delta}$ and $\hat{\varphi}$ times higher than the average value of the outcome among standalones. Importantly, this comparison is made among firms located in the same city, operating in the same industry, and having the same size (defined by both annual sales and total assets).

Table 2 shows the results of this exercise. On average, MNEs report nearly four times higher loans than similar standalones. They also deduct four times higher interest expenses and eight times higher non-interest financial expenses. Their total deductions are five times higher than the standalone average. But surprisingly they report nearly 25 times lower profits than comparable standalones. In the final two columns of the table we decompose loans into two parts: loans from related parties and loans from unrelated parties.[18] The difference in loans is largely driven by loans from related parties as loans from unrelated parties are nearly the same for both groups. This is important because profit shifting through debt is more likely to operate through related parties loans.

Table 2: 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						

Note: the table investigates whether MNEs use debt to shift profits out of Uganda. We report results from estimating the regression specification (Equation 11). 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 two-digit industry classification the firm belongs to and *location* is the sub-district the firm is located in. For details of industries and locations in our sample, please see Figure 7. We normalize the outcomes by the control mean (reported in the last row of the table), so that the estimated coefficients show 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 Appendix A1.
Source: authors' calculations.

Table 3 replicates the same analysis, but this time we estimate Equation 11 separately for the periods 2014, 2015–17, and 2018–22. Recall that during the first two periods Uganda had rules based on the equity test in force, with a fixed debt-to-equity ratio of 1 in 2014 and 1.5 in the latter period. In 2018, these rules were replaced by those based on the earnings test. Given this variation, where the rules were initially relaxed in 2015 and then tightened again in 2018, any movement in the relevant estimates would provide the first-pass evidence on the anti-avoidance impact of the rules. However, we do not find any such movement in this raw comparison. In fact, all relevant variables including loans, interest expenses,

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[18] Note that for standalone firms loans from related parties capture loans from shareholders, directors, or family members.

non-interest financial expenses, and loans from related parties show an increase over time, while loans from unrelated parties remain unchanged.

Table 3: 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)
A: 2014							
MNE	3.184	2.124	5.843	4.220	−154.954	3.688	0.576
	(0.278)	(0.337)	(0.324)	(0.315)	(17.934)	(0.306)	(0.364)
Observations	17,849	17,849	17,849	17,849	17,849	17,849	17,849
Control mean (UGX millions)	385.150	13.241	11.558	72.903	0.871	141.429	69.056
B: 2015–17							
MNE	3.184	2.908	6.306	4.892	−55.081	4.134	0.147
	(0.148)	(0.193)	(0.169)	(0.162)	(4.337)	(0.162)	(0.202)
Observations	75,061	75,061	75,061	75,061	75,061	75,061	75,061
Control mean (UGX millions)	358.351	11.100	11.709	70.756	−1.763	130.479	58.740
C: 2018–22							
MNE	4.003	4.592	8.689	5.636	−6.361	4.958	0.622
	(0.118)	(0.163)	(0.144)	(0.122)	(1.317)	(0.131)	(0.160)
Observations	193,940	193,940	193,940	193,940	193,940	193,940	193,940
Control mean (UGX millions)	302.708	7.900	7.345	67.224	3.860	107.749	48.256
Controls	Industry fixed effects; location fixed effects; assets; revenue						

Note: the table investigates whether MNEs use debt to shift profits out of Uganda. We report results from estimating the regression specification (Equation 11). Panels A–C run the regression separately for 2014, 2015–17, and 2018–22. 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 two-digit industry classification the firm belongs to and *location* is the sub-district the firm is located in. For details of industries and locations in our sample, please see Figure 7. We normalize the outcomes by the control mean (reported in the last row of each panel), so that the estimated coefficients show 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 Appendix A1.

Source: authors' calculations.

To provide more evidence on the question, Figure 8 compares the effective tax rate paid by MNEs and standalones. Following the strategy developed by Bachas et al. (2023), Figure 8(a) plots the effective tax rate paid by the two types of firms against firm size. The effective tax rate here is defined as the ratio between the tax liability and profit of the firm (please see Appendix A1 for the detailed definition). To benchmark the effective tax rate, we indicate the statutory tax rate and the rate proposed under the global minimum tax through horizontal lines in the plot. MNEs pay nearly 50 per cent lower effective tax rate than standalones throughout the size distribution. This rate hovers between one-sixth and one-third of the statutory tax rate and between one-third and two-thirds of the global minimum tax rate.

MNEs may pay a lower effective tax rate than standalones if they operate disproportionately in less profitable industries or locations. Although Figure 7 mitigates this concern, Figure 8(b) addresses it

more rigorously. We now compare the effective tax rate between MNEs and standalones operating in the same industry and location. The large difference in the effective tax rate persists even when we control for any variation in the industrial and spatial distribution of firms.

Figure 8: Do MNEs use debt to shift profits?

(a) Effective tax rate: raw
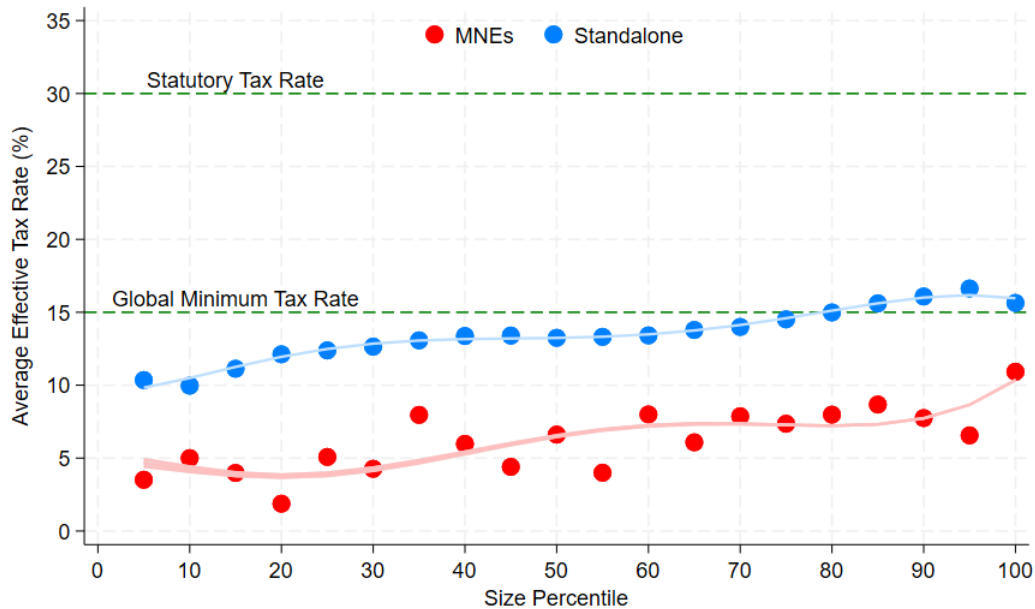
(b) Effective tax rate: within industry and location
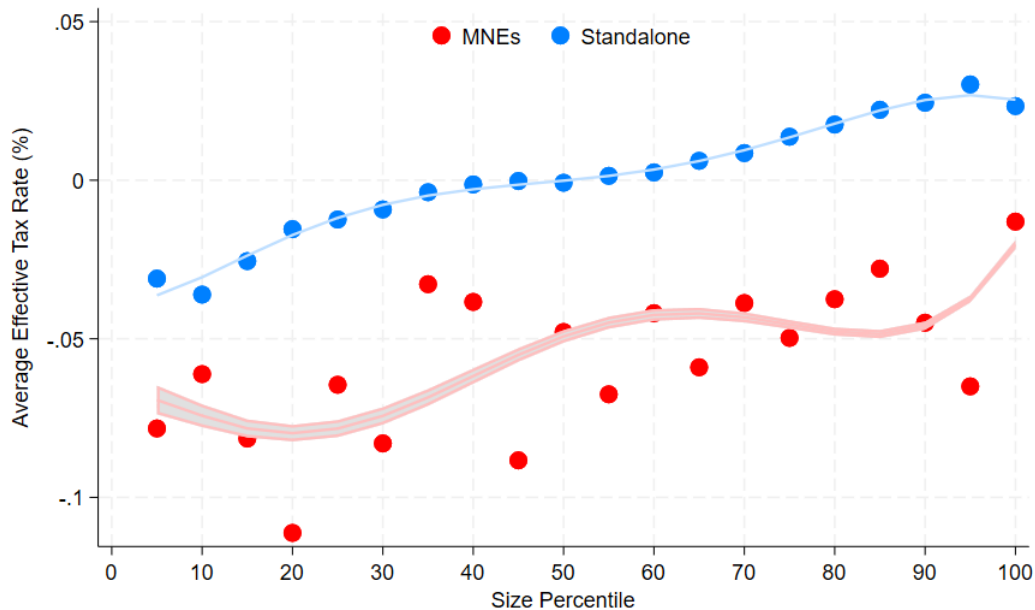
Note: the figure compares the average effective tax rate faced by MNEs in Uganda with that of domestic standalone firms, using pooled data from 2014 to 2022. Firms are divided into size percentiles based on their total annual sales, creating size percentiles at the firm–year level. We define the effective tax rate as the ratio between net tax liability and net profits. 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 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 per cent confidence interval around it on each set of scatter points.

Source: authors' calculations.

Finally, we compare MNEs and standalones using the matching strategy developed by Bilicka (2019). In this approach, we match each MNE to a standalone firm by finding the closest match based on industry, district, total assets, and sales.[19] Tables 4 and 5 report the results from this exercise. Qualitatively, we obtain the same results, although the differences are now smaller in magnitude.

Table 4: 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						

Note: this table replicates the analysis from Table 2 using a matched sample of MNEs and standalones. 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 (Equation 11) 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 two-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 7. 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 standalones. For precise definitions of the seven variables used in this analysis, please see Appendix A1.
Source: authors' calculations.

Collectively, the six pieces of evidence above suggest that the answer to the question we pose in this section is in the affirmative. MNEs report higher loans (especially those from related parties), higher interest expenses, and higher deductions than comparable standalones. Yet they report significantly lower profits and pay a significantly lower effective tax rate. It is therefore likely that they are shifting profits out of Uganda, thereby depriving the country of the due revenue. In the next section, we present micro-based evidence to examine if the two anti-avoidance rules reduce this profit shifting.

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[19] Note that we use district as a measure of the location of the firm here rather than sub-district as used in other sections of the paper. This is because using district gives us better matches between MNEs and domestic firms.

Table 5: 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)
A: 2014							
MNE	1.523	18.853	3.440	0.230	−42.999	15.223	−0.505
	(0.932)	(23.383)	(1.625)	(1.433)	(20.186)	(4.710)	(0.516)
Observations	460	460	460	460	460	460	460
Control mean (UGX millions)	1086.027	2.825	38.471	232.279	−13.480	102.808	736.944
B: 2015–17							
MNE	3.039	8.662	3.319	4.874	−28.956	3.738	0.613
	(0.716)	(2.752)	(0.636)	(1.127)	(14.904)	(0.757)	(0.639)
Observations	1,830	1,830	1,830	1,830	1,830	1,830	1,830
Control mean (UGX millions)	776.232	14.058	58.486	145.636	−10.927	344.535	304.757
C: 2018–22							
MNE	2.340	4.579	1.411	3.908	−78.832	2.705	0.556
	(0.502)	(1.076)	(0.398)	(0.768)	(29.808)	(0.521)	(0.483)
Observations	3,338	3,338	3,338	3,338	3,338	3,338	3,338
Control mean (UGX millions)	1093.478	31.104	49.947	164.982	3.907	449.431	305.776
Matched on	Industry, location, assets and revenue						

Note: this table replicates the analysis from Table 3 using a matched sample of MNEs and standalones. 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 (Equation 11) on this matched sample. Panels A–C run the regression separately for 2014, 2015–17, and 2018–22. 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 two-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 7. 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 standalones. For precise definitions of the seven variables used in this analysis, please see Appendix A1.

Source: authors' calculations.

6 Impacts of anti-avoidance rules

In this section, we present our causal estimates of the three treatments illustrated in Figure 6 and described in Section 4. We focus exclusively on MNEs by dropping from the sample both domestic groups and standalone firms. We then use our event study and difference-in-differences specifications to estimate the causal impact of each treatment separately.

6.1 Treatment 1: earnings test introduced

We begin by comparing outcomes between MNEs in Treatment 1 and the control group using our event study specification (Equation 10). The comparison isolates the causal impact of the introduction of the earnings test. Figure 9 presents results for the two outcomes—loans and interest expenses—that are most directly affected by the introduction of the new anti-avoidance rule. Both outcomes were evolving on a common trend prior to the 2018 reform. Common trends between the treated and control groups is a general feature of the more than 20 outcomes we study, validating the principal identification assumption underlying our empirical framework. In terms of impact, the introduction of the earnings test produces a sharp response among the treated MNEs. Consistent with Prediction 1, developed in Section 3, both total loans reported and interest expenses claimed by these MNEs reduce sharply when the new test is implemented and remain lower for the next five years. The first two columns of Table 6 show the magnitude of the response, presenting the corresponding difference-in-differences results. Loans of treated MNEs decrease by nearly UGX13 billion and interest expenses by UGX1 billion, a substantial reduction of nearly 70 per cent and 80 per cent relative to the baseline mean.

Table 6: Impacts of Treatment 1: earnings test introduced

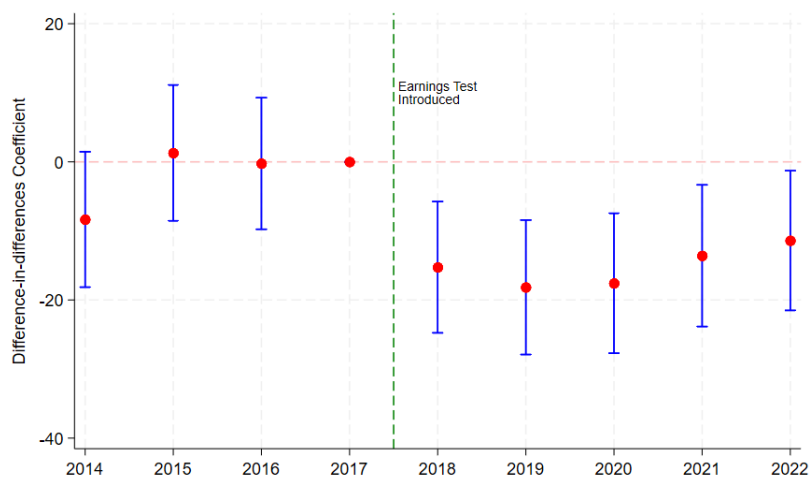| Outcomes (y_i):	Loans	Interest expenses	Financial expenses	Loans related parties	Loans unrelated parties	Secure loans	Unsecure loans
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treat × after	−13.489***	−1.014***	−1.052*	−2.734***	−1.594**	−5.753***	1.019
	(4.522)	(0.350)	(0.567)	(1.033)	(0.711)	(2.002)	(1.271)
Observations	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 effects:	Firm; year; industry × year						

Note: the table reports the results from our difference-in-differences model corresponding to our event study specification (Equation 10). We focus exclusively on MNEs. The treatment group comprises MNEs whose *average* interest expenses to EBITDA ratio during the baseline years of 2014–17 was greater than 0.2, while their *maximum* debt-to-equity ratio during these years was less than 1.3. These firms were close to failing the earnings test but were never at risk of failing the equity test. The control group consists of MNEs that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. 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 a percentage of this mean. For precise definitions of the outcomes used here, please refer to Appendix A1. ***, **, and * denote significance at the 1%, 5%, and 10% levels. Source: authors' calculations.
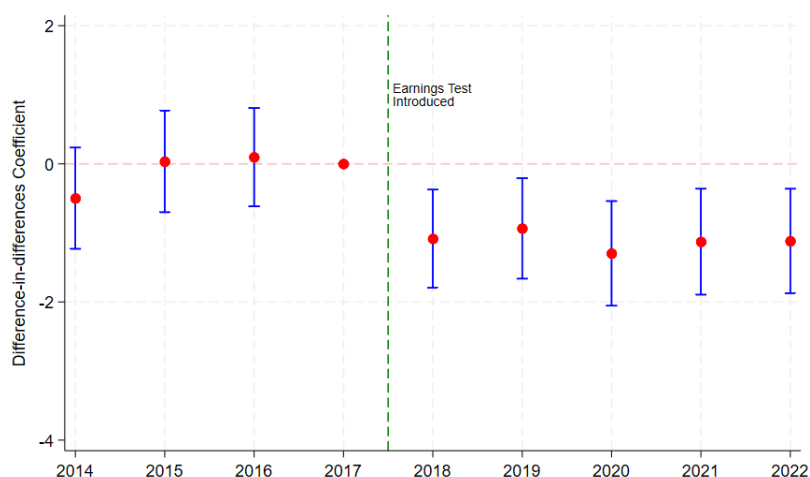
Figure 10 and columns (4)–(7) of Table 6 explore the impact on loans in more detail. Figure 10(a) and (b) examine loans from related and unrelated parties separately, while (c) and (d) do this for unsecured and secured loans. Unsecured loans refer to loans not backed by any specific assets or collateral. For an MNE, they are more likely to be internal loans obtained from the parent company or sister affiliates, as such borrowing would not require pledging any assets. Holding the interest rate fixed, a dollar of loan—whether internal or external—will have the same effect on the company's tax liability in Uganda. However, internal loans are more likely to be profit shifting devices, and their differential response would thus be informative on how debt-based profit shifting reacts to the anti-avoidance rule. Interestingly, the decrease in external loans (proxied by unrelated parties loans and secured loans) is far stronger than

the decrease in internal loans both statistically and economically (in proportional terms; see Table 6). In fact, the unsecured loans increase slightly after the reform, while both unrelated parties loans and secured loans reduce sharply and stay lower for most post-reform periods.[20]

Figure 9: Impacts of Treatment 1: earnings test introduced

(a) Loans

(b) Interest expenses

Note: the figure plots the results from our event study specification (10), focusing exclusively on MNEs. The treatment group comprises MNEs whose *average* interest expenses to EBITDA ratio during the baseline years of 2014–17 was greater than 0.2, while their *maximum* debt-to-equity ratio during these years was less than 1.3. These firms were close to failing the earnings test but were never at risk of failing the equity test. The control group consists of MNEs that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. The outcomes are measured in levels, expressed as UGX billions. For precise definitions of the outcomes displayed here, please refer to Appendix A1.

Source: authors' calculations.

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[20] At the global level, the marginal benefit of a dollar of secured/unrelated party loan to an MNE is lower than the marginal benefit of related party loans. Hence, when the marginal cost of debt reallocation rises, MNEs first unload these less-profitable loans. To make them reduce their related parties loans, one needs an even higher increase in the marginal cost by making the rule more stringent or enforcement better.

We next turn to items that determine the tax liability of a firm (see Figure 11 and Table 7). Figure 11(b)(and column (2) of Table 7) shows that deductions claimed by the treated firms reduce significantly after the new rules come into effect. Deductions are the adjustments—interest expenses, depreciation, amortization, etc.—firms can make against their taxable incomes to reduce their tax liability. Comparing deductions with interest expenses shows that the former fell more than the latter by nearly UGX0.6 billion, suggesting that MNEs' response to the reform was far wider than a simple adjustment in loans. Under the earnings test, an MNE is not allowed to adjust interest expenses in excess of 30 per cent of its EBITDA. These disallowed interest expenses must appear in the line item shown in Figure 11(c)(column (3) of Table 7). Note, however, that firms are allowed to carry forward excess interest expenses for three years before they are disallowed. Any response in this line item will therefore appear with a lag of three years. But we see no response at all. In fact, if anything, disallowed deductions decrease towards the end of our sample. Together, the evidence suggests that treated firms adjust their interest expenses and deductions immediately after the reform in such a way that they never end up claiming interest expenses above the allowed limit.
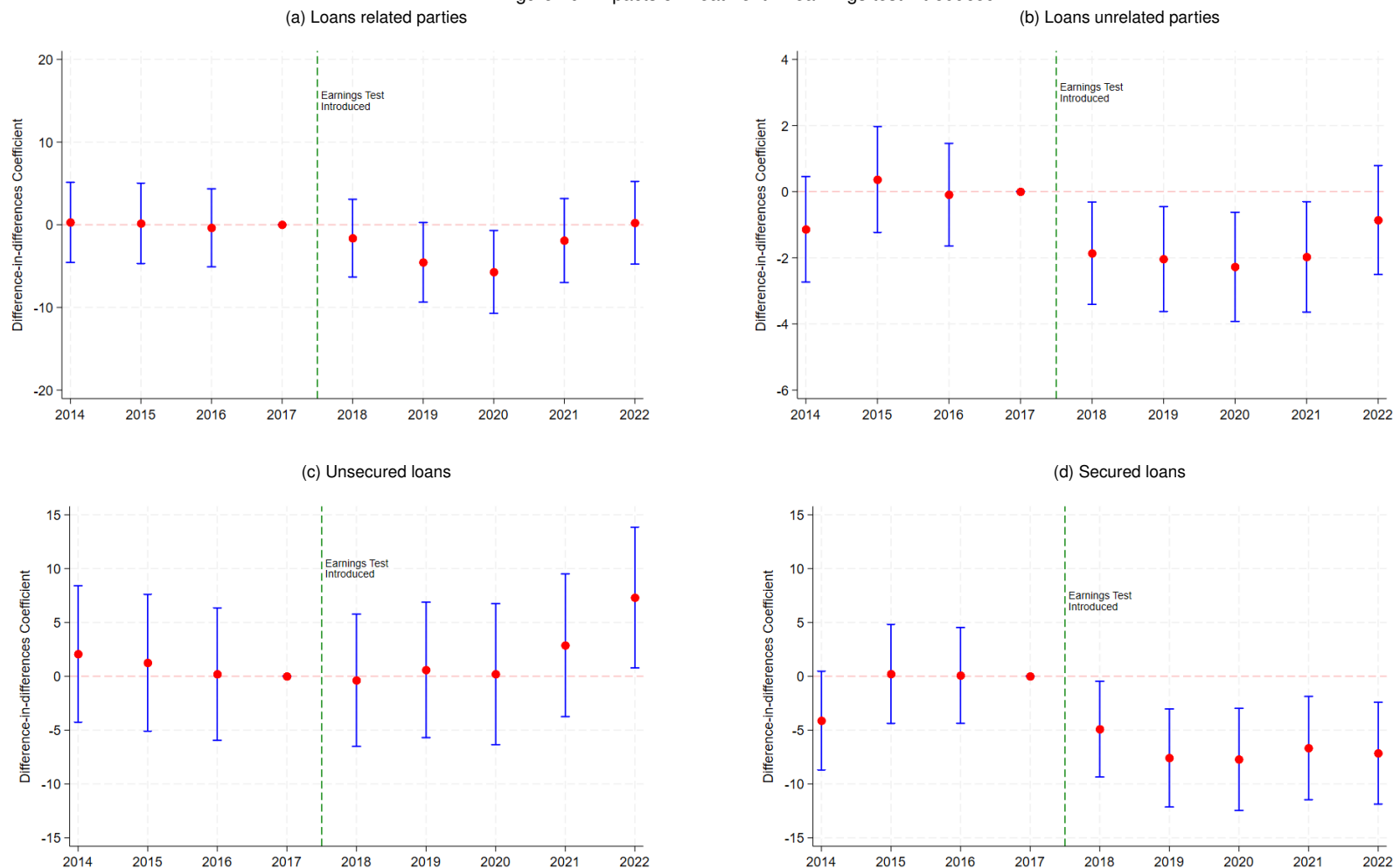
Table 7: Impacts of Treatment 1: earnings test introduced

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 effects	Firm; year; industry × year						

Note: the table reports the results from our difference-in-differences model corresponding to Equation 10. We focus exclusively on MNEs. The treatment group comprises MNEs whose *average* interest expenses to EBITDA ratio during the baseline years of 2014–17 was greater than 0.2, while their *maximum* debt-to-equity ratio during these years was less than 1.3. These firms were close to failing the earnings test but were never at risk of failing the equity test. The control group consists of MNE that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. 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 a percentage of this mean. For precise definitions of the outcomes used here, please refer to Appendix A1. ***, **, and * denote significance at the 1%, 5%, and 10% levels.
Source: authors' calculations.

Figure 10: Impacts of Treatment 1: earnings test introduced

(a) Loans related parties

(b) Loans unrelated parties

(c) Unsecured loans

(d) Secured loans

Note: the figure plots the results from our event study specification (Equation 10), focusing exclusively on MNEs. The treatment group comprises MNEs whose *average* interest expenses to EBITDA ratio during the baseline years of 2014–17 was greater than 0.2, while their *maximum* debt-to-equity ratio during these years was less than 1.3. These firms were close to failing the earnings test but were never at risk of failing the equity test. The control group consists of MNEs that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. The outcomes are measured in levels, expressed as UGX billions. For precise definitions of the outcomes displayed here, please refer to Appendix A1.
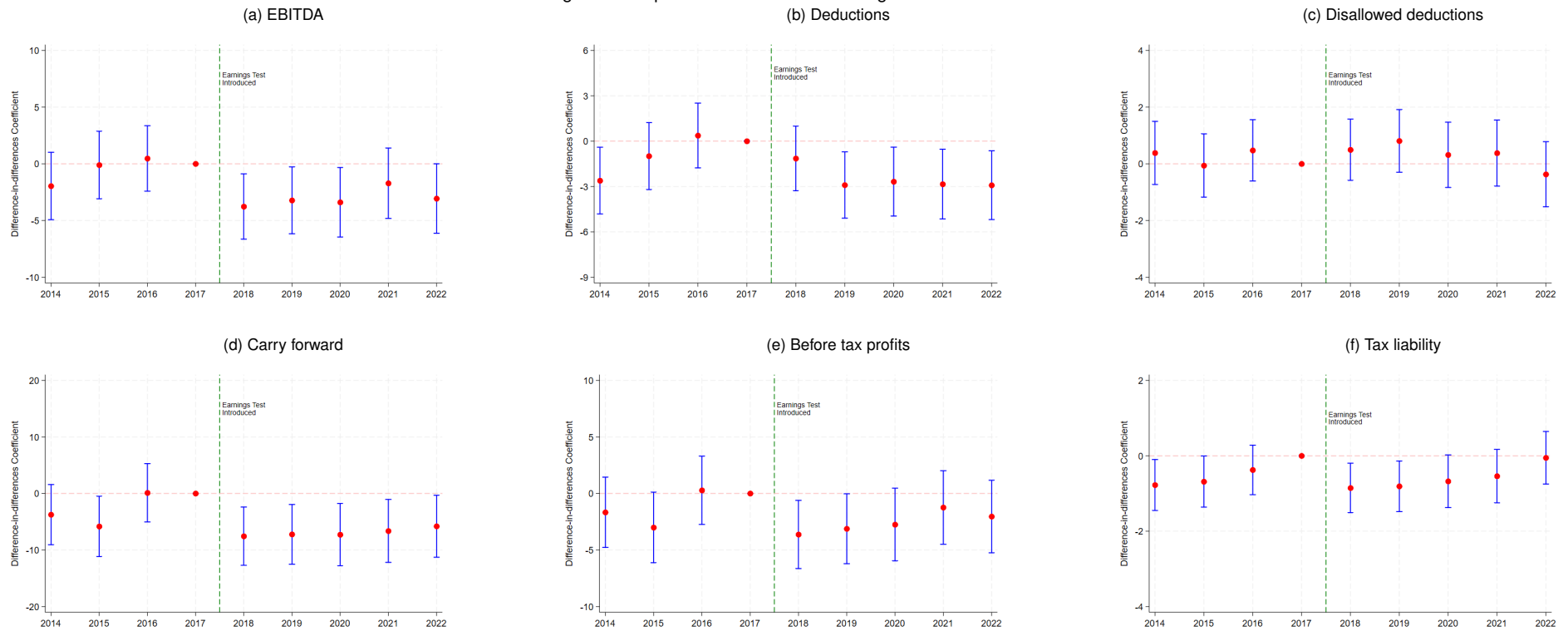
Source: authors' calculations.

Figure 11: Impacts of Treatment 1: earnings test introduced

Note: the figure plots the results from our event study specification (Equation 10), focusing exclusively on MNEs. The treatment group comprises MNEs whose *average* interest expenses to EBITDA ratio during the baseline years of 2014–17 was greater than 0.2, while their *maximum* debt-to-equity ratio during these years was less than 1.3. These firms were close to failing the earnings test but were never at risk of failing the equity test. The control group consists of MNEs that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. The outcomes are measured in levels, expressed as UGX billions. For precise definitions of the outcomes displayed here, please refer to Appendix A1.

Source: authors' calculations.

Figure 11(f) (column (5) of Table 7) shows that the tax liability of treated firms decreases after the reform (although the decrease is not statistically significant). This is surprising because for fixed earnings the tax liability of a firm must increase as its deductions fall. This puzzle is solved by the evidence in Figure 11(a) (column 1 of Table 7). Although the deductions of treated firms fall, their earnings before these deductions (EBITDA) fall even more, resulting in a decrease in the tax liability rather than an increase. An additional factor reducing the tax liability is that the carry forward of treated firms also falls after the reform (Figure 11(d); column (4) of Table 7), suggesting that firms are drawing down their accumulated balance to offset lower deductions.

Lower earnings of treated firms could indicate either misreporting or a genuine reduction in real economic activity. To distinguish between these two mechanisms, we turn to Figures 12 and 13 and Tables 8 and 9. Figure 12 and Table 8 reveal that both the income statements and the balance sheets of treated firms are contracting: turnover, costs, profits, equity, and assets all decrease after the reform, while liabilities increase. Critically, however, the results suggest that this contraction is driven by a real reduction in economic activity as third-party-reported items—such as wages, imports, and exports—which are difficult to manipulate or misreport are also declining like other items (see Figure 13 and Table 9). This broad-based reduction reinforces the conclusion that the observed changes are not merely a result of accounting adjustments, but reflect genuine economic shrinkage consistent with the second part of Prediction 2 (see Section 3).

In sum, the key message of the above analysis is that the introduction of the new anti-avoidance rule induces strong behavioural responses among treated MNEs. They reduce their loans and claim substantially lower interest expenses. But these adjustments fail to translate into higher reported profits or increased corporate tax payments in Uganda, which must have been the only intended objective of the reform. Instead, as an unintended consequence, the new rules cause treated firms to contract real economic activity in Uganda. Their balance sheets and income statements deteriorate, leading to a nearly 20 per cent fall in their net book value.

Table 8: Impacts of Treatment 1: earnings test introduced

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 effects	Firm; year; industry × year						

Note: the table reports the results from our difference-in-differences model corresponding to Equation 10. We focus exclusively on MNEs. The treatment group comprises MNEs whose *average* interest expenses to EBITDA ratio during the baseline years of 2014–17 was greater than 0.2, while their *maximum* debt-to-equity ratio during these years was less than 1.3. These firms were close to failing the earnings test but were never at risk of failing the equity test. The control group consists of MNEs that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. 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 a percentage of this mean. For precise definitions of the outcomes used here, please refer to Appendix A1. ***, **, and * denote significance at the 1%, 5%, and 10% levels.
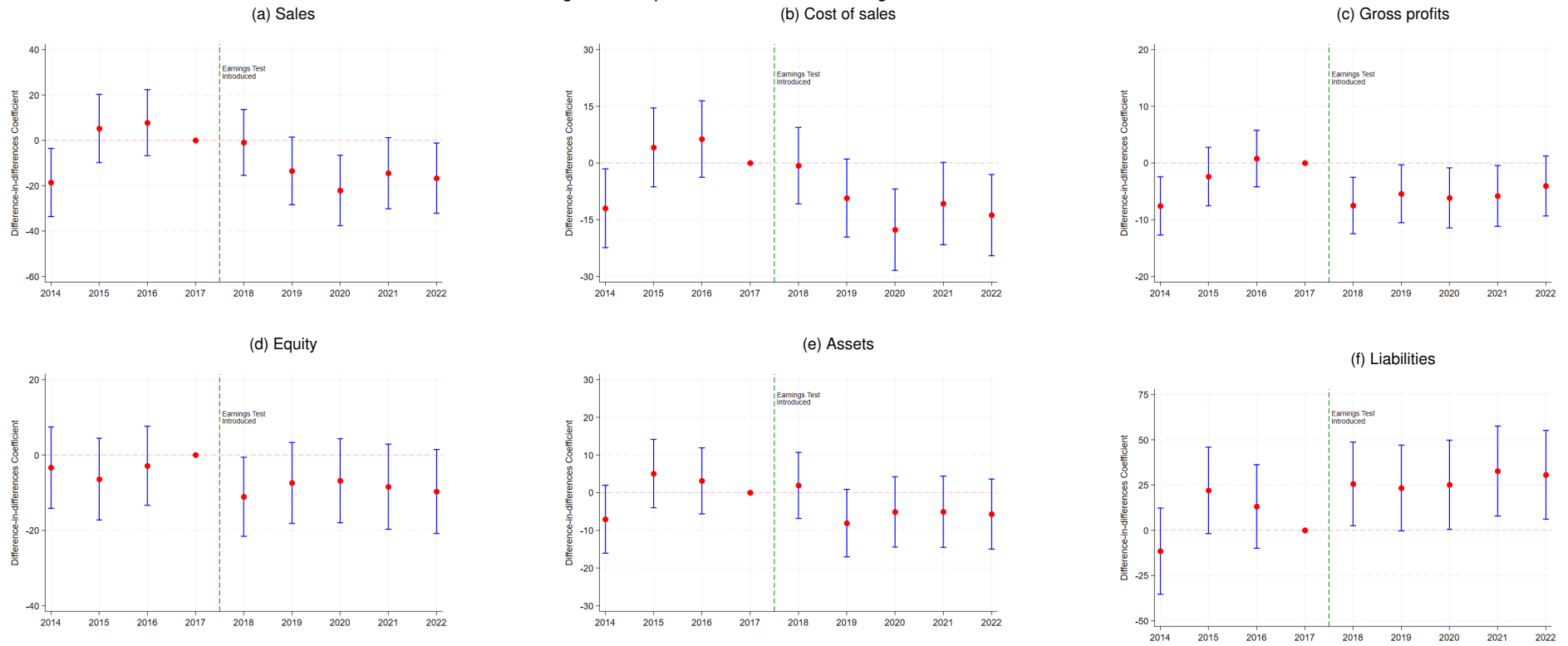
Source: authors' calculations.

Table 9: Impacts of Treatment 1: earnings test introduced

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 effects	Firm; year; industry × year						

Note: the table reports the results from our difference-in-differences model corresponding to Equation 10. We focus exclusively on MNEs. The treatment group comprises MNEs whose *average* interest expenses to EBITDA ratio during the baseline years of 2014–17 was greater than 0.2, while their *maximum* debt-to-equity ratio during these years was less than 1.3. These firms were close to failing the earnings test but were never at risk of failing the equity test. The control group consists of MNEs that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. 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 a percentage of this mean. For precise definitions of the outcomes used here, please refer to Appendix A1. ***, **, and * denote significance at the 1%, 5%, and 10% levels.
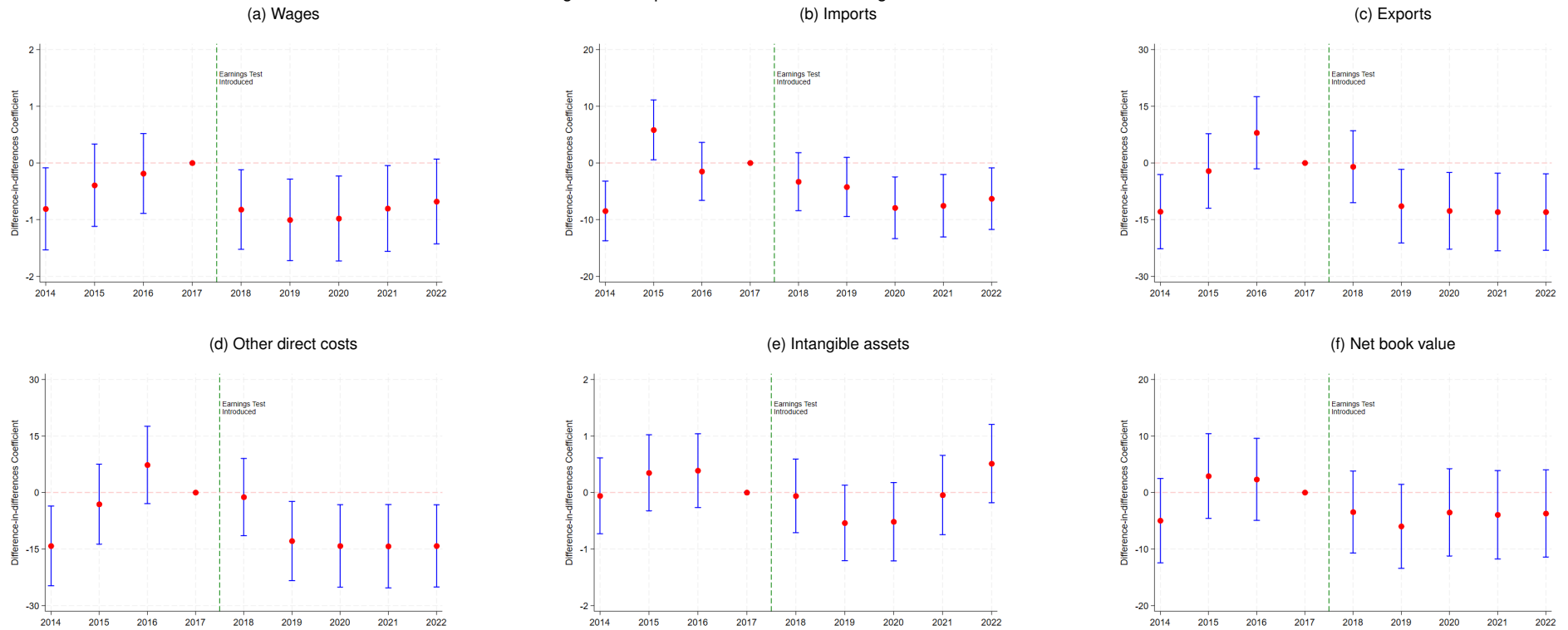
Source: authors' calculations.

Figure 12: Impacts of Treatment 1: earnings test introduced

(a) Sales   (b) Cost of sales   (c) Gross profits

(d) Equity   (e) Assets   (f) Liabilities

Note: the figure plots the results from our event study specification (Equation 10), focusing exclusively on MNEs. The treatment group comprises MNEs whose *average* interest expenses to EBITDA ratio during the baseline years of 2014–17 was greater than 0.2, while their *maximum* debt-to-equity ratio during these years was less than 1.3. These firms were close to failing the earnings test but were never at risk of failing the equity test. The control group consists of MNEs that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. The outcomes are measured in levels, expressed as UGX billions. For precise definitions of the outcomes displayed here, please refer to Appendix A1.

Source: authors' calculations.

Figure 13: Impacts of Treatment 1: earnings test introduced

(a) Wages

(b) Imports

(c) Exports

(d) Other direct costs

(e) Intangible assets

(f) Net book value

Note: the figure plots the results from our event study specification (Equation 10), focusing exclusively on MNEs. The treatment group comprises MNEs whose *average* interest expenses to EBITDA ratio during the baseline years of 2014–17 was greater than 0.2, while their *maximum* debt-to-equity ratio during these years was less than 1.3. These firms were close to failing the earnings test but were never at risk of failing the equity test. The control group consists of MNE that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. The outcomes are measured in levels, expressed as UGX billions. For precise definitions of the outcomes displayed here, please refer to Appendix A1.

Source: authors' calculations.

6.2   Treatment 2: equity test removed

Our empirical setting offers two experiments to tease out the causal effects of the equity test: the relaxation of the fixed ratio of the test from 1 to 1.5 in 2015 and its ultimate removal in 2018. We, however, can only use the latter experiment due to an insufficient baseline period for the former.
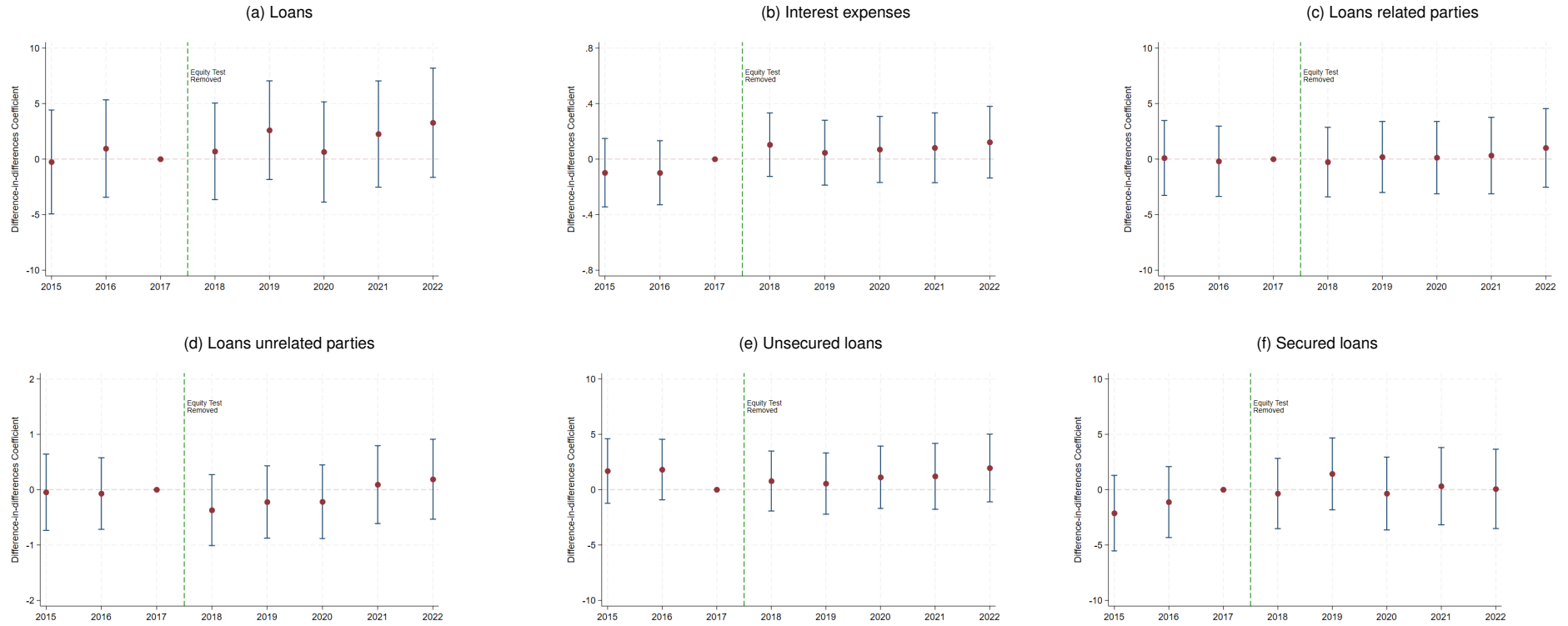
Figure 14 examines the effects of the latter experiment. We estimate our event study specification (Equation 10) on loans and related outcomes. The treatment group includes MNEs that, in the baseline years of 2015–17, were close to failing the equity test but were not at risk of failing the earnings test.[21] These firms were hence treated by the removal of the equity test in 2018, meaning that they were subject to the equity test before the reform but not subject to any tests after the reform. The control group, on the other hand, consists of MNEs that were never at risk of failing either of the two tests during the baseline years. We exclude the year 2014 from our sample to avoid conflating the effects of the 2015 reform.[22] 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. Appendix Figures A1–A3 extend this analysis to the 18 other outcomes we study. The findings are consistent with the trends observed above. The reform does not produce statistically 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—the introduction of the earnings test.

These findings are not surprising. Indeed, the key reason behind the OECD's recommendation that the equity test should not be the main anti-avoidance rule against debt-based profit shifting was that MNEs could easily circumvent this rule (please see Section 2.2 for details). Our results validate the basis of the OECD's recommendation. The equity test does not lead to significant reduction in interest deduction. Nor does it result in an increase in tax paid in Uganda.

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[21] Specifically, the treatment group comprises MNEs whose debt-to-equity ratio was greater than 1.3 in the baseline years of 2015–17 but whose interest expenses to EBITDA ratio during these years was always less than 0.2.

[22] Effectively, the assumption here is that the response to the 2015 reform was immediate and permanent (no dynamic component), making the years 2015–17 a stable baseline. Our event studies are indeed consistent with this assumption.

Figure 14: Impacts of Treatment 2: equity test removed

Note: the figure presents the results from our event study specification (Equation 10), focusing exclusively on MNEs. The treatment group comprises MNEs whose *average* debt-to-equity ratio during the baseline years of 2014–17 was greater than 1.5, while their *maximum* interest expenses to EBITDA ratio during these years was less than 0.2. These firms were failing the equity test at the baseline but were never in danger of failing the earnings test. The control group consists of MNEs who were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio during these years was less than 0.2. The outcomes are measured in levels, expressed as UGX billions. For precise definitions of the outcomes displayed here, please see Appendix A1.

Source: authors' calculations.

6.3 Treatment 3: equity test replaced by earnings test

We now turn to our final treatment. The experiment involves MNEs transitioning from the equity test to the earnings test. Any response to the treatment would thus be informative on which of the two tests is more effective against profit shifting through the debt channel.
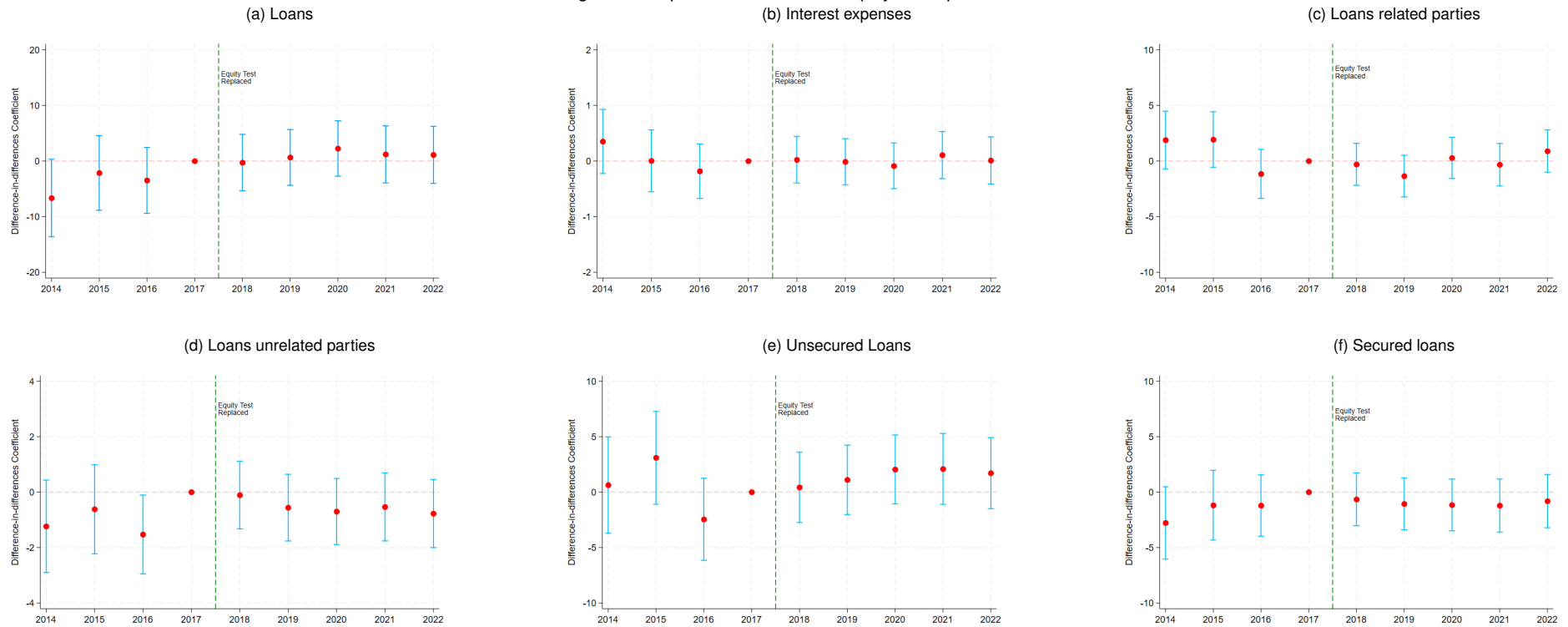
Figure 15 shows the results for loans and related outcomes. The treatment group here consists of MNEs that were close to failing both tests during the baseline years of 2014–17. In contrast, MNEs in the control group were never at risk of failing either of the tests during these years. The results show that the treatment does not induce any significant response. The outcomes do not diverge in any meaningful way from the pre-existing trend at the time of the reform. Figures A4–A6 confirm that this pattern holds in general for the other 18 outcomes we study as well.

One important distinction between Treatment 3 and the other treatments in our setup is that the treatment intensity under Treatment 3 does not move in one single direction for all MNEs after the reform. When the equity test is replaced by the earnings test, 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 the others. For this reason, estimating an *average* effect of the treatment does not make sense. To address this, we define a new dummy variable that takes the value 1 if for an MNE the interest deduction disallowed by the earnings test is greater than the interest deduction disallowed by the equity test at the baseline (2014–17). 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 are expected to be similar to those facing Treatment 1.

Tables 10–13 test this hypothesis. We estimate our difference-in-differences model by partitioning the double interaction term treat × after into two parts. The additional triple-interaction dummy captures the responses of MNEs for which the 2018 reform results in increased treatment intensity. The results are consistent with the hypothesis we 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 secure 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 discussed here are not statistically significant. But the overall message is clear: MNEs that transition from a binding equity test to a binding earnings test behave similarly to those experiencing the earnings test for the first time (Treatment 1), provided this transition imposes tighter restrictions on their ability to deduct interest expenses.

Having examined the effects of all three treatments, we can draw two key conclusions. First, the equity test seems to have little to no impact on firm behaviour. Treatment 2, which creates a clean experiment of MNEs experiencing the removal of the test, produces no significant response along any margins, especially along loans and related outcomes. Second, while the earnings test induces treated MNEs to reduce their loans and interest expenses, these reductions do not lead to increased tax payments or higher profits. Instead, the real economic activity of these firms contracts, resulting in reduced turnover, employment, and international trade.

Figure 15: Impacts of Treatment 3: equity test replaced

(a) Loans

(b) Interest expenses

(c) Loans related parties

(d) Loans unrelated parties

(e) Unsecured Loans

(f) Secured loans

Note: the figure presents the results from our event study specification (Equation 10), focusing exclusively on MNEs. The treatment group comprises MNEs whose *average* debt-to-equity ratio during the baseline years of 2014–17 was greater than 1.5, while their *average* interest expenses to EBITDA ratio during these years was greater than 0.2. Not only were these firms failing the equity test at the baseline, they were also close to failing the earnings test. The control group consists of firms that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. The outcomes are measured in levels, expressed as UGX billions. For precise definitions of the outcomes displayed here, please see Appendix A1.

Source: authors' calculations.

Table 10: Impacts of Treatment 3: equity test replaced with earnings test

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 effects:	Firm; year; industry × year						

Note: the table reports the results from our difference-in-differences model corresponding to Equation 10. We focus exclusively on MNEs. The treatment group comprises MNEs whose *average* debt-to-equity ratio during the baseline years of 2014–17 was greater than 1.5, while their *average* interest expenses to EBITDA ratio during these years was greater than 0.2. Not only were these firms failing the equity test at the baseline, they were also close to failing the earnings test. The control group consists of firms that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. 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 a percentage of this mean. For precise definitions of the outcomes used here, please refer to Appendix A1. ***, **, and * denote significance at the 1%, 5%, and 10% levels.
Source: authors' calculations.

Table 11: Impacts of Treatment 3: equity test replaced with earnings test

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 effects	Firm; year; industry × year						

Note: the table reports the results from our difference-in-differences model corresponding to Equation 10. We focus exclusively on MNEs. The treatment group comprises MNEs whose *average* debt-to-equity ratio during the baseline years of 2014–17 was greater than 1.5, while their *average* interest expenses to EBITDA ratio during these years was greater than 0.2. Not only were these firms failing the equity test at the baseline, they were also close to failing the earnings test. The control group consists of firms that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. 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 a percentage of this mean. For precise definitions of the outcomes used here, please refer to Appendix A1. ***, **, and * denote significance at the 1%, 5%, and 10% levels.
Source: authors' calculations.

Table 12: Impacts of Treatment 3: equity test replaced with earnings test

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 effects	Firm; year; industry × year						

Note: the table reports the results from our difference-in-differences model corresponding to Equation 10. We focus exclusively on MNEs. The treatment group comprises MNEs whose *average* debt-to-equity ratio during the baseline years of 2014–17 was greater than 1.5, while their *average* interest expenses to EBITDA ratio during these years was greater than 0.2. Not only were these firms failing the equity test at the baseline, they were also close to failing the earnings test. The control group consists of firms that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. 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 a percentage of this mean. For precise definitions of the outcomes used here, please refer to Appendix A1. ***, **, and * denote significance at the 1%, 5%, and 10% levels.
Source: authors' calculations.

Table 13: Impacts of Treatment 3: equity test replaced with earnings test

Outcomes (y_i):	Wages	Imports	Exports	Other direct costs	Intangible assets	Fixed assets	Shareholder capital
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treat × after	0.229*	−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 × after × TI ↑	−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 effects	Firm; year; industry × year						

Note: the table reports the results from our difference-in-differences model corresponding to Equation 10. We focus exclusively on MNEs. The treatment group comprises MNEs whose *average* debt-to-equity ratio during the baseline years of 2014–17 was greater than 1.5, while their *average* interest expenses to EBITDA ratio during these years was greater than 0.2. Not only were these firms failing the equity test at the baseline, they were also close to failing the earnings test. The control group consists of firms that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. 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 a percentage of this mean. For precise definitions of the outcomes used here, please refer to Appendix A1. ***, **, and * denote significance at the 1%, 5%, and 10% levels.
Source: authors' calculations.

7   Why are the tests ineffective?

Our analysis reveals that neither anti-avoidance test results in MNEs paying higher taxes or reporting higher profits in Uganda. This outcome is particularly surprising given the strong evidence in Section 5 indicating that MNEs use debt to shift profits out of Uganda. In this section, we make sense of these results.

7.1   Tests impact a few firms only

Figure 16 illustrates the fraction of firms for which the two tests are binding. Figure 16(a) shows that approximately 20 per cent of MNEs fail the equity test. This fraction remains stable over time, showing no appreciable change either in 2014, when the fixed ratio of the test was relaxed, or in 2018, when it was removed. Nor does it vary much across firm types. In contrast, a far smaller fraction of MNEs fails the earnings test. This fraction is more volatile over time, fluctuating between 3 and 6 per cent for MNEs, and across firm types. Appendix Figure A7 separately plots the numerator and denominator of the earnings test to understand why so few firms fail it. It shows that only about 25 per cent of MNEs report positive interest expenses and only around 40 per cent report positive EBITDA. Given these numbers, it is perhaps not surprising that so few firms have interest expenses exceeding 30 per cent of their EBITDA and thus fail the earnings test.

Figure A8 shows the distribution of the ratios on which the two tests are based, focusing exclusively on MNEs and comparing the pre- and post-reform years. The plots show that the majority of MNEs fall below the threshold of each test. This is particularly true for the earnings test, for which we observe a huge spike at zero. Overall, nearly 80 per cent of firms have non-positive values for the ratio and hence unsurprisingly not many fail the test. Another important takeaway from the figure is the lack of bunching at the thresholds. It is in part because these tests are designed as kinks rather than notches, and kinks in general receive far weaker bunching than notches (see e.g. Kleven 2016). But the lack of bunching also reflects that firm density around the thresholds is quite thin.

Figure 16: Proportion of firms failing the tests
(a) Fails equity test
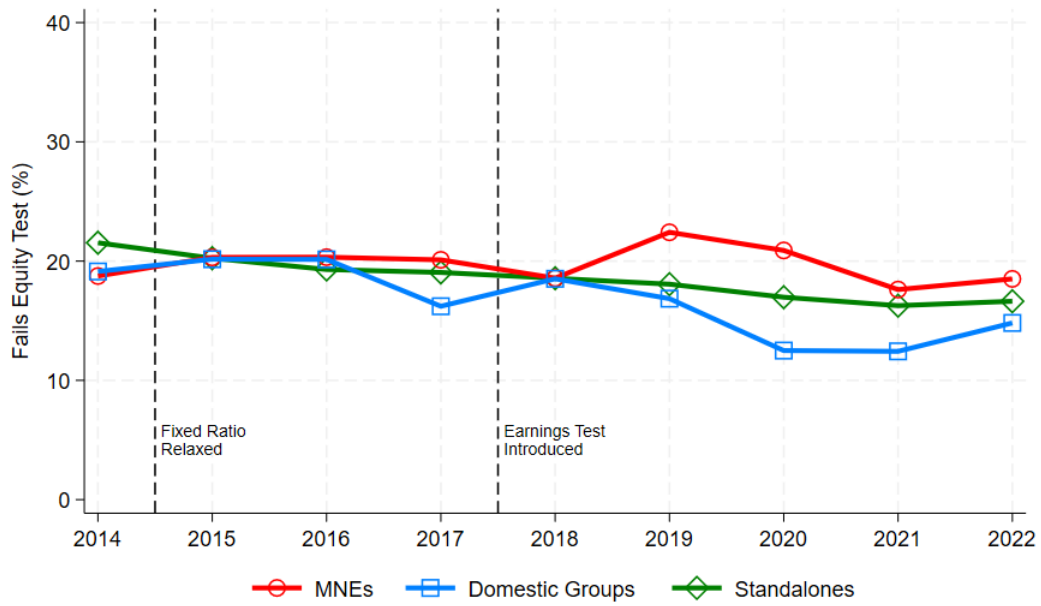
(b) Fails earnings test
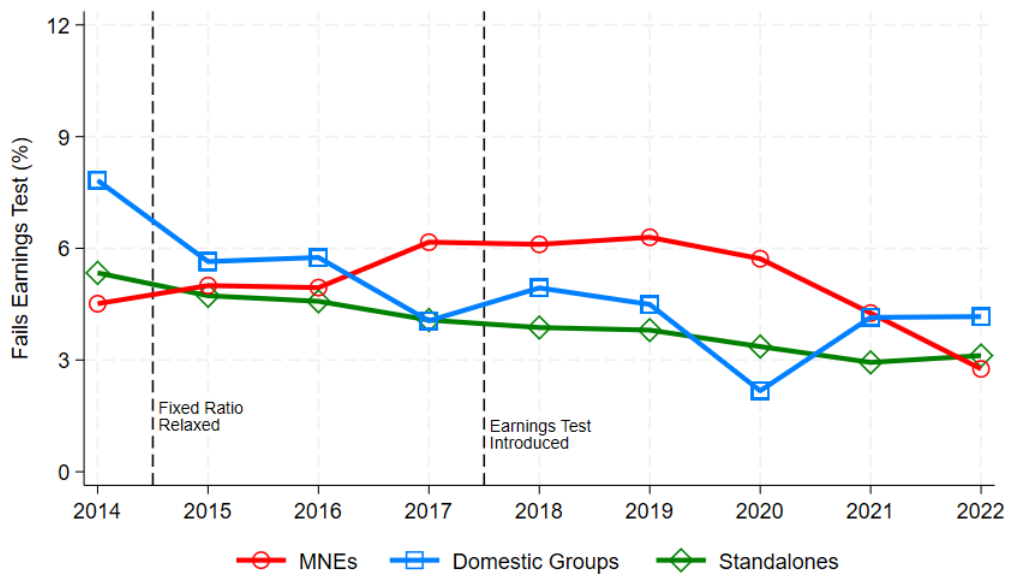
Note: the figure plots the fraction of firms that fail the two tests. Panel (a) focuses on the equity test, where a firm fails the test if its debt-to-equity ratio for the year exceeds 1.5. We calculate the fraction of firms failing the test separately for the three types of firms. For instance, a marker for year t for MNEs show the ratio of the number of MNEs with debt-to-equity ratio exceeding 1.5 in year t to the total number of MNEs in that year. Panel (b) repeats this exercise for the earnings test. A firm fails this test if its interest expenses to EBITDA ratio exceeds 0.3.
Source: authors' calculations.

7.2   Tests are poorly targeted

The fact that only a few firms fail the tests is not necessarily problematic. It is widely known that profit shifting is a top-heavy phenomenon. Indeed, a handful of th largest corporations are considered responsible for the vast majority of profit shifting observed globally.[23] So, just because they are targeting a small fraction of firms does not render the tests ineffective, as long as they are targeting the right type of firms.

Figure 17 examines the targeting efficiency of the two tests. We plot binned scatter diagrams showing the average fraction of firms that fail a test against interest expenses in bins of size UGX40 million. Our focus is solely on MNEs, and we separate the pre- and post-reform years. We fit a linear regression line to the scatter points and report the slope coefficient and R[2] from these regressions. The four curves we obtain are fairly flat, with a significant slope coefficient only in Figure 17(a). This shows that on average firms with higher interest expenses are not more likely to fail the test. The relationship is particularly flat for the earnings test, and it remains largely unchanged after the reform when the test becomes operational. The fact that firms with lower interest expenses are almost as likely as firms with higher interest expenses to fail the test implies that the two tests lack efficiency, given that they do not effectively discriminate against firms with *excessive* interest expenses.

Figure 17: Tests vs. interest expenses
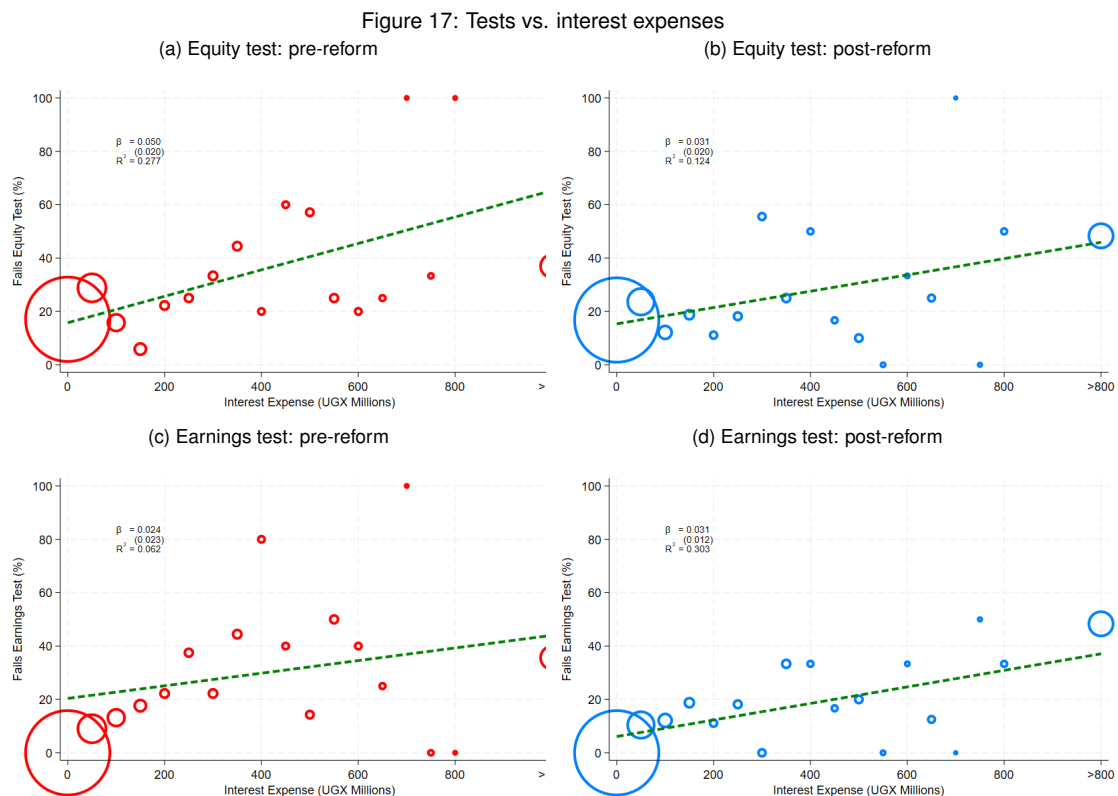
Note: the figure explores the targeting efficiency of the two anti-avoidance tests. We plot binned scatter diagrams showing the fraction of MNEs that fail a test as a function of the interest expenses claimed by them. The horizontal axis represents these interest expenses in bins of UGX40 million, while the vertical axis illustrates the average fraction of MNEs failing the test in each bin. The last bin includes all MNEs with interest expenses exceeding UGX800 million. The size of each scatter point is proportional to the number of MNEs in the bin. We fit a linear curve to the scatter points (dashed green curve in the plots). The regression coefficient, along with the standard error and R[2] from the regressions, is displayed in each plot.
Source: authors' calculations.

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[23] For example, in a global cross-country study using microdata from country-by-country reporting, Fuest et al. (2022) estimate that 60 per cent of the profit shifting is carried out by the 10 per cent largest multinational companies. Similarly, Wier and Erasmus (2023) find that 10 per cent of the multinationals do 98 percent of profit shifting in South Africa.

7.3 No immediate impact even when tests bind

When a firm fails an anti-avoidance test, it does not necessarily mean it will pay higher taxes. For instance, if the firm has negative EBITDA, failing the equity test will have no tax consequences. Alternatively, the firm's earnings trajectory may prevent it from ending up in a tax-paying position even after failing the earnings test. This is because the inadmissible interest deduction in year t can be offset against any positive tax liability in years $t+1$ to $t+3$, as the firm is allowed to carry forward the inadmissible deduction for three years. In general, the tests are more likely to be consequential if the firm earns a positive profit and does not have a large carry-forward balance.

Figure 18 explores how much of the interest deduction disallowed by the two tests results in an immediate tax consequence. We start by plotting in Figure 18(a) the interest expenses claimed by MNEs that fail the tests as a proportion of the total interest expenses claimed by all MNEs. Despite some volatility over time, on average, MNEs that fail the earnings test claim nearly half of the aggregate interest expenses. Initially, this proportion is lower for the equity test, but it reaches the same level after the reform when the test ceases to be operational.

Figure 18: Inadmissible interest expenses by tests
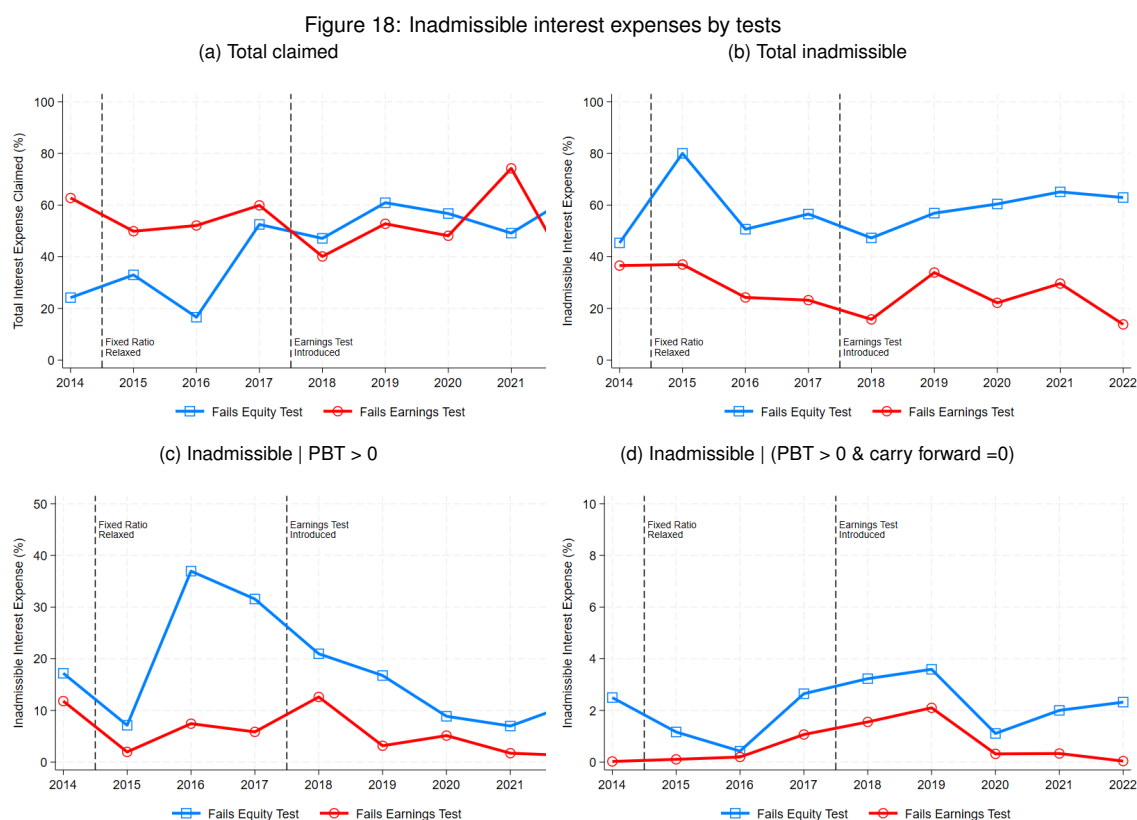
Note: the figure explores how much of the interest deduction disallowed by the two tests results in an *immediate* tax consequence. Panel (a) plots the interest expenses of MNEs that fail the tests in a given year as a proportion of the total interest expenses claimed by all MNEs in that year. Panel (b) repeats the analysis but focuses on the inadmissible interest expenses of the MNE rather than its total interest expenses. For firms failing the earnings test, inadmissible interest expenses are the interest expenses exceeding 0.3 times the firm's EBITDA. For firms failing the equity test, we first calculate inadmissible debt as the debt exceeding 1.5 times the firm's equity. We then multiply the inadmissible debt by the constant interest rate to calculate inadmissible interest expenses, where the constant interest rate is calculated by dividing total interest expenses claimed by the company by its total debt. Panel (c) repeats the analysis in panel (b) but restricts the sample to only those MNEs that report positive profit before tax in the year, while panel (d) further narrows it down to firms that also have zero carried-forward balance in the year.
Source: authors' calculations.

Figure 18(b) repeats the analysis but focuses on the inadmissible interest expenses of the MNE rather than its total interest expenses.[24] The important takeaway from this analysis is that the inadmissible interest is significantly lower under the earnings test for all years in our sample.

The last two panels of Figure 18 focus on the subset of MNEs for which failing a test is likely to have significant, immediate tax consequences. Figure 18(c) examines MNEs with positive profit before tax in the year, while Figure 18(d) further narrows it down to firms that also have zero carried-forward balance. For these MNEs, inadmissible interest expense is likely to translate one to one into higher tax payments in the current period. Surprisingly, less than 5 per cent of the interest claimed by MNEs meets these conditions. The remaining 95 per cent of interest is either admissible or will not have an immediate tax consequence even if its deduction is disallowed. It is therefore not surprising that neither the earnings test nor the equity test results in higher tax payments by MNEs in Uganda.

It is important to understand that we are discussing the immediate not the *ultimate* tax consequence. Interest deductions disallowed by the earnings test will eventually impact taxes if they cannot be offset against tax liability within the next three years. In contrast, there is no such distinction between immediate and ultimate tax consequences for the equity test, as it does not allow carrying forward disallowed interest deductions.

8   Conclusions

Aggressive profit shifting by MNEs is a growing concern for domestic resource mobilization in developing economies. In this paper, we evaluate the revenue and welfare consequences of a flagship anti-avoidance policy, recommended by the OECD under its BEPS framework and implemented by more than 45 countries up to 2019, to counter profit shifting through the debt channel. We focus on Uganda, a representative developing economy, which implemented the policy in 2018, replacing the criteria to determine *excessive* debt from an equity-based test to an earnings-based test. Exploiting administrative data comprising the universe of corporate tax returns filed between 2014 and 2022, we document three important sets of results.

First, our analysis suggests that MNEs are likely engaged in tax avoidance in Uganda. They report nearly four times higher loans and deduct four times higher interest expenses, yet they report 25 times lower profits compared to similar domestic firms. Second, we find that neither of the two tests provides effective protection against tax avoidance. Both tests fail to significantly increase tax payments or reported profits. Although the earnings test reduces loans and interest expenses, it leads to unintended economic consequences, including a contraction in real economic activity, such as reduced turnover, employment, and trade. Third, we highlight the limited targeting efficiency of both tests. The majority of MNEs are not affected by the tests, and even those that are often manage to avoid immediate tax consequences due to carry-forward provisions or negative earnings.

Our results question the overall welfare impact of a widely adopted anti-avoidance measure. While it fails to achieve its primary goal of preventing tax avoidance, it results in the contraction of real economic activity, suggesting that its welfare effects might be negative. A more general lesson one can draw from these results is that tax avoidance rules, especially when implemented in developing countries, must

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[24] For firms failing the earnings test, calculating inadmissible interest expenses is straightforward: it is simply the interest expenses exceeding 0.3 times the firm's EBITDA. However, for firms failing the equity test the calculation is not that simple because the test is based on debt rather than interest expenses, and the interest rate is not observed. To calculate inadmissible interest expenses for these firms, we assume a constant interest rate calculated as total interest expenses divided by total debt of the firm. We multiply the inadmissible debt by this rate to calculate the inadmissible interest expense. Inadmissible debt is defined as debt exceeding 1.5 times the firm's equity.

take into account their unintended consequences. Policy-makers should consider the broader economic impacts and target efficiency when crafting these regulations. Future policies might benefit from integrating mechanisms that address both immediate and ultimate tax consequences, ensuring that the rules can counter profit shifting without harming the economic environment.

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A Appendix

A1 Definition of variables

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

- **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.

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

- **EBITDA.**[25] A measure of a firm's operating performance over a given year. It is calculated by excluding expenses related to interest, taxes, depreciation, and amortization from a firm's taxable earnings.

- **Profit before tax.** The amount calculated as the tax base in a given year by the revenue authority, which includes the firm's reported profit before tax adjusted for disallowed expenses, carry-forwards from previous periods, and other allowed deductions.

- **Profit after tax.** The net income,in a given year, of a firm after all taxes have been deducted from the profit before tax, including adjustments for tax credits, carry-backs, and other tax-related provisions as determined by the revenue authority.

- **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.

- **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.

- **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.

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

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

- **Related (unrelated) party loans.** The sum of secure and unsecured loans from related (unrelated) parties in a given year.

- **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.

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[25] Earnings before interest, tax, depreciation, and amortization.

- **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.

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

- **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.

- **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.

- **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.

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

- **Other direct costs.** Expenses directly associated with the production of goods or services that are not classified as cost of goods sold, such as direct labor, materials, and manufacturing overheads.

- **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.

- **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.

- **Intangible assets.** Non-physical assets owned by a firm that provide economic benefits, such as patents, trademarks, copyrights, goodwill, and brand recognition.

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

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

- **Shareholder capital.** The total amount of money that shareholders have invested in a firm in exchange for ownership shares, representing the initial and subsequent contributions made by shareholders.

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

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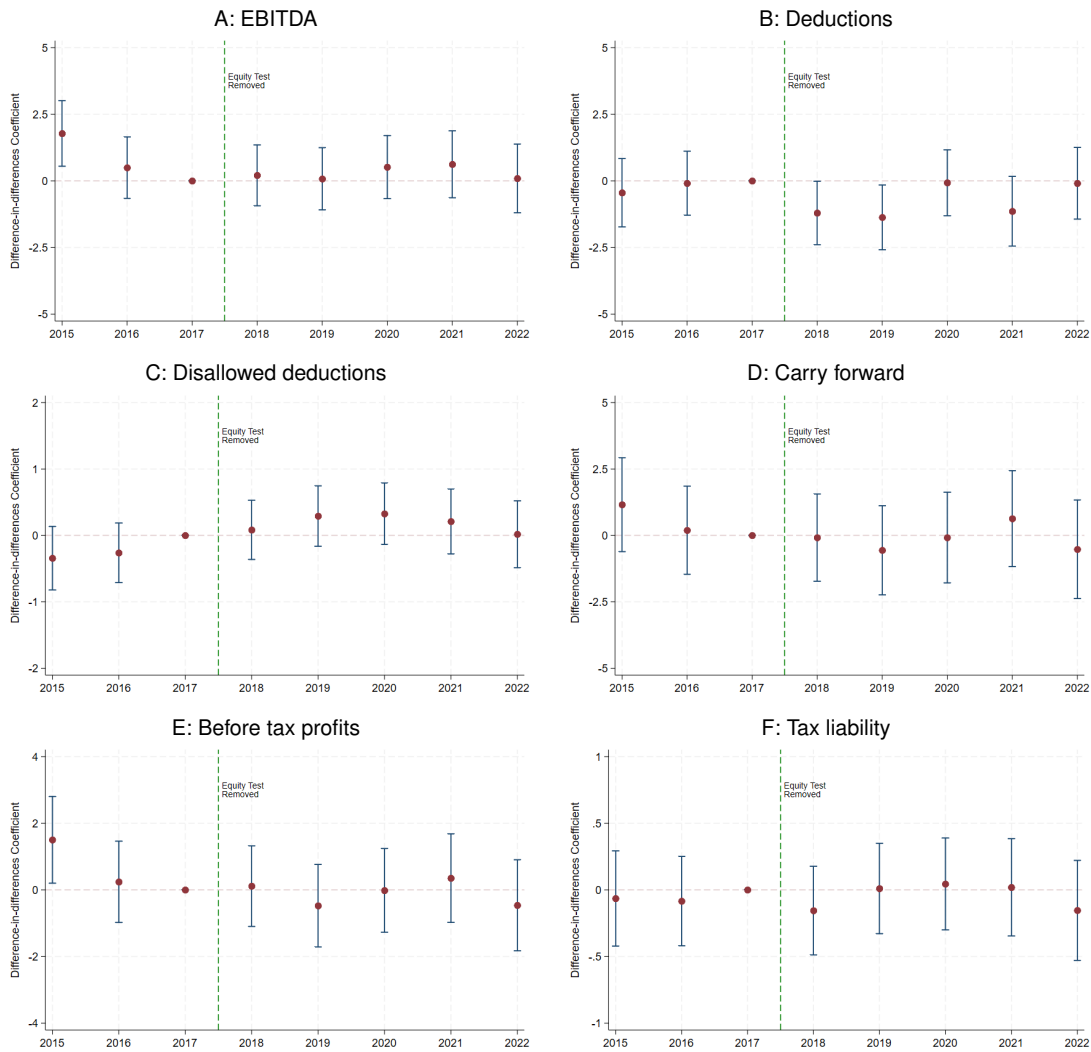
- **Debt/equity.** A financial ratio that measures a firm's leverage by dividing its total debt by its total equity. This ratio indicates the relative proportion of debt and equity used to finance the company's assets.

- **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.

- **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.

A2   Data cleaning

The administrative tax returns data used in this project is 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 CIT returns are dropped. The raw data also contained numerous duplicate observations arising for various reasons, including multiple filings by firms, revisions to initial returns, and changes in accounting periods. In cases where exact duplicates were identified, they were simply dropped. For revisions, 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.
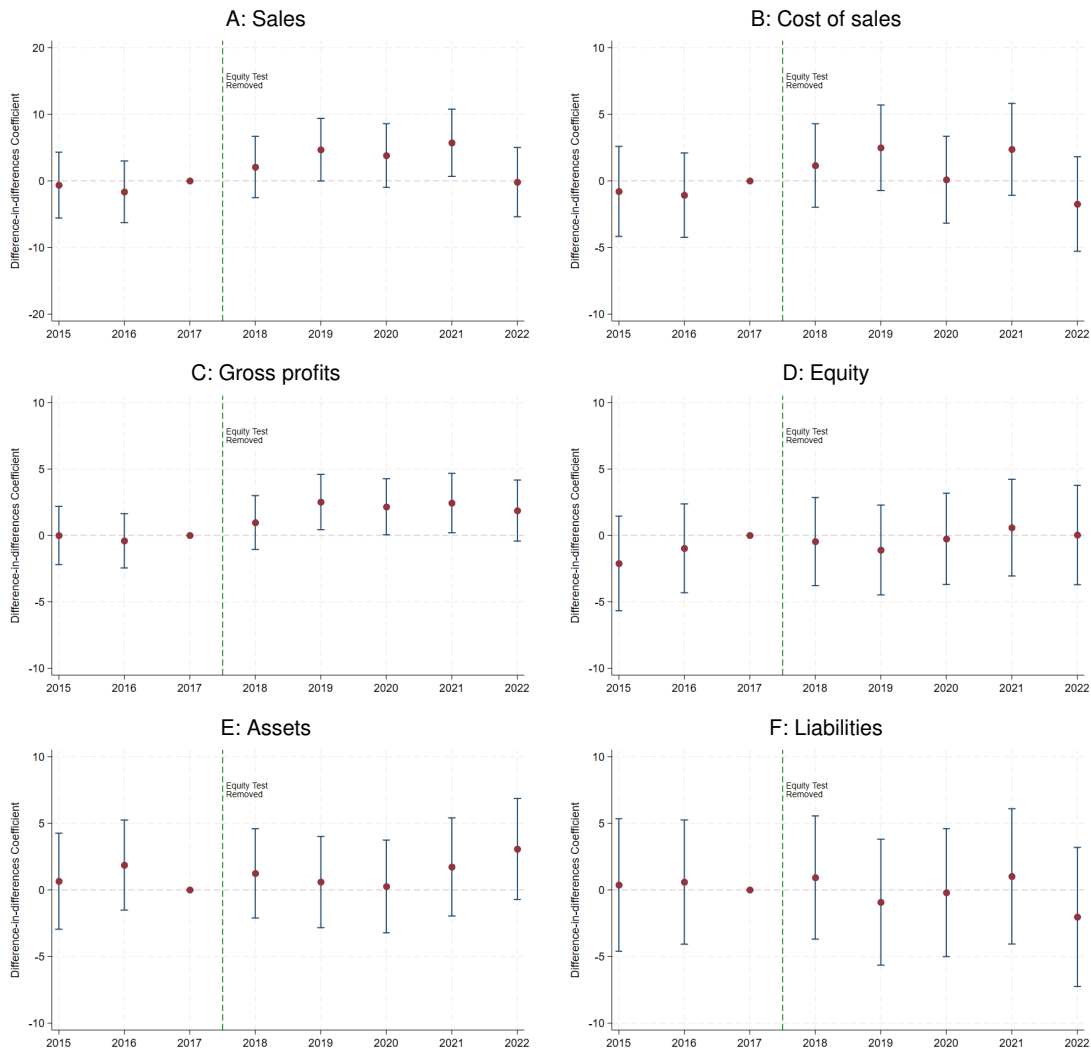
In addition to above cleaning done by the URA, we undertook more cleaning steps to refine the dataset further. Quite briefly, we dropped all the firms belonging to the financial sector and the data pertaining to non-corporate taxpayers. Additionally, we dropped the observations for which the information on *financial year* was missing. We then defined the variables detailed in section A1 and assumed a value of 0 for missing *EBITDA* and *interest expense* and dropped the observations reporting negative *interest expenses*.

Figure A1: Impacts of Treatment 2: equity test removed

Note: the figure presents the results from our event study specification (10), focusing exclusively on MNEs. The treatment group comprises MNEs whose *average* debt-to-equity ratio during the baseline years of 2014–2017 was greater than 1.5, while their *maximum* interest expenses to EBITDA ratio during these years was less than 0.2. These firms were failing the Equity Test at the baseline but were never in danger of failing the Earnings Test. The control group consists of MNEs who were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014-17 was less than 1.3 and their interest expenses to EBITDA ratio during these years was less than 0.2. The outcomes are measured in levels, expressed as UGX billions. For precise definitions of the outcomes displayed here, please see section A1.
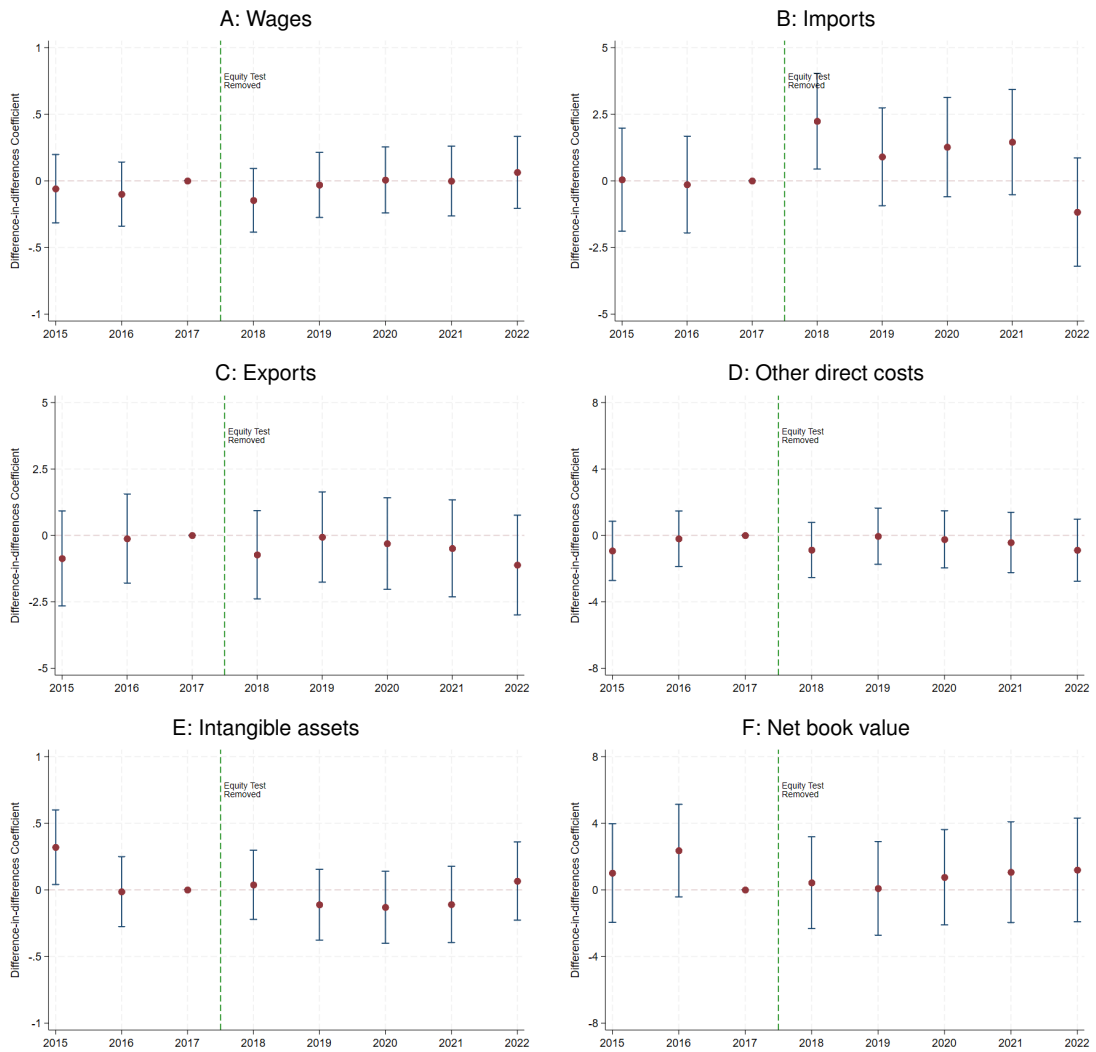
Source: authors' calculations.

Figure A2: Impacts of Treatment 2: equity test removed

Note: the figure presents the results from our event study specification (10), focusing exclusively on MNEs. The treatment group comprises MNEs whose *average* debt-to-equity ratio during the baseline years of 2014–2017 was greater than 1.5, while their *maximum* interest expenses to EBITDA ratio during these years was less than 0.2. These firms were failing the Equity Test at the baseline but were never in danger of failing the Earnings Test. The control group consists of MNEs who were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio during these years was less than 0.2. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please see section A1.
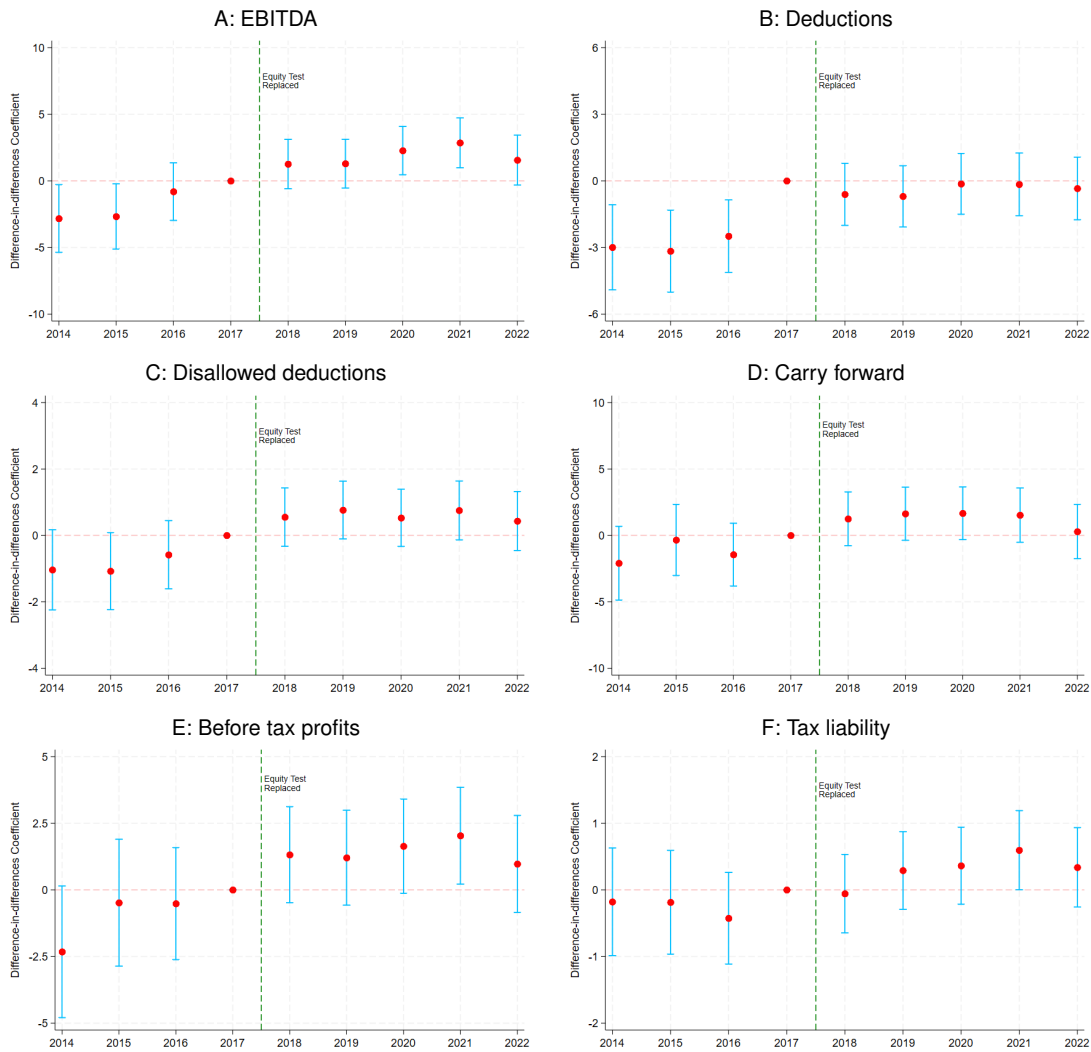
Source: authors' calculations.

Figure A3: Impacts of Treatment 2: equity test removed

A: Wages

B: Imports

C: Exports

D: Other direct costs

E: Intangible assets

F: Net book value

Note: the figure presents the results from our event study specification (10), focusing exclusively on MNEs. The treatment group comprises MNEs whose *average* debt-to-equity ratio during the baseline years of 2014–2017 was greater than 1.5, while their *maximum* interest expenses to EBITDA ratio during these years was less than 0.2. These firms were failing the Equity Test at the baseline but were never in danger of failing the Earnings Test. The control group consists of MNEs who were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio during these years was less than 0.2. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please see section A1.
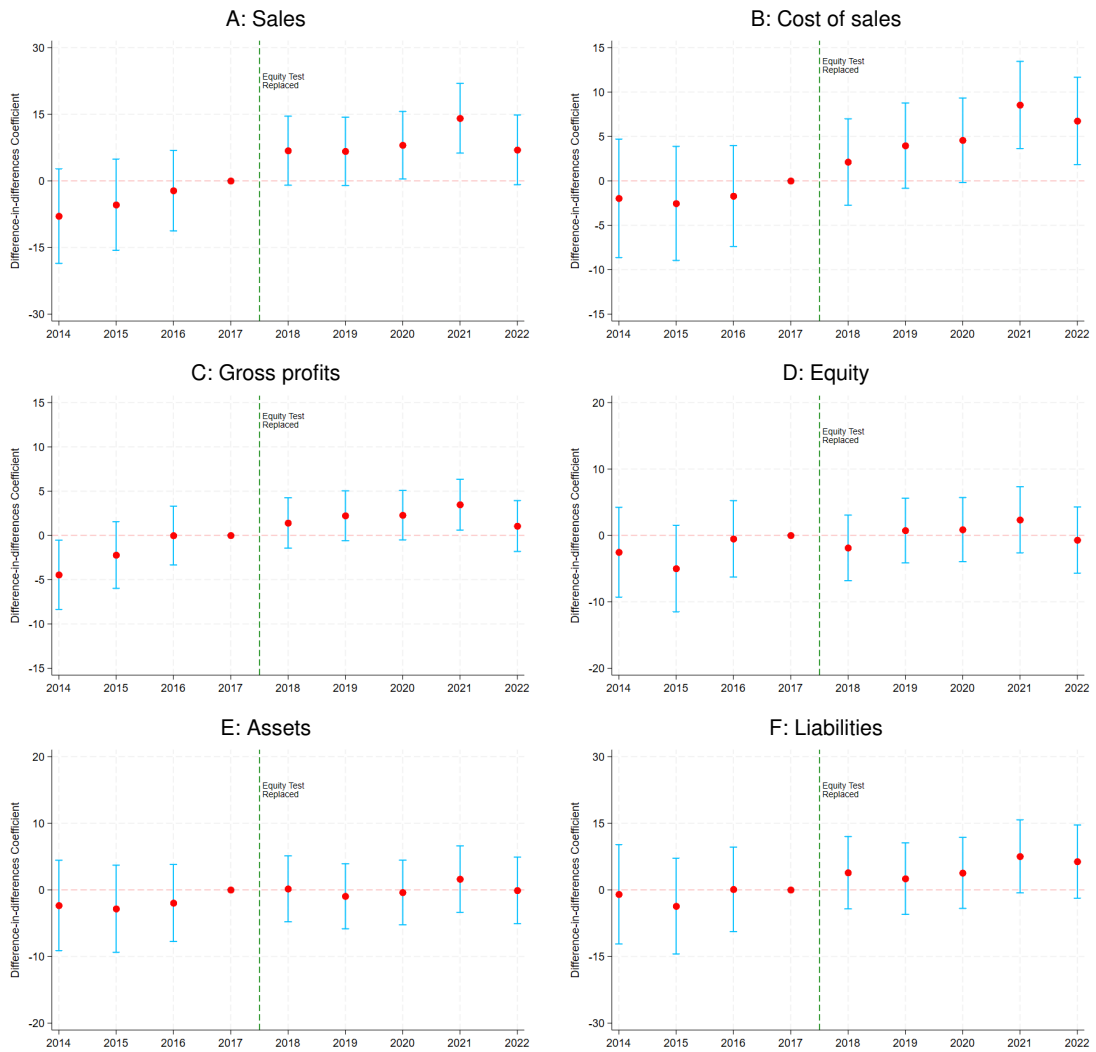Source: authors' calculations.

Figure A4: Impacts of Treatment 3: equity test replaced

A: EBITDA

B: Deductions

C: Disallowed deductions

D: Carry forward

E: Before tax profits

F: Tax liability

Note: the figure presents the results from our event study specification (10), focusing exclusively on MNEs. The treatment group comprises MNEs whose *average* debt-to-equity ratio during the baseline years of 2014–2017 was greater than 1.5, while their *average* interest expenses to EBITDA ratio during these years was greater than 0.2. Not only were these firms failing the Equity Test at the baseline, but they were also close to failing the Earnings Test. The control group consists of firms that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please see section A1.
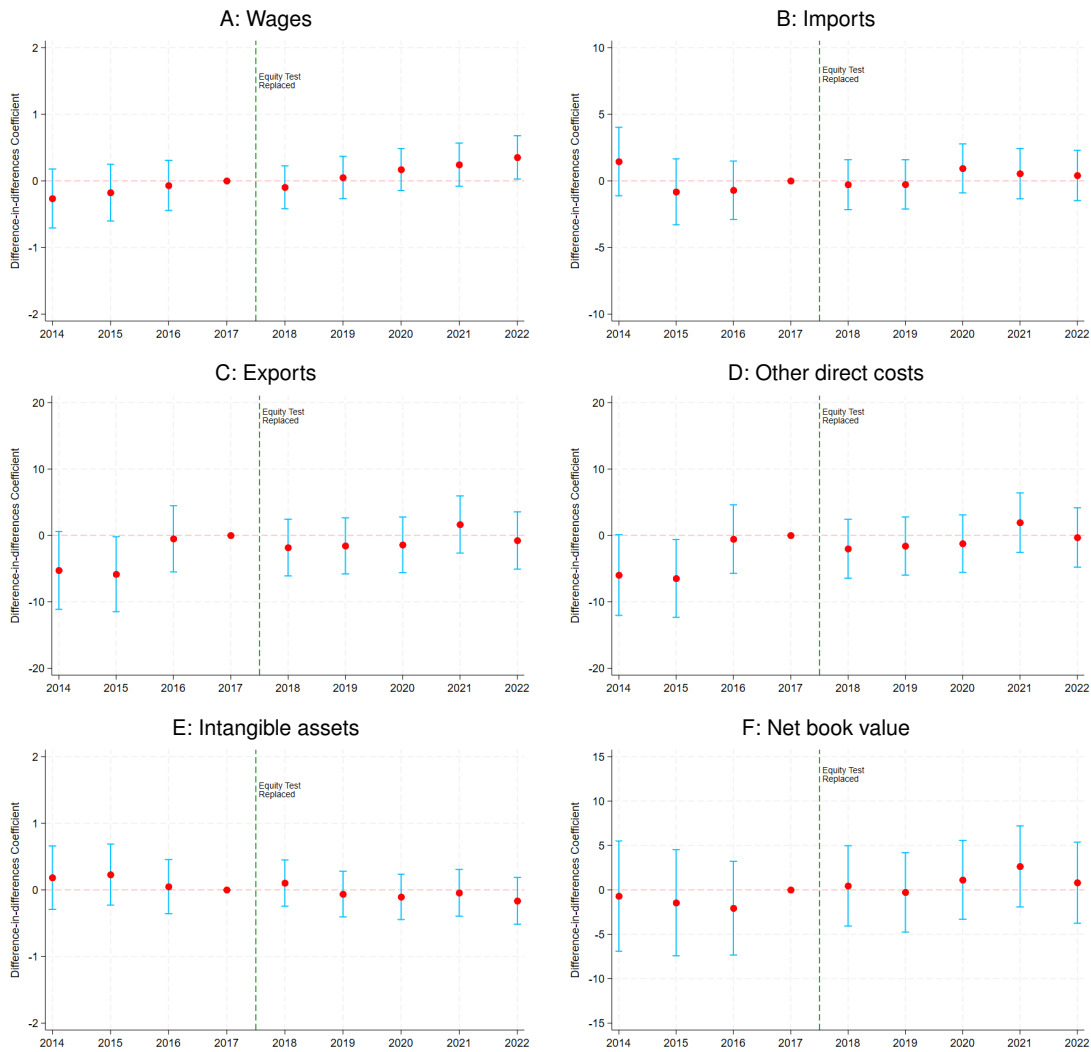
Source: authors' calculations.

Figure A5: Impacts of Treatment 3: equity test replaced

Note: the figure presents the results from our event study specification (10), focusing exclusively on MNEs. The treatment group comprises MNEs whose *average* debt-to-equity ratio during the baseline years of 2014–2017 was greater than 1.5, while their *average* interest expenses to EBITDA ratio during these years was greater than 0.2. Not only were these firms failing the Equity Test at the baseline, but they were also close to failing the Earnings Test. The control group consists of firms that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please see section A1.
Source: authors' calculations.

Figure A6: Impacts of Treatment 3: equity test replaced

Note: the figure presents the results from our event study specification (10), focusing exclusively on MNEs. The treatment group comprises MNEs whose *average* debt-to-equity ratio during the baseline years of 2014–2017 was greater than 1.5, while their *average* interest expenses to EBITDA ratio during these years was greater than 0.2. Not only were these firms failing the Equity Test at the baseline, but they were also close to failing the Earnings Test. The control group consists of firms that were never at risk of failing either test. Specifically, their debt-to-equity ratio in the baseline years of 2014–17 was less than 1.3 and their interest expenses to EBITDA ratio was less than 0.2. The outcomes are measured in levels, expressed as UGX Billions. For precise definitions of the outcomes displayed here, please see section A1.

Source: authors' calculations.

Figure A7: Proportion of firms failing the tests

A: Interest expenses > 0

B: EBITDA > 0
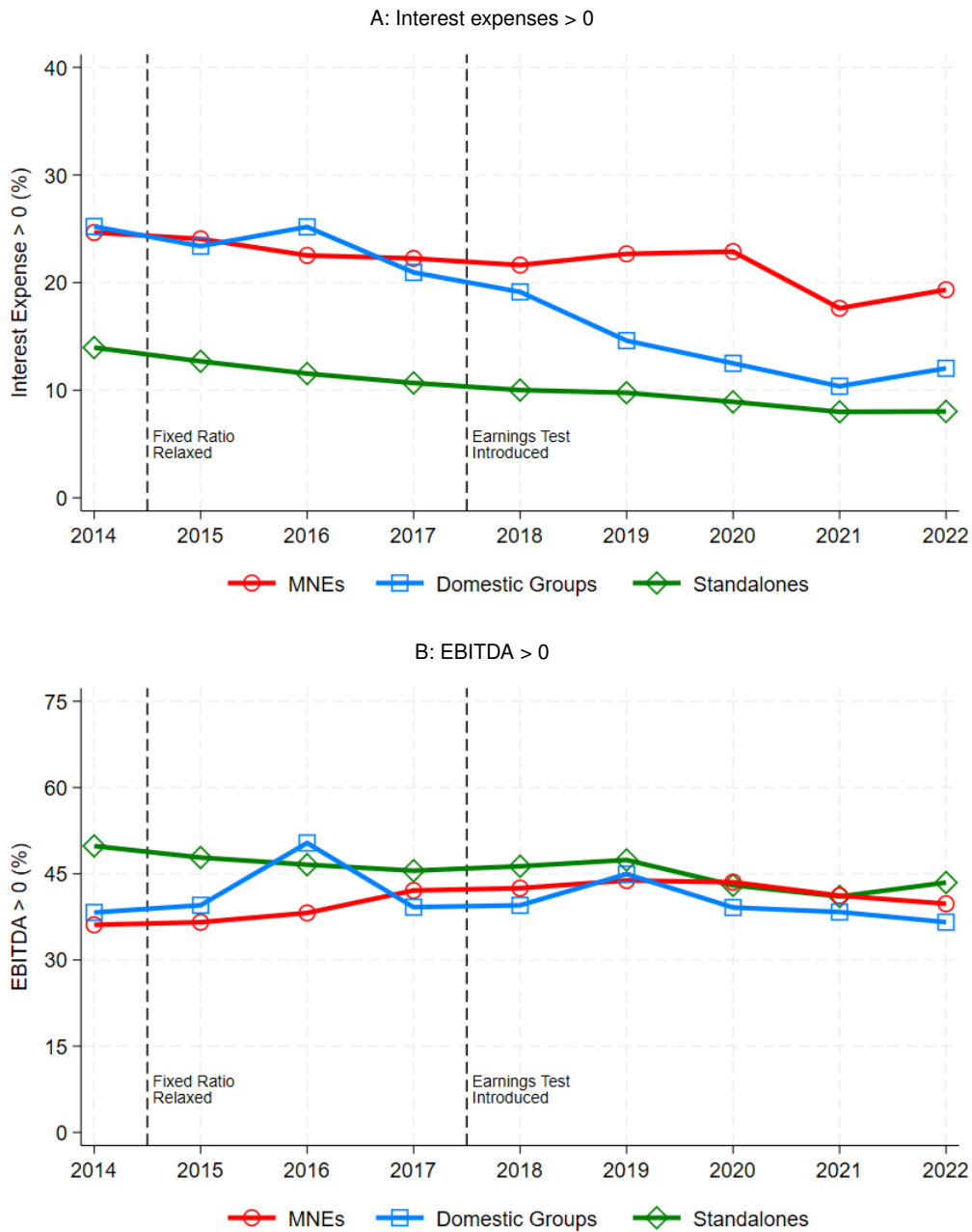
Note: the figure explores why so few firms fail the Earnings Test. Panel A focuses on the numerator of the Earnings Test—the interest expenses of a firm. It plots the fraction of firms which report non-zero interest expense in the given year, separately for the three types of firms. Panel B repeats the analysis but examines the denominator of the test—the EBITDA of the firm. The first dashed line denotes the year the first interest limitation rule—the Equity Test—was introduced in Uganda, while the second dashed indicates the year the Earnings Test was introduced.
Source: authors' calculations.

Figure A8: Proportion of firms failing the tests

A: Debt-to-equity ratio

B: Interest expenses to EBITDA ratio
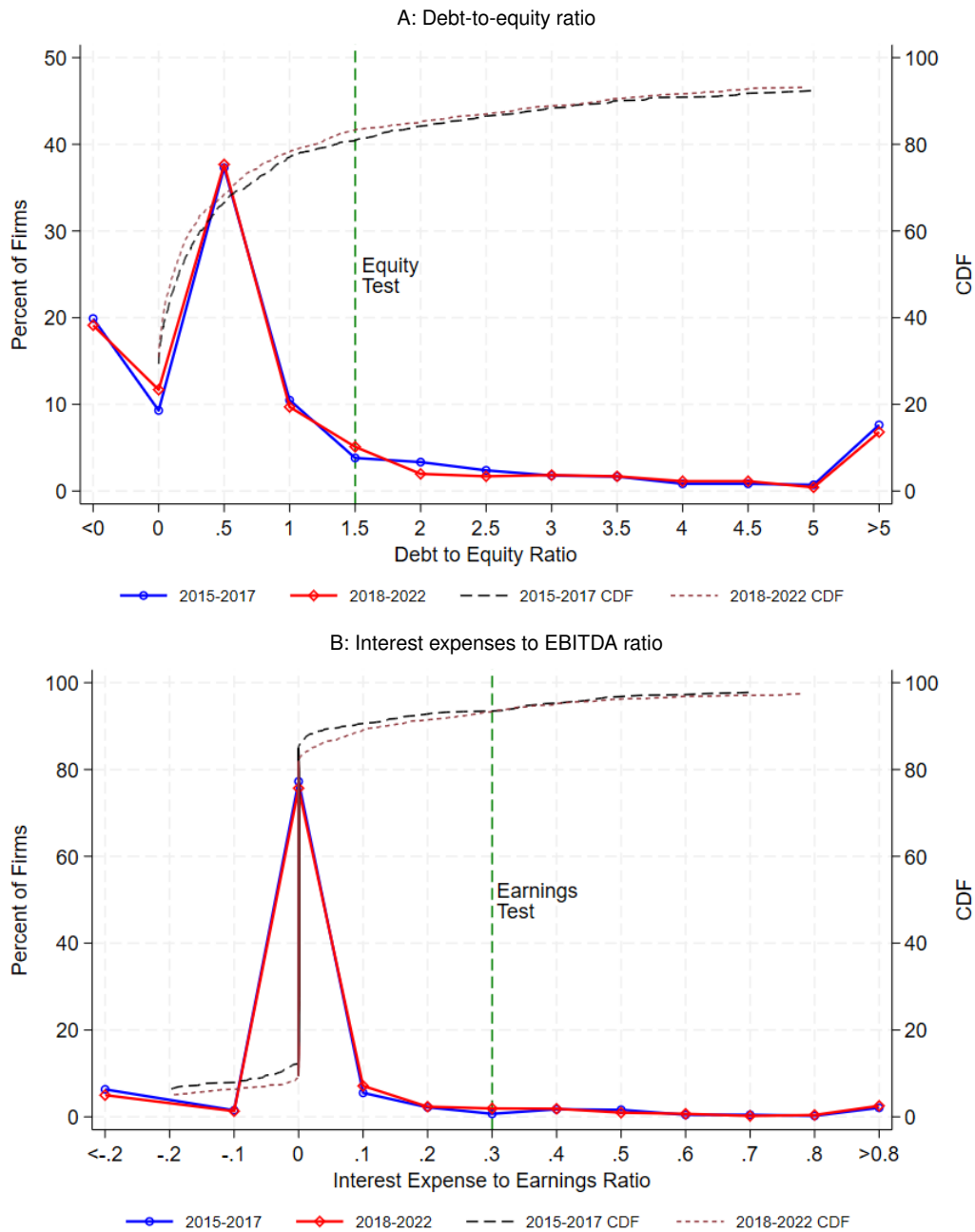
Note: the figures plots the distribution of the ratios the two anti-avoidance tests are based on. We focus exclusively on MNEs. Panel A illustrates the debt-to-equity ratio of MNE, separately for the pre- and post-reform years. We also show the CDF of the ratio in the plot, again separately for the pre- and post-reform years. We discretize the distribution by using bins of size 0.5. The dashed vertical line denotes the threshold of the test. Panel B repeats the analysis for the Earnings Test.
Source: authors' calculations.

A3 Industry description

Table A1: 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

Note: this table presents the detailed description of the 20 industries shown in the panels A and B of Figure 7. Column (1) corresponds to the industry label shown along the y-axis of the plot. Column (2) provides the detailed description of the industry. Industry ranks are generated according to total numbers of firms in each industry.
Source: authors' elaboration.