WIDER Working Paper 2023/133

Did Uganda's corporate tax incentives benefit the Ugandan economy or only the firms?

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November 2023

United Nations University World Institute for Development Economics Research

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Abstract: Uganda has one of the lowest corporate income tax collection rates in sub-Saharan Africa, while offering generous corporate tax incentives. It is unclear whether tax incentives achieve their objectives without primarily benefiting firms, potentially undermining domestic revenue mobilization and encouraging tax avoidance. Using Uganda's administrative tax data for 2014–21 and a new tax incentive dataset, this study shows that tax holidays and the reintroduction of investment allowances are associated with a significant increase in investment and mostly with higher workforce-related expenses. However, there is no clear evidence of a causal link with these incentives, while tax holidays can cost Uganda over UGX160 billion annually, corresponding to 0.12 per cent of GDP, thus demanding further research. In addition to guidance for Ugandan policy-makers on the effect of particular tax incentives, the results also highlight the importance of assessing impacts and systematic use of administrative tax data for evidence-based policy-making in developing countries.

Key words: corporate tax incentives, domestic revenue mobilization, administrative tax data, developing countries, tax avoidance

JEL classification: F63, H25, H26, O23

Acknowledgements: This paper forms part of the UNU-WIDER call for proposals 'Analysis on firms and taxation using microdata from Uganda'. This study uses the Uganda Revenue Authority Firm Panel data developed in collaboration with the Uganda Revenue Authority (URA) and UNU-WIDER. We thank the URA and UNU-WIDER for providing the opportunity to access the data. The authors thank Alessandro Chiari for their research assistance. Alessandro Chiari, Tereza Palanská, and Caroline Schimanski acknowledge support from the Czech Science Foundation (CORPTAX, 21-05547M). Tereza Palanská also acknowledges funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No. 870245. The authors thank Anna Kochanova, Maria Jouste, Miroslav Palanský, and the participants of the UNU-WIDER work-in-progress workshop, LAGV Conference, and IIPF Congress 2023 for their comments.

Note: The study received ethical approval from the Joint Ethical Review Board of the UNU (Ref. 202104/01) on 11 May 2021.

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This study has been prepared within the UNU-WIDER project Building up efficient and fair tax systems – lessons based on administrative tax data, which is part of the Domestic Revenue Mobilization programme. The programme is financed through specific contributions by the Norwegian Agency for Development Cooperation (Norad).

Information and requests: publications@wider.unu.edu

ISSN 1798-7237 ISBN 978-92-9267-441-0

https://doi.org/10.35188/UNU-WIDER/2023/441-0

Typescript prepared by Gary Smith.

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1 Introduction

Among sub-Saharan African countries, Uganda collects the lowest share of corporate income tax (CIT) as a percentage of GDP, even though the statutory 30 per cent CIT rate is slightly above the regional average (McNabb et al. 2022). To address this issue and increase tax revenue, Uganda's government issued a Domestic Revenue Mobilization Strategy in 2020 aiming to raise tax collection by 0.5 per cent of GDP per year, as its estimated potential revenue-to-GDP ratio lies about 10 percentage points above the ratio of 12.9 per cent achieved in the financial year 2018/19. To achieve such a target, it is essential for Uganda to detect the main challenges to its CIT collection. Notably, while the statutory CIT rate is high, the effective rate is relatively low for large taxpayers, especially multinational corporations (MNCs) (Koivisto et al. 2021).

Next to corporate tax avoidance via profit-shifting to tax havens, numerous and generous tax incentives are considered to be one of the main causes of lower effective tax rates and, thus, lower CIT revenues. The Ugandan Ministry of Finance, Planning and Economic Development (MoFPED) considers investment allowances, traditional tax holidays and exemptions, deductions, reduced rates, and indefinite loss carryforwards to be major obstacles to CIT collection (MoFPED 2020).

In recent decades, governments worldwide have been engaged in a race to lower their corporate tax rates and offer generous tax incentives with the aim of spurring labour and capital investments, increasing productivity, or revitalizing regions with a lack of thriving businesses (Klemm and Van Parys 2009). It is essential to consider whether the advantages of stimulating real economic activity and fostering a multiplier effect by attracting business operations can outweigh the revenue loss resulting from tax incentives. While empirical evidence indicates that tax incentives can attract investments, they are not typically the decisive factor for firms when selecting investment locations. Thus, it is crucial to evaluate the potential overall impact of tax incentives on the economy and domestic revenue collection (Kronfol and Steenbergen 2020).

Uganda currently lacks transparency and oversight on the costs and benefits of individual tax incentives offered to firms (MoFPED 2020; Waiswa and Rukundo 2023). This lack of transparency makes it challenging to assess the effectiveness of tax incentives in Uganda and their impact on domestic revenue collection. It is imperative for the government to establish transparency and oversight mechanisms to evaluate the net impact of tax incentives.

Despite the best practices advocated by institutions such as the World Bank, emphasizing the necessity of continuous cost–benefit analyses of tax incentives, especially in developing countries, there is a noticeable scarcity of evidence regarding the costs and benefits of corporate tax incentives. Most of what we know about their impact stems from studies in developed countries; case studies are available for the majority of industrialized nations (Clark 2001; Klemm 2010). Research that specifically examines the effects of accelerated depreciation on a country's manufacturing sector suggests a positive correlation between tax incentives and economic growth (Eichfelder and Schneider 2014; Ohrn 2019). Studies have demonstrated that implementing special economic zones (SEZ), a concept widely adopted in Asia, leads to increased investment and productivity (Ishida 2009; Wong and Chu 1984).

Results from policies enacted in Africa and in other developing countries are in some cases different, possibly because of the presence of a larger informal economy or simply because of less dynamic economic systems (Keen and Mansour 2010; Naudé and Krugell 2007). Tax incentives are not always strongly correlated with an increase in foreign direct investment (FDI), but rather classified as a secondary cause (NU CEPAL 2013), less important than other factors, including a skilled workforce and high-quality infrastructure (Bird 2008). Developing countries tend to use more profit-based fiscal incentives, such as tax holidays and SEZ, while European and North American countries usually implement

tax credits for specific sectors and capital gains tax exemptions (Meinzer et al. 2019). Steenbergen (2018) found that in Rwanda about half of the tax revenue forgone from CIT incentives stemmed from depreciation allowances, but at the same time highlights that few firms meet the criteria to benefit from CIT incentives. Given the limited research available on the costs and benefits of corporate tax incentives in developing countries, this paper aims to contribute to the existing literature by providing evidence on the effectiveness of tax incentives in Uganda.

The research objective of this paper is five-fold: (1) to systematically map Uganda's corporate tax incentives and to compare them to corporate tax incentives offered in other sub-Saharan African countries and the world; (2) to identify the characteristics of firms benefiting from different incentives (e.g., industry, size, multinational versus domestic company status, and profitability); (3) to assess the cost and benefits of the tax incentives offered to firms operating in Uganda; (4) to highlight the importance of evaluating the impact of tax incentives offered, enhancing transparency and informed decision-making; and (5) to showcase the value of using administrative tax data as a foundational resource for evidence-based policy formulation, particularly within the context of developing countries.

To achieve these objectives, we have systematically collected data on the offered tax incentives, including initial investment allowances, tax holidays, and other types of incentives. We have compiled this data into a comprehensive and detailed dataset that provides an extensive overview of Uganda's tax incentives, allowing for comparisons with international counterparts. This dataset has been combined with the Ugandan Revenue Authority's (URA) firm panel covering CIT administrative data for the financial years 2013/14 to 2020/21. The integration of these two datasets serves a dual purpose: first, to discern patterns regarding which types of firms are more likely to receive tax incentives in Uganda; and second, to study whether these incentives have effectively stimulated investment and contributed to economic growth.

Our new dataset highlights that Uganda provides fewer tax holidays but relies more on accelerated depreciation incentives than other sub-Saharan African countries. We study the impacts of these two corporate tax incentives on investment, pre-tax profits, and employee numbers, assessing their contribution to typical tax incentive objectives. Our results reveal that all studied tax holidays are associated with larger levels of new investments, and most are linked to higher workforce-related expenses, potentially indicating elevated employment levels. Though these findings remain consistent at the aggregate level, we cannot conclude that Uganda benefited to some extent from the tax holidays offered, as further research is needed into causal support for these findings, which is currently lacking.. Notably, while the share of MNCs among the tax holiday beneficiaries is higher than among the overall firm population, it is mostly not MNCs benefiting from these four tax holidays, but instead large domestic firms. Irrespective of their MNC status, large firms are, however, likely not the most in need of tax incentives to operate profitably. However, these incentives are costly, with up to UGX160 billion in revenue forgone, equivalent to 0.12 per cent of GDP. Notably, this cost estimate is conservative due to non-obligatory tax return submissions by all benefiting firms.

Our analysis reveals a significant surge in plant and machinery investments more than 50 km from Kampala following the reintroduction of accelerated depreciation incentives. Firms adjust investment decisions around the time of the reintroduction of the incentive. The sustained high investments even after four years challenge the idea of mere timing adjustments. Nonetheless, causal evidence remains inconclusive and the surge in investment may be unrelated to the investment allowance. Moreover, it appears to be a selected sample of large firms, likely not necessarily needing the incentive, that invest in plant and machinery in the presence of the initial allowance.

Thus, while the tax incentives clearly benefited firms, in particular large, profitable firms, which in the case of MNCs as shown in Koivisto et al. (2021) also engage in profit-shifting, it imposed a large

cost on the Ugandan economy. Further research is needed to reveal whether potential causal effects on investment and job creation correlations identified can outweigh the high revenue forgone.

The remainder of the paper is structured as follows: the next section offers a comprehensive overview of the data sources employed in this study, followed by a section outlining the methodology applied to assess the impact of corporate tax incentives in Uganda. Section 4 presents the results of the study. The concluding section summarizes the paper by underlining its policy implications and contributions to the existing literature concerning tax incentives in developing countries.

2 Data

This study relies on three types of data: tax administrative panel data from the URA, additional firm-level information, and information on Uganda's corporate tax incentives.

2.1 URA firm panel and additional firm-level information

The URA firm panel contains the full population of Ugandan CIT-paying firms[1] for the period of the financial years 2013/14 to 2020/21 that filed their taxes electronically.[2] The original panel contains 105,528 unique firm observations, with a balanced panel for 11,366 firms and administrative data for around 30,000–55,000+ firms annually—whereby the annual growth is driven by new firms incorporating in Uganda and more existing firms filing their taxes electronically. We exclude observations with unrealistic values,[3] which leads us to a total of 361,789 firm observations and 105,528 unique firm observations.

This firm panel information from the corporate tax register and the corporate tax returns is complemented with additional data identifying (1) which firms in the anonymized panel are MNCs and (2) which firms benefit from specific tax incentives in the form of tax holidays. For the identification of MNCs, we merge the rigorously identified MNC status variable created by Koivisto et al. (2021),[4] which applied a three-

[1] This excludes very small firms in specific business sectors that are allowed to file presumptive taxes based on turnover rather than profit.

[2] Not all firms file their taxes electronically yet, and not all firms that benefit from a tax holiday file a corporate tax return at all.

[3] The study excludes observations with negative investment in depreciable assets, negative administrative expenses, and negative basic salary expenses.

[4] Koivisto et al. (2021) rely for the rigorous MNC status classification, in the first stage, on information on MNC status obtained from Orbis (Bureau van Dijk) firm-level data, and in the second stage on an optional field in the non-individual TIN registration form regarding whether the firm has a foreign holding company, complemented by a manual Google search to identify the country of the global ultimate owner. Lastly, they classify obvious MNCs as such if not captured in the previous stages developed. This classification is merged with the non-anonymized TIN numbers in the URA firm panel and subsequently anonymized again. As the classification of Koivisto et al. (2021) was restricted to large taxpayers and relies on the TIN register up to 2018, the MNC status of new firms registered since then and non-large taxpayers is additionally classified through merging a list of firms held by the URA International Tax Office, based on proxy criteria of firms behaving like MNCs. The exact criteria (i.e. variables and specific cutoff point) the URA International Tax Office has been using are not transparent and have not been disclosed to the researchers of this study. Whereas the majority of the firms in the URA firm panel are not large taxpayers, the large majority of MNCs are large taxpayers or are handled through that tax office. So the less rigorous MNC classification of smaller firms is considered acceptable. Moreover, this study assumes that there have been very limited changes in MNC status of existing firms in the MNC register and few additional MNCs entering the URA tax register in the tax years 2020 and 2021, so these two MNC identification lists are in combination considered a good proxy for firms' MNC status during the panel period.

step methodology, an additional list[5] of newly identified MNCs applying the methodology developed by Koivisto et al. (2021), and a list of firms handled by the URA International Tax Office containing firms subjectively[6] considered to behave like MNCs.[7]

Operational lists held by the URA of 635 firms benefiting in a particular tax year from a tax holiday, granted as an incentive to firms exporting more than 80 per cent, starting agro-processing operations, and operating in SEZ or industrial parks, are merged with the URA firm panel. To our knowledge there exists no such list of firms located more than 50 km from Kampala taking up the benefit of the reintroduced accelerated depreciation for plant and machinery. Therefore, this study considers as a proxy in the latter case all firms investing in plant and machinery as beneficiaries of the incentive.

2.2 Uganda's corporate tax incentives

A systematic collection of information on CIT incentives that were in effect at any point between the tax years 2013/14 and 2019/20 has been undertaken using the methodology developed for the World Bank Global Tax Incentives Database project[8] and is envisioned to be verified by the URA. Following the methodology developed by the World Bank (2022), this study defines tax incentives as any benefit for a particular subset of firms that is better than the country's norm. As one country's normal tax parameters may be more beneficial to firms than those of another country, it is important to look at both tax parameters and tax incentives when comparing the relative competitiveness of tax systems across countries. As the main sources, we use the Domestic Tax Laws of Uganda (2020 edition) and the relevant amendment acts. As secondary sources, we use the EY and PwC global corporate tax summary guides. To each identified tax incentive we assign the conditions (such as sector, location, or firm size) that a firm needs to meet to be eligible for a tax incentive and the benefits that the tax incentive provides (the number of years of tax exemption, the reduced rate, etc.) For each tax incentive, we carefully record all the information on the sources.

A systematic exploration of the offered tax incentives in Uganda identified two major changes in tax incentives over the sample period: the introduction of a tax holiday for industrial parks and special zones and an initial investment allowance that was reintroduced in 2018 after it was repealed in 2014 (PwC 2017). Whereas the former was only a formalization into law of the incentive already given to firms, the latter allows for a quasi-experimental methodology to estimate the impact of this incentive, as described in the following section.

Figure 1 provides an overview of the composition of Uganda's collected tax incentives and its development between 2014 and 2020. The number of tax incentives has increased over the observed period. However, this does not necessarily mean that the number of granted tax incentives also increased. The tax system has become more complex, and the provided tax incentives are more specific, which is the main reason why the tax holiday category increased so substantially in 2020.

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[5] This list contains MNCs that were additionally identified as such starting from a new extraction from Orbis during the first quarter of 2023. Considering that the Orbis dataset is continuously updated, becomes increasingly comprehensive, new firms become available in the URA panel over time, and new MNCs are formed, this list identifies additional MNCs following the approach of Koivisto et al. (2021) not even five years after the initial identification of MNCs using this approach.

[6] See footnote 4.

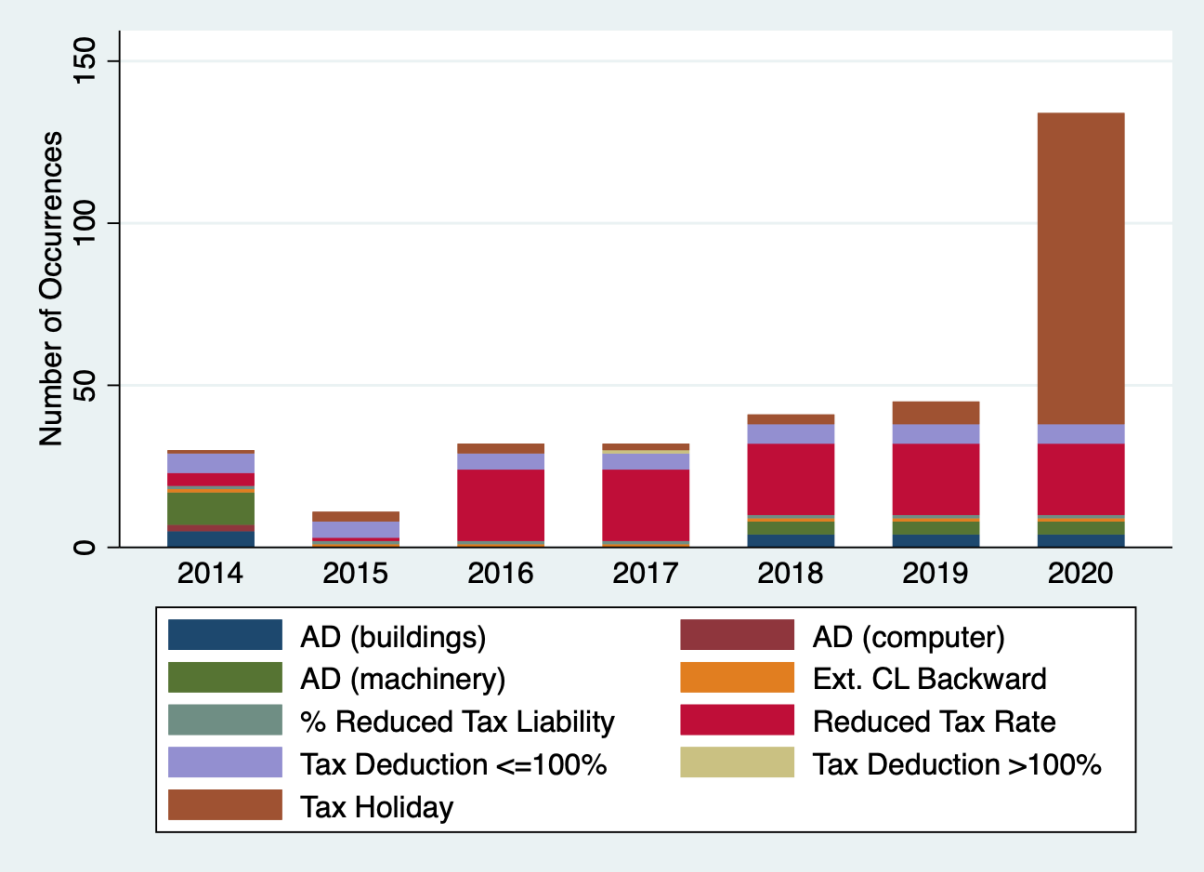
[7] Any firm that is considered an MNC by either Koivisto et al. (2021), the new additional list following the same methodology, or the URA International Tax Office's list is for the purpose of this study considered an MNC.

[8] This methodology of the World Bank (2022) relies initially on secondary data sources, such as EY and PwC global corporate tax summary guides, and is complemented by information from primary data sources, such as tax and investment legislation, where secondary sources do not provide the necessary detail.

Table A1 in the Appendix provides information on the frequency of each type of tax incentive for all covered years. The most common conditions attached to collected tax incentives are location and sector. Among other conditions a firm must fulfil to be eligible for a specific tax incentive are export, diversity (employing people with disabilities), and being foreign or domestic firms.

Table 1 compares the variety and distribution of tax incentives offered by Uganda to that in other sub-Saharan African countries and the rest of the world, and to high-income and non-high-income countries. Uganda's incentive portfolio offers fewer tax incentives than other sub-Saharan African countries or developing countries in the sample. The average number of tax incentives offered falls between the averages for developing and developed countries. However, the proportion of tax holidays, which are among the most costly tax incentives in terms of forgone revenue, is less than 20 per cent. In this regard, Uganda's tax incentive scheme resembles that of high-income countries.[9]

Figure 1: Composition of collected tax incentives in Uganda over time (2014–20)



Note: AD = accelerated depreciation; Ext. CL Backward = extended loss carry backward.

Source: authors' estimations based on data sources discussed in the text.

Beyond the number and type of tax incentives offered, which provide an indication of the complexity of the tax system, it is important to assess the generosity of the tax incentives and whether the revenue forgone by the government is compensated by other economic benefits, which will be assessed in the following sections.

Examining tax holidays in greater detail underscores the importance of requiring firms to file their taxes even when they are beneficiaries of a tax holiday. Table A2 in the Appendix presents the number of firms that avail themselves of specific tax holidays in a given tax year. For the industrial park and special

[9] The tax incentive summary statistics for Uganda can be directly compared to those based on the data from the World Bank (2022), as the authors collected the data for both following the same methodology.

Table 1: Summary statistics: tax incentives around the world

	World	Sub-Saharan Africa	Uganda	Developing countries	Developed countries
Tax holiday	29.40%	39.67%	19.1%	31.16%	20.40%
Reduced tax rate	23.80%	26.63%	43.8%	26.55%	9.70%
Tax credit	5.21%	2.80%	0.0%	1.77%	22.87%
Tax deduction	2.74%	0.77%	0.4%	2.39%	4.53%
Extended loss carry forward/backward	0.98%	1.88%	3.6%	0.88%	1.48%
Accelerated depreciation	37.65%	28.22%	33.0%	37.19%	39.96%
Average count of incentive 2014–20	54	53	46	64	30

Note: developing = low-, lower middle-, and upper middle-income countries; developed = high-income countries.

Source: authors' estimates based on data collected by the authors and by the World Bank (2022).

zone tax holidays, the table also highlights the number of firms benefiting from the incentive but not included in the firm panel. This exclusion occurs either because they did not file their taxes at all, as they are already tax-exempted, or because they submitted paper-based filings, which fall outside the scope of this analysis. These firms might represent the highest cost in terms of forgone revenue and could differ in terms of the economic benefits they generate compared to other firms.

3 Methodology

Tax incentives alter the cost–benefit considerations by companies when deciding about their future activities. Most tax incentives are aimed at lowering the costs of such activities, and they often focus on specific geographical areas, industry sectors, or types of activity, with the objective of incentivizing companies to alter their activities to benefit the economy, whereby the benefits should outweigh the costs in terms of forgone revenue. Based on the mapping of the tax incentives in Section 2.2, this paper studies the effectiveness of tax incentives in stimulating firms to behave in the intended way using a simplified multi-period model and then zooming in on two specific tax incentives—tax holidays and special investment allowances—the latter allowing for an analysis using quasi-experimental methods.

In a simplified multi-period model, at the end of period 1, firm f chooses region r in which to make an investment I (the actual duration of which, equal to $1/\delta$ periods, is defined by the economic depreciation rate δ on a straight-line basis) according to the following maximization problem:

$$max_{r,f}\, U \;=\; \sum_{t\,=\,2}^{1+1/\delta} (1-\tau_{t,f}+d_{r,t})(f_{r,t,f}(I)-z_{r,t}I) \tag{1}$$

where $\tau_{t,f}$ is the CIT rate faced by firm f in period t on the profits obtained from asset I, and $d_{r,t}$ is a tax rate deduction or exemption offered as a tax incentive by region r in period t.[10] Asset I generates profit to firm f according to the production function $f_{r,t,f}(I)$, which is region-specific and assumed to be linear across periods t without loss of generality. The asset economically depreciates at rate δ (which would normally get captured as a cost within $f_{r,t,f}(I)$), but can be depreciated for tax purposes at rate $z_{r,t}$, which, when tax incentives are in place, is higher than δ, and may vary across regions and time.

Each firm considers these tax incentives when making an investment decision, and we hypothesize that variations in $d_{r,t}$ and $z_{r,t}$ across regions and time affect this decision in a substantial way. We test for these effects using the following general specification:

$$\log(I_{r,t,f}) = \beta_0 + \beta_1 \cdot \log(A_{t,f}) + \gamma_1 \cdot d_{r,t} + \gamma_2 \cdot z_{r,t} + \theta_f + t + \varepsilon \tag{2}$$

[10] Instead of region, other conditionalities may apply to obtaining tax incentives. In the case of special agreements about tax incentives, these tax incentives may even be firm-specific.

where $I_{r,t,f}$ is the new investment in depreciable assets made by firm f in region r in period t. Apart from the log of the investment, we use an inverse hyperbolic sine (IHS) transformation not to lose zero investment values that are not defined in the logarithmic transformation. Alternative specifications use profit before tax or a proxy for the number of employees for $I_{r,t,f}$.[11] $A_{t,f}$ is a vector of measures of economic activity of firm f (proxied by assets, total investments, turnover, and total administrative costs related to employment). θ_f represents firm fixed effects, location, sector, and MNC status. t is the tax year and ε is the error term.

We test a variety of models to estimate the semi-elasticity of new investment in a given region to tax exemptions (as measured by $d_{r,t}$) and extra depreciation rates (as measured by $z_{r,t}$). We hypothesize that the coefficients of interest, γ_1 and γ_2, are positive and statistically significant. This would indicate that tax incentives indeed attract additional investment or employment but should not affect profit before tax.

We use the semi-elasticity estimates to calculate the overall net benefits of tax incentives by comparing the costs of such incentives (in terms of forgone tax revenue, using the statutory tax rate of 30 per cent as the counterfactual in the absence of the tax incentive) and the benefits (reflected, for example, in additional investment in a given region). Thus, we can estimate the tax cost of tax incentives per unit of investment. Knowledge of this ratio may contribute to designing more or differently targeted incentives in the future and reduce the costs of tax incentives.

First, we analyse how four specific tax holidays for those firms exporting at least 80 per cent of their production of finished goods, starting new agro-processing operations, or operating in industrial parks or special zones affect new investments, profitability, and employment. We run the following regressions:

$$\log(I_{t,f}) = \beta_0 + \beta_1 \cdot \log(A_{t,f}) + \gamma_1 \cdot \text{Export}_{t,f} + \gamma_2 \cdot \text{MNC}_f + \text{Sector}_f + \text{Location}_f + \text{Tax Year}_t + \varepsilon \quad (3)$$

The variable of interest is $\text{Export}_{f,t}$,[12] which is a dummy variable that equals 1 for firms exporting at least 80 per cent and 0 otherwise, thus splitting the sample into a treatment group and a control group. As the intensity and level of investment may differ substantially for different industries and years, and potentially also by MNC status, we include categorical control variables Tax Year_t and Sector_f, and a dummy MNC_f which is 1 for MNCs and 0 otherwise. By substituting the dependent variable total investment $I_{t,f}$ for profit/loss before tax, and a proxy for the number of employees, we also explore the effects of the tax holiday on other aspects of firm activity, such as whether the firm really needs a tax holiday to be reasonably profitable, and whether the argument of employment generation through providing tax holidays indeed holds and could possibly outweigh the forgone tax revenue.

As a robustness check, a pooled model looks at the overall correlations of tax holidays with investment levels, profit before tax, and employment proxies, respectively. Pooling all the firms benefiting from tax holidays together addresses the concern that some tax holidays apply only to a few firms. Instead of specific year effects, another robustness check controls for time trends.

In an additional model, the sample is restricted to only those firms benefiting from tax holidays to evaluate the relative effect of each of the tax holidays.

The latter two models we additionally test by restricting the sample to only MNCs and only domestic firms, to be able to address a concern that the associations may be driven particularly by MNCs.

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[11] Lacking actual employee numbers, we use the basic salary cost or, if unavailable, other employment-related expenses as a proxy.

[12] This dummy is interchanged by a dummy for new agro-processing operations, firms in industrial parks, and firms in SEZ.

Second, we use quasi-experimental methods to test the impact of the removal and reintroduction of the accelerated depreciation incentive for investment in plant and machinery for firms located beyond a 50 km radius from Kampala, starting from the tax years 2015 and 2018, respectively.

We use a simple event study model and restrict our sample to only those firms outside the 50 km radius and the tax years 2015–21, to focus on the discontinuity of the incentive these firms face over time. This gives us three tax year periods before and three tax year periods after the event: the reintroduction of the tax incentive in the tax year 2018. The $\log(I_{pm,t,f})$ stands for the logarithmic transformation of the new investment in plant and machinery in year t by firm f. The dummy D_reintro_t takes the value 1 for each year t that the accelerated depreciation incentive was reintroduced and 0 otherwise.

$$\log(I_{pm,t,f}) = \beta_0 + \beta_1 \cdot \log(A_{t,f}) + \gamma_1 \cdot \text{D\_reintro}_t + \gamma_2 \cdot \text{MNC}_f + \text{Sector}_f + \text{Location}_f + \text{Tax Year}_t + \varepsilon \quad (4)$$

The 50 km outside of Kampala threshold of the incentive lends itself to a regression discontinuity design analysis, whereby we observe a geographic discontinuity around the 50 km threshold. While such a methodology would be optimal to obtain estimates of causal effects of the reintroduction of the incentive on investment akin to the equation below, whereby $\text{D}_{\text{reintro},t}$ is a treatment dummy variable that takes the value 1 if the firm is located beyond the 50 km threshold and the value 0 for the control observations located within the 50 km radius and the variable $\text{distance}_{\text{above50},f}$ represents the distance of each firms' location from the 50 km cutoff threshold, its estimation poses various challenges when considering the conditions and assumptions for regression discontinuity designs as outlined by Gertler et al. (2016).[13]

$$\begin{aligned}\log(I_{pm,t,f}) = {} & \beta_0 + \beta_1 \cdot \log(A_{i,f}) + \gamma_1 \cdot \text{D\_reintro}_t + \gamma_2 \cdot \text{D\_distance\_above50\_D\_reintro}_{t,f} \\ & + \gamma_3 \cdot \text{MNC}_f + \text{Sector}_f + \text{Tax Year}_t + \varepsilon\end{aligned} \quad (5)$$

Even though the kilometre distance is a continuous eligibility criterion, with a sharp eligibility threshold, the cutoff choice may not be exogenous to the tax incentive. In particular, there is a concern that the firms are not smoothly distributed over the distance, but rather concentrate within the 50 km threshold. As the 50 km radius around Kampala largely coincides with the geographical expansion of the greater Kampala metropolitan area, it is thus not an exogenous threshold and not unique to the tax incentive reintroduction policy. Hence, any estimated effects cannot be attributed to the tax incentive reintroduction alone, but need to be considered as a compensatory effect of being located outside of the capital area.

One possible way to circumvent this concern would be to focus the analysis on firms located just within or just beyond the threshold. Whereas distances of firms located further beyond the threshold distance could be proxied through the distance of their business district to Kampala on Google Maps, the focus on firms close to the threshold would require the precise location data of the firms to estimate the exact distance from Kampala. However, a list with GPS coordinates or a precise distance of firm location to the 50 km boundary does not seem readily available within the URA nor is there a clearly defined point from where the 50 km radius is to be measured. This highlights not only another challenge to using a rigorous impact evaluation methodology, but also a potential operational concern for the URA and the firms alike if eligibility is not transparent and cannot be easily assessed. The eligibility may be subject to non-random manipulation due to abuse of firms not actually eligible and firms potentially under-investing or not applying for the benefit because the eligibility is not fully transparent and cannot be easily assessed before making the investment decision.

Once a list of distances of each firm to the threshold becomes available, it will be important to test for bouncing around the threshold, as this would speak against limiting the analysis to firms close to the

[13] According to Gertler et al. (2016), these conditions and assumptions are: a continuous running variable with a clear cutoff that is exogenous and unique to the intervention, observations that are ranked smoothly along the running variable, and no evidence of non-compliance or manipulation of the eligibility (i.e. bunching around the cutoff)

threshold. The fact that not all investing firms may take up the incentive despite investing is less of a concern, as we are looking at effects on investment itself.

Third, we use a difference-in-difference methodology, whereby we again consider firms within the 50 km radius of Kampala to be the control group and those firms located beyond the 50 km boundary to be the treatment group. Considering that firms located within 50 km and beyond 50 km from Kampala may likely be of a different nature, with different investment patterns and trends, we use a matched difference-in-difference model as a robustness check. Whereas the propensity score matching model cannot control unobservables, it at least allows us to identify a common support sample, meaning a sample of firms on either side of the eligibility threshold—thus among the treatment and control groups—that is comparable on observable characteristics for a difference-in-difference model. The difference-in-difference is specified as follows:

$$\begin{aligned}\log(I_{pm,t,f}) = \beta_0 + \beta_1 \cdot \log(A_{i,f}) + \gamma_1 \cdot \text{D\_distance\_above50\_D\_reintro}_{t,f} \\ + \text{D\_distance\_above50}_f + \text{D\_reintro}_t + \gamma_2 \cdot \text{MNC}_f + \text{Sector}_f + \text{Tax Year}_t + \varepsilon\end{aligned} \tag{6}$$

As a robustness check, instead of the logarithm of the investment in plant and machinery, we also use the year-on-year investment growth rate as a dependent variable. For the propensity score matching, we limit the sample to positive investment levels or investment growth rates prior to the reintroduction of the incentive. The common support for the control and treatment groups is based on tax year, firm size in terms of total assets and turnover, sector, and MNC status.

4 Results

4.1 The impact of special tax holidays

The beneficiaries of special tax holidays

Within this section, we delve into the beneficiaries of various tax holidays, examining their characteristics and shedding light on potential implications for Uganda's tax policy. Summary statistics in Table 2, without controlling for any other characteristics, show that firms benefiting from either of these four different tax holidays had higher levels of average investment in depreciable assets and total assets, greater turnover, larger profit before tax, and larger employee proxy. Remarkably, almost one-third of firms benefiting from agro-processing and industrial park tax holidays are MNCs. This is noteworthy because MNCs make up only 1.9 per cent of the entire Ugandan firm panel population but constitute 19 per cent—almost a ten-fold larger share—of firms benefiting from special tax holidays, and even close to one-third of those benefiting from agroprocessing and special zone tax holidays. Contrary to common belief, the bulk of beneficiaries of these special tax holidays are not primarily MNCs. The beneficiaries tend to be large firms that are, with the exception of those in special zones, generally profitable. In the case of special zones, both MNCs and domestic firms exhibit a wide range of profitability, with both types of firms being, on average, unprofitable. However, domestic firms experience larger losses, and even the median domestic firm remains unprofitable, while the median MNC in special zones is already profitable. This difference might be associated with MNCs as shown in Koivisto et al. (2021) having the option to shift profits from other sources to the firm benefiting from the tax holiday. This warrants further analysis.

What deserves even more attention and further operational investigation is the fact that the profit before tax of firms benefiting from the exporting tax holiday is, on average, more than double the value of new investments in depreciable assets and has been rapidly increasing in the case of export and agroprocessing tax holidays, while the number of firms benefiting from these tax holidays has remained rather stagnant, as shown in Table A2 in the Appendix. This highlights that the tax incentive has been unable

to significantly keep raising the number of almost pure exporters and agroprocessing firms while the revenue forgone from those few beneficiaries of these tax holidays has kept rising. This further raises the question of whether these particular tax holidays were really intended to promote new agroprocessing operations and stimulate firms to operate as almost pure exporters or originate from an incentive targeted at a specific set of firms that was put in a more general manner into law. Considering the statutory CIT rate of 30 per cent, 53 firms (more than half of firms) benefiting from the exporting tax holiday would maintain a positive after-tax profit at their observed investment amount. In the case of the agro-processing, industrial parks, and special zone tax holiday this would be 27, 222, and 55 firms, respectively, thus about one-third of firms in each case for which after-tax profit would surpass the value of their investment. This suggests that a large share of firms benefiting from tax holidays, especially the export >80 per cent tax holiday, may not have required the tax holiday to achieve profitability, given their investment level. A further angle of analysis could look at the profit margin and return on investment that is considered reasonable, which has not been taken into account yet.

Table 2: Summary statistics: tax holidays

Firms benefiting from:	Observations	Share of MNCs	Investment in deprec. assets	Total assets	Turnover	Profit before tax	Employee proxy
			Millions of UGX				
Complete sample data	361,789	1.9%	81.0	2,210	1,830	73.7	101
No 'special' tax holiday	360,777	1.9%	70.4	2,040	1,730	70.1	96.5
Any 'special' tax holiday	1,012	19.0%	3,890	53,100	38,200	1,340	1,590
Export >80% tax holiday	100	8.0%	1,320	22,500	38,500	2,750	530
Agro-processing tax holiday	83	28.9%	4,840	53,200	49,100	554	977
Industrial parks tax holiday	653	16.5%	4,750	64,900	42,400	175	1,910
Special zones tax holiday	176	29.5%	1,740	26,900	27,500	–630	1,310

Note: all values are average values over the tax years 2013/14–2020/21.

Source: authors' own estimations based on URA firm panel.

The cost of special tax holidays

The revenue forgone from the four special tax holidays (exporting more than 80 per cent, starting new agro-processing activities, operating in industrial parks, and operating in special zones) is estimated by applying the statutory 30 per cent CIT rate to the profit before tax value of those firms benefiting from the incentives, assuming that they would also be operating in Uganda without the tax holiday and do not benefit from other incentives that would lower their effective tax rate. Table 3 shows that the revenue forgone from these incentives varies over the years and the total revenue forgone peaked during the panel period in the tax year 2020, followed by the tax year 2021 with a total revenue forgone of over UGX160 billion in 2020.[14] This represents roughly 19 per cent of total CIT revenue collected for the tax year 2017,[15] or 0.115 per cent of GDP in 2020.[16] Looking at the estimated tax revenue forgone from these tax holidays in the tax year 2020 as a share of revenue forgone from CIT collection based on the Global Tax Expenditure Database, this value is over 100 per cent, which suggests that the Global Tax Expenditure Database may not cover the full CIT expenditure in Uganda.

It is crucial to acknowledge that the estimated revenue forgone attributed to these four tax holidays represents a lower bound because the population of firms benefiting from these tax incentives exceeds the number of firms included in our firm panel. Several tax-exempted firms either do not file their taxes or provide incomplete financial records. Specific firms, such as those in the oil sector, continue to submit paper tax returns, whereas our firm panel exclusively considers electronically filed returns. Certain firms enjoy tax holidays under unique arrangements that fall outside the scope of existing tax laws.

[14] This corresponded on 21 September 2023 to about €40 million.

[15] See figures 1 and 2 in Koivisto et al. (2021).

[16] Based on a value of UGX160,724 million in 2020 (see World Bank 2023).

Table 3: Tax revenue foregone from specific tax holidays

Tax year	Exporting >80%	Agro-processing	Industrial park	Special zone	Sum	% GDP	% of tax revenue	% revenue forgone CIT
	Revenue forgone in millions of UGX							
2014	2 607	1,501	53,459	7,990	65,557	0.08		
2015	4,801	577	74,722	10,272	90,373	0.10	0.91	
2016	7,785	2,303	96,646	8,897	115,630	0.11	1.03	
2017	18,162	8,172	103,694	7,134	137,161	0.13	1.09	89.27
2018	19,808	8,937	68,041	10,938	107,725	0.09	0.77	60.20
2019	26,084	6,003	89,906	4,136	126,129	0.10	0.78	58.72
2020	17,539	6,218	131,417	5,550	160,724	0.12	1.01	103.57
2021	10,720	12,312	130,891	2,620	156,543	0.11	0.85	

Note: the values of percentage of GDP, percentage of tax revenue, and percentage of revenue forgone refer each to the sum of revenue forgone from any of the four tax holidays.
Source: authors' estimates based on URA data, World Bank data for GDP and tax revenue, and data from the Global Tax Expenditure Database.

Among the four studied tax holidays, the industrial park tax holiday incurs the highest cost in terms of revenue forgone, followed by the tax holiday for exporting more than 80 per cent. It's important to approach with caution any differences in the popularity of these tax holidays and potential trends in revenue forgone. Such variations could primarily result from differences in the proportion of firms benefiting from tax holidays that actually file tax returns. In any case, the annual sums of revenue forgone, although only representing a lower bound, are substantial. This underscores the importance of further investigation to determine whether the lost revenue is offset by other economic benefits, as will be emphasized in the following section. Additionally, to gain a comprehensive understanding of the full extent of revenue forgone resulting from these tax holidays and how it evolves over time, it is crucial to implement a requirement for all firms to file tax returns, irrespective of whether they benefit from tax holidays or other incentives. Furthermore, it's essential that all firms file their returns electronically.[17] This would enable future research to encompass the entire population of firms.

The associated benefits of special tax holidays

The following tables represent the results of our specification (3) for the four different types of tax holidays. We estimate the effects of these tax holidays on three different dependent variables: new investment in depreciable assets, profit before tax, and a proxy for the number of employees, while also controlling for a firm's total asset base, turnover, and administrative expenses. Since tax filings typically do not include specific data regarding the number of employees, and many firms do not disclose salary costs but rather incorporate them into other employment-related expenses, we employ the cost of salaries and other administrative expenses as a proxy for the number of employees. This proxy relies on the assumption that variations in this data predominantly correspond to changes in the number of employees rather than firm-specific modifications in employee benefits or salary levels.[18]

Furthermore, many firms report zero values for our other dependent and independent variables, which can be legitimate due to various reasons, such as no investment in a given year or incurring losses. Utilizing log transformations for these variables would exclude a substantial portion of observations. To

[17] Paper-filed returns are currently not included in the URA firm panel due to the time-consuming and error-prone nature of encoding paper filings into electronic format.

[18] We acknowledge that obtaining more precise data on the number of employees would be advantageous. When the URA PAYE panel becomes available, this will allow us to obtain a more reliable proxy of the number of employees. The URA PAYE panel contains withheld personal income tax information for formal employees working at the firms in the URA firm panel. The number of formal employees working at least at some point over the tax year for a firm could serve as a better proxy for the number of employees and additionally offer insights on firm-specific changes in salary levels. Nevertheless, even with this improved proxy, it's important to note that it still serves as an estimate, particularly in the context of high levels of informal employment, as observed in Uganda, where formal firms may also employ a significant number of informal workers.

circumvent this issue, we employ the IHS transformation for our variables. This transformation approximates the natural logarithm while allowing us to retain negative and zero-valued observations. However, it's worth noting that this approach may introduce some noise into the data since zeros can also be attributed to reporting inaccuracies. Consequently, we estimate models using both types of transformations, with the results using the natural logarithm transformation presented in Appendix Tables A3–A6.

Table 4 presents estimates of the coefficients of our model on the effect of the tax holiday for companies exporting more than 80 per cent of their production, represented by the dummy variable *Dummy exporting >80%*. The specification presented in column (1) represents the effect on new investment in depreciable assets in the presence of tax year and sector fixed effects, while column (2) shows the results when additionally considering location fixed effects.

Table 4: Effects of tax holiday for companies exporting over 80 per cent (IHS transformation)

Variables	(1) IHS (New investment in depreciable assets)	(2) IHS (New investment in depreciable assets)	(3) IHS (Profit before tax)	(4) IHS (Employee proxy)
IHS (Total assets)	0.0423***	0.0438***	0.182***	0.156***
	(0.00197)	(0.00197)	(0.00440)	(0.00271)
IHS (Turnover)	0.0477***	0.0482***	0.426***	0.566***
	(0.00239)	(0.00240)	(0.00643)	(0.00271)
IHS (Admin. expenses)	0.223***	0.223***	-0.349***	
	(0.00278)	(0.00278)	(0.00725)	
Dummy exporting >80%	5.835***	5.727***	3.316	1.637***
	(1.728)	(1.708)	(2.769)	(0.565)
Dummy MNC status	4.944***	4.787***	-0.560	2.820***
	(0.205)	(0.204)	(0.391)	(0.156)
One-digit ISIC sector	x	x	x	x
Tax year	x	x	x	x
Location (business district)		x	x	x
Constant	0.0516	0.275	–2.816**	–1.667**
	(0.0903)	(0.540)	(1.362)	(0.756)
Observations	286,105	284,014	278,618	284,014
R-squared	0.198	0.203	0.095	0.608

Note: cluster robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, with clustering at the firm level. 'IHS' refers to inverse hyperbolic sine transformation using the Stata command 'asin' to avoid losing zero and negative values, which get lost in logarithmic transformations as the logarithm is not defined for zero and negative values. 'Employee proxy' refers to a variable created for the number of employees, based on the basic salary expense amount, and if this field of the tax return form is not filled or zero, thus is substituted by the total administrative expense value, which captures any sort of employment-related expenses. 'New investment in depreciable assets' refers to the total new investments made in a specific tax year in any asset that falls into a depreciation category.

Source: authors' estimations.

As the coefficients for all presented variables in these first two columns do not differ substantially for other dependent variables, we present only results including sector, location, and tax year fixed effects. In columns (1) and (2) the estimated coefficients on firms with tax holidays due to exporting over 80 per cent are statistically significant at the 99 per cent level and are many times higher than the variables that measure other firm performance (e.g. total assets or turnover). This large and positive parameter indicates that firms that are granted this type of tax holiday are associated with significantly higher new investment in depreciable assets than those who do not benefit from this tax holiday. The association with profit before tax (column 3) is also positive but not statistically significant. The variable of interest also has a positive and statistically significant estimated coefficient when we test for effects on employment (column 4) using the proxy. This result shows that the firms benefiting from the tax holiday have, on average, higher expenses associated with the workforce and thus potentially a higher volume of employees. However, the estimated effect size is much lower than for asset investment.

The very high and statistically significant dummy variable, MNC status, in all models except for column (3) indicates that firms being part of an MNC—to a similar or even higher degree than firms benefiting from the tax holidays—are associated with higher new investment in depreciable assets as well as employment, as one would expect. Looking at the results using log transformations presented in Table A3, thus excluding loss-making firms or firms that do not invest, shows a much more modest picture with a significant association with investment and higher profit before tax, but not so with the employee proxy.

The availability of export data would open the door to a quasi-experimental analysis, as the current approach lacks the capacity for causal inference. The observed correlations may simply mirror the characteristics of firms benefiting from tax holidays. Nevertheless, this could strengthen the argument that such firms would likely increase investments and employment even without the holiday.

Tables 5 and 6 present results using the same methodology as Table 4 to assess the impact of tax holidays specifically granted to firms operating within industrial parks or SEZ. Notably, the estimated coefficients and their significance levels in both tables are quite similar. Once more, the substantial coefficients on the dummy variables indicate that firms benefiting from tax holidays in either special zones or industrial parks tend to invest more in depreciable assets (columns (1) and (2)) compared to firms without these tax incentives.

Table 5: Effects of tax holiday for companies operating in industrial parks (IHS transformation)

Variables	(1) IHS (New investment in depreciable assets)	(2) IHS (New investment in depreciable assets)	(3) IHS (Profit before tax)	(4) IHS (Employee proxy)
IHS (Total assets)	0.0420***	0.0435***	0.182***	0.156***
	(0.00197)	(0.00197)	(0.00440)	(0.00271)
IHS (Turnover)	0.0478***	0.0484***	0.426***	0.566***
	(0.00238)	(0.00239)	(0.00643)	(0.00271)
IHS (Admin. expenses)	0.223***	0.223***	–0.349***	
	(0.00277)	(0.00278)	(0.00725)	
Dummy industrial parks	4.460***	4.439***	0.890	1.171***
	(0.643)	(0.627)	(1.145)	(0.322)
Dummy MNC status	4.890***	4.733***	–0.570	2.806***
	(0.205)	(0.204)	(0.391)	(0.156)
One-digit ISIC sector	x	x	x	x
Tax year	x	x	x	x
Location (business district)		x	x	x
Constant	0.0605	0.287	–2.809**	–1.663**
	(0.0906)	(0.541)	(1.362)	(0.756)
Observations	286,105	284,014	278,618	284,014
R-squared	0.199	0.204	0.095	0.608

Note: cluster robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, with clustering at the firm level. 'IHS' refers to inverse hyperbolic sine transformation using the Stata command 'asin' to avoid losing zero and negative values, which get lost in logarithmic transformations as the logarithm is not defined for zero and negative values. 'Employee proxy' refers to a variable created for the number of employees, based on the basic salary expense amount, and if this field of the tax return form is not filled or zero, thus is substituted by the total administrative expense value, which captures any sort of employment-related expenses. 'New investment in depreciable assets' refers to the total new investments made in a specific tax year in any asset that falls into a depreciation category.

Source: authors' estimations.

Table 6: Effects of tax holiday for companies operating in special zones (IHS transformation)

Variables	(1) IHS (New investment in depreciable assets)	(2) IHS (New investment in depreciable assets)	(3) IHS (Profit before tax)	(4) IHS (Employee proxy)
IHS (Total assets)	0.0423***	0.0438***	0.182***	0.156***
	(0.00197)	(0.00197)	(0.00440)	(0.00271)
IHS (Turnover)	0.0478***	0.0484***	0.426***	0.566***
	(0.00238)	(0.00240)	(0.00643)	(0.00271)
IHS (Admin. expenses)	0.223***	0.223***	–0.349***	
	(0.00277)	(0.00278)	(0.00725)	
Dummy special zones	4.900***	4.667***	–1.949	2.854***
	(1.024)	(1.009)	(2.718)	(0.582)
Dummy MNC status	4.915***	4.760***	–0.546	2.802***
	(0.206)	(0.205)	(0.391)	(0.156)
One-digit ISIC sector	x	x	x	x
Tax year	x	x	x	x
Location (business district)		x	x	x
Constant	0.0298	0.253	–2.796**	–1.684**
	(0.0898)	(0.540)	(1.362)	(0.756)
Observations	286,105	284,014	278,618	284,014
R-squared	0.198	0.203	0.095	0.608

Note: cluster robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, with clustering at the firm level. 'IHS' refers to inverse hyperbolic sine transformation using the Stata command 'asin' to avoid losing zero and negative values, which get lost in logarithmic transformations as the logarithm is not defined for zero and negative values. 'Employee proxy' refers to a variable created for the number of employees, based on the basic salary expense amount, and if this field of the tax return form is not filled or zero, thus is substituted by the total administrative expense value, which captures any sort of employment-related expenses. 'New investment in depreciable assets' refers to the total new investments made in a specific tax year in any asset that falls into a depreciation category.

Source: authors' estimations.

In column (3) we observe a noteworthy distinction. For SEZ there is a negative correlation with profit before tax, though it lacks statistical significance. In the case of industrial parks, this correlation remains positive, but also fails to reach statistical significance. The persistence of a positively significant MNC dummy for both industrial parks and special zones underscores the need for additional robustness checks to better understand the role of MNC status in conjunction with tax holidays. Furthermore, the positive and statistically significant coefficients on the dummy variables representing firms benefiting from tax holidays in special zones or industrial parks in model (4), where the dependent variable is the employee proxy, suggest that these firms, on average, have higher employment expenses.

Finally, Table 7 provides results on firms in the agro-processing industry. We limit our sample to firms manufacturing food products, beverages, and tobacco products or providing specific agriculture activities, to reduce the noise in the sample from firms facing very different economic factors and to isolate only the effect of the tax holiday on new agro-processing activities. We include the variable *Dummy agro-processing* for firms that newly started agro-processing operations and benefit from respective tax holidays.

In columns (1) and (2) the statistically significant and positive high value of the dummy coefficients suggests that granting a tax holiday for firms newly engaged in agricultural production is correlated with more new investment in depreciable assets. Likewise, an even stronger significant correlation is observed for MNCs. However, the effects of the tax holiday on profit before tax and the proxy for employment (columns (3) and (4), respectively) are not statistically significant.

Table 7: Effects of tax holiday for companies operating in the agro-processing industry (IHS transformation)

Variables	(1) IHS (New investment in depreciable assets)	(2) IHS (New investment in depreciable assets)	(3) IHS (Profit before tax)	(4) IHS (Employee proxy)
IHS (Total assets)	0.0571***	0.0603***	0.139***	0.109***
	(0.0145)	(0.0142)	(0.0316)	(0.0151)
IHS (Turnover)	0.136***	0.124***	0.539***	0.638***
	(0.0208)	(0.0202)	(0.0511)	(0.0164)
IHS (Admin. expenses)	0.321***	0.333***	–0.620***	
	(0.0241)	(0.0232)	(0.0563)	
Dummy agro-processing	5.018**	5.146**	3.019	0.897
	(2.139)	(2.159)	(3.184)	(0.663)
Dummy MNC status	6.601***	6.387***	6.399***	1.238**
	(0.877)	(0.862)	(2.190)	(0.529)
One-digit ISIC sector	x	x	x	x
Tax year	x	x	x	x
Location (business district)		x	x	x
Constant	–1.471***	–3.740***	3.793	4.805***
	(0.498)	(1.448)	(2.620)	(0.765)
Observations	5,324	5,315	5,292	5,315
R-squared	0.341	0.375	0.103	0.717

Note: cluster robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, with clustering at the firm level. 'IHS' refers to inverse hyperbolic sine transformation using the Stata command 'asin' to avoid losing zero and negative values, which get lost in logarithmic transformations as the logarithm is not defined for zero and negative values. 'Employee proxy' refers to a variable created for the number of employees, based on the basic salary expense amount, and if this field of the tax return form is not filled or zero, thus is substituted by the total administrative expense value, which captures any sort of employment-related expenses. 'New investment in depreciable assets' refers to the total new investments made in a specific tax year in any asset that falls into a depreciation category.

Source: authors' estimations.

In Table A6 we applied a log transformation and narrowed the sample down to investing firms, profit-making firms, and those with employee expenses in agro-processing industries. Notably, the previously significant correlations have disappeared, except for the consistent positive association between being part of an MNC and the dependent variables across all models.

To gain a more comprehensive understanding of the impact of tax holidays, further robustness checks are essential. These checks should explore whether tax holidays genuinely lead to increased investment and whether the observed associations are not simply a result of high initial investments for new agro-processing firms. Additionally, they should assess whether these effects would have occurred regardless of the tax holiday and whether they would not have rendered operations unprofitable.

The absence of an effect on employment in either model raises important questions about the overall economic benefits of this incentive in terms of job creation. Further investigation is needed to evaluate the true impact of tax holidays on investment and employment within this specific context.

Table 8 presents the pooled model results and shows a positive association of tax holidays with new investments and the employment proxy, but not with profit before tax. These results are in line with the findings of the individual tax holiday estimations. Nevertheless, these results should be interpreted with caution, as they represent correlations and do not allow for drawing causal conclusions.

Table 8: Pooled and differential effects of different tax holidays (IHS transformation)

Variables	(1) IHS (New investment)	(2) IHS (New investment)	(3) IHS (Profit before tax)	(4) IHS (Employee proxy)	(5) IHS (New investment)	(6) IHS (Profit before tax)	(7) IHS (Employee proxy)
IHS (Total assets)	0.0432***	0.0432***	0.182***	0.156***	0.0726**	0.0875	0.120***
	(0.00197)	(0.00197)	(0.00440)	(0.00271)	(0.0344)	(0.0737)	(0.0304)
IHS (Turnover)	0.0482***	0.0484***	0.426***	0.566***	0.0833	0.878***	0.578***
	(0.00239)	(0.00239)	(0.00643)	(0.00271)	(0.0580)	(0.133)	(0.0430)
IHS (Admin. expenses)	0.223***	0.222***	–0.350***		0.471***	–0.739**	
	(0.00277)	(0.0077)	(0.00724)		(0.0734)	(0.162)	
Dummy any tax holiday	4.991***	4.993***	0.826	1.495***			
	(0.505)	(0.505)	(0.962)	(0.251)			
Dummy agro-processing					1.591	3.922	–1.673**
					(3.521)	(4.007)	(0.787)
Dummy industrial parks					0.369	–3.519	–0.165
					(2.069)	(2.866)	(0.556)
Dummy special zones					–0.112	–7.826**	1.182*
					(2.076)	(3.466)	(0.608)
One-digit ISIC sector	x	x	x	x	x	x	x
Tax year		x			x	x	x
Tax year trend	x		x	x			
Location (business district)	x	x	x	x	x	x	x
Constant	–120.1***	0.246	59.38**	203.2***	7.054**	7.895	3.921***
	(11.20)	(0.541)	(27.25)	(10.91)	(2.813)	(5.087)	(1.116)
Observations	284,014	284,014	278,618	284,014	1,010	1,010	1,010
R-squared	0.204	0.204	0.094	0.607	0.438	0.200	0.728

Note: cluster robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, with clustering at the firm level. 'IHS' refers to inverse hyperbolic sine transformation using the Stata command 'asin' to avoid losing zero and negative values, which get lost in logarithmic transformations as the logarithm is not defined for zero and negative values. 'Employee proxy' refers to a variable created for the number of employees, based on the basic salary expense amount, and if this field of the tax return form is not filled or zero, thus is substituted by the total administrative expense value, which captures any sort of employment-related expenses. 'New Investment' refers to the total new investments made in a specific tax year in any asset that falls into a depreciation category.

Source: authors' estimations.

Looking at the relative effect of the four different tax holidays in a pooled model in Table 8 shows that the association with new investment does not seem to differ by tax holiday. Relative to firms benefiting from the tax holiday for exporting more than 80 per cent, firms operating in special zones are associated with significantly lower profits before tax. The relative association with the employment proxy in column (7) of Table 8 indicates that benefiting from the special zone and industrial park incentives is associated with a significantly higher employment level than benefiting from the exporting incentive. On the other hand, benefiting from the agro-processing incentive is associated with a significantly lower employment level than firms benefiting from other tax holidays. These results underscore the importance of controlling for other factors and looking beyond the summary statistics presented in Table 1. In particular, it might be interesting to examine the sector composition of firms benefiting from the different tax holidays, as it might be counter-intuitive that firms benefiting from agro-processing tax holidays are associated with a lower employment proxy than firms benefiting from other tax holidays. This is intriguing, as agricultural firms are generally considered to absorb a large amount of labour.

To ensure the robustness of our analysis, we conducted additional regressions on two distinct samples: one excluding MNCs and another consisting solely of MNCs, as shown in Tables A7 and A8, respectively. For the sample excluding MNCs, the results closely align with those presented in Table 8.

For the sample that includes only MNCs the coefficient for the tax holiday dummy variable remains positive and statistically significant at the 95 per cent confidence level for the models in columns (1) and (2), albeit with notably smaller magnitudes. For the employment proxy the coefficient is no longer statistically significant. This observation may imply that the analysed tax holidays exert a more pronounced effect on stimulating new investment and employment for non-MNCs than for MNCs. This suggests that MNCs might be the primary beneficiaries of these tax holidays, enjoying reduced tax burdens without

significantly contributing to Uganda's economy through increased investment and employment. Taken together, all these results should be regarded with caution, as these are not causal estimates but mere correlations, and further research is needed on the potential existence of a causal impact on investment and job creation, also taking into consideration the power of the results given in the case of the exporting >80 per cent and agroprocessing tax holiday small number of beneficiary firms.

4.2 The impact of the reintroduction of accelerated depreciation benefits

The beneficiaries of special investment allowances

Table 9 shows that the eligible beneficiaries of the investment allowance, which allows firms located outside a 50 km radius from Kampala to depreciate investment in plant and machinery faster, are on average smaller firms than those located in close proximity of Kampala. However, firms located outside a 50 km radius from Kampala have a large variety of sizes, with MNCs exceeding the average firms within and beyond the 50 km radius in terms of size in all dimensions. In the case of domestic firms and MNCs, it is noteworthy that for about one-third of firm–year observations profits before tax exceed average new investment of any kind. This suggests an area for further research and operational considerations regarding the reasonable profit margin and return on investment for firms benefiting from this tax incentive, and whether the current targeting is adequate.

Effects of special investment allowances

When exclusively considering firms located beyond the 50 km radius around Kampala[19] and examining the event study and the complete sample for the difference-in-difference analyses in columns (1) and (2) and (3) to (5) of Table 10, respectively, we observe a noteworthy increase in investment following the reintroduction of the accelerated depreciation benefit, in the form of higher initial depreciation.

[19] Due to the absence of precise distance data for firms from Kampala, we have defined a conservative approach for determining their location relative to the 50 km radius around Kampala. We consider firms within the following areas to be within the 50 km radius: Kampala and Wakiso business districts, Lugazi Municipality, Mukono Municipality, Wobulenzi Town Council, and Mpigi Town Council. Firms situated outside these locations are classified as being located more than 50 km away from Kampala. It's important to note that we have excluded firms located in the Mukono and Luweero business districts, as well as those for which location data is unknown. This exclusion is temporary and is pending the acquisition of more precise distance data, as firms in Mukono and Luweero districts may fall inside or outside the 50 km radius of Kampala, and we aim to make more accurate assessments once additional information becomes available.

Table 9: Summary statistics: accelerated depreciation investment allowance for firms >50 km from Kampala

Firms benefiting from:	Observations	Share of MNCs (%)	Investment in dep. assets	Total assets	Turnover	Profit before tax	Employee proxy	Investment in P&M	Growth rate invest. in P&M (%)	Log investment ratio (%)
			Millions of UGX							
Complete sample data	211,121	1.8	85.7	2,420	1,790	87.3	102	82.4	1,090,324.0	87.6
Firms $\leq$50 km from Kampala	144,919	2.4	106	2,910	2,110	108	130	102	1,415,009.0	87.4
Firms 50 km from Kampala	66,202	0.4	40.7	1,180	1,070	41	41.7	39.4	323	88
Not investing firm >50 km from Kampala	59,876	0.3	0.19	253	402	–4.64	16.7	–	–	–
Investing firm >50 km from Kampala	6,326	2.4	424	7,330	7,330	472	274	412	765	88
Investing MNCs >50 km from Kampala	153	100	6,710	132,000	124,000	13,700	368	6,560	546	84.4
Investing domestic >50 km from Kampala	6,173	–	268	4,250	4,430	145	190	260	776	88.4
Investing in rural areas >50 km from Kampala	4,469	3.0	551	9,900	9,090	661	339	536	838	87.6
Investing in urban area >50 km from Kampala	1,857	1.0	117	1,150	3,090	15.5	119	113	525	90.1

Note: all values are average values over the tax years 2017/18–2020/21. 'Employee proxy' refers to the basic salary value or if missing or zero to the total administrative expenses. 'Investing' refers to new investments in plant and machinery. 'P&M' stands for plant and machinery. The growth rate of investment plant and machinery refers to the year-on-year growth rate of new investments into plant and machinery. The log investment ratio represents the log of new investment in plant and machinery over log total assets.

Source: authors' estimations based on the URA firm panel.

Table 10: Effect of reintroduction of accelerated depreciation benefits >50 km from Kampala

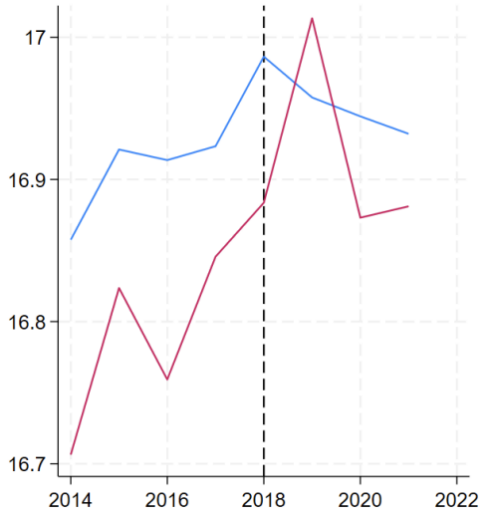
Variables	(1) Log new investment in plant & machinery	(2) Log new investment in plant & machinery	(3) Log new investment in plant & machinery	(4) Log new investment in plant & machinery	(5) Log new investment in plant & machinery
Log (Total assets)	0.454***	0.0456***	0393***	x	
	(0.0120)	(0.0120)	(0.00579)		
Log (Turnover)	0.167***	0.166***	0.180***	x	
	(0.0124)	(0.0124)	(0.00618)		
Dummy reintroduction	0.181**	0.157**	0.0957***	x	
	(0.0716)	(0.0674)	(0.0393)		
Dummy >50 km from Kampala			0.0962***	x	
			(0.0363)		
Dummy reintroduction >50 km from Kampala			0.0524	0.1328***	0.010
			(0.0445)	(0.0387)	(0.883)
One-digit ISIC sector	x	x	x		x
Urban		x			
Dummy MNC status	x	x	x		x
Tax year		x	x		
Tax year trend	x			x	x
Constant	24.07	4.619**	5.680***		
	(34.77)	(0.204)	(0.104)		
Observations	8,103	8,103	34,195	34,195	19,307
R-squared	0.488	0.488	0.431		

Note: standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Columns (1) and (2) show results estimated using the event study design, whereas columns (3) to (5) are based on the difference-in-difference methodology, with column (5) displaying the matched difference-in-difference results using propensity score matching.

Source: authors' estimations.

Interestingly, this result remains consistent regardless of whether we include a time trend instead of time fixed effects when focusing exclusively on firms beyond the 50 km radius. However, the significance of the results diminishes when we include all firms in the difference model in column (3) and investigate the interaction of the reintroduction dummy with the treatment dummy. The fact that removing the control variables for the sector and the MNC status in the difference-in-difference model in column (4) reverses the result again suggests that increases in investment amounts post-2018 by firms outside of Kampala are likely driven by specific firms in specific sectors. Plotting the trends of average investments and the log investment ratio in the treatment and control groups before the reintroduction (Figures 2 and 3) shows that treatment firms' investments seem to have seen much faster growth pre-2018, thus not fulfilling the parallel trends assumption of the difference-in-difference methodology. Addressing the concern that the differing nature and different propensity to invest of firms within and outside of the 50 km radius around Kampala might drive the results, column (5) shows the matched results based on the sample for which there is common support among firms on both sides of the 50 km boundary, based on total assets, turnover, sector, and MNC status, which significantly reduces bias and is shown in Figure A1. This shows that there seems no significant difference between firms on either side of the 50 km boundary in increasing their investments after the reintroduction of the accelerated depreciation incentive. Therefore, the inconclusive causal evidence requires further investigation.

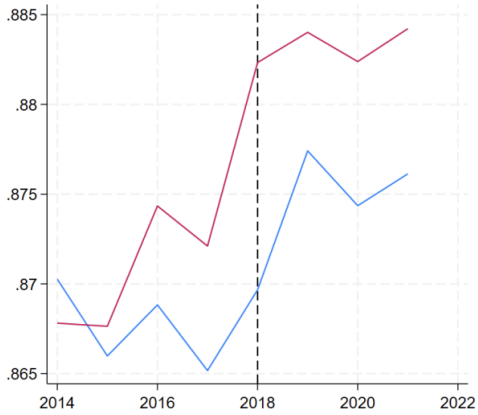
Figure 2: Trends in investment over time



Note: the *y*-axis represents the log transformation of the investment in plant and machinery, the blue line depicts the control group within 50 km of Kampala, and the red line represents the average investment of firms located beyond the 50 km radius around Kampala.

Source: authors' estimations based on the URA firm panel.

Figure 3: Trends in investment ratio over time

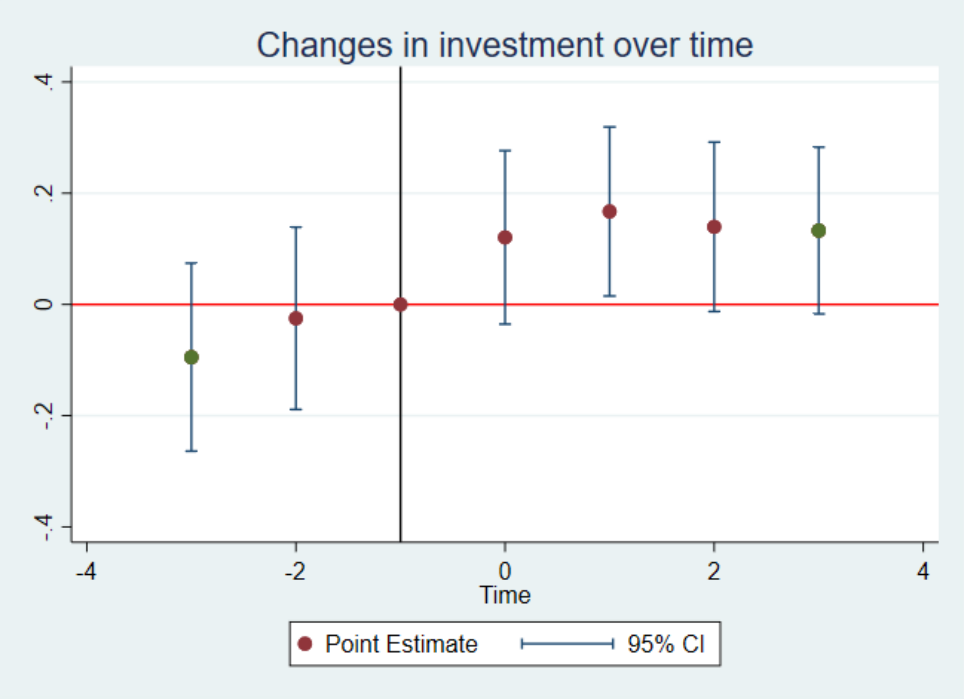


Note: the *y*-axis represents the log transformation of investment ratio, the blue line depicts the control group within 50 km of Kampala, and the red line represents the average investment of firms located beyond the 50 km radius around Kampala.

Source: authors' estimations based on the URA firm panel.

Nevertheless, the investment in plant and machinery, observed in columns (1) and (2) in Table 9 and plotted in Figure 4, shows an increase in investment leading up to and following the reintroduction, whereby time 0 on the *x*-axis represents the tax year 2018, the first tax year in which firms could benefit from the incentive. Even without significant evidence that the reintroduction policy reform caused the rise in investment, the increase in itself may be considered positive if generally raising investment levels outside of Kampala was aimed for.

Figure 4: Changes in investment over time



Note: each point in time represents a tax year from 2015 (the first year after the removal), here represented as time –3, to tax year 2021, here represented as time 3.

Source: authors' estimations based on the URA firm panel.

Additional estimates[20] using the growth rate or the propensity to invest anything at all, and controlling for the urban versus rural location, showed a lot of noise or could not be specified, suggesting extremely

[20] Not displayed here.

noisy investment data and a lack of urban firms outside Kampala. This aspect requires further in-depth analysis, as well as the option to use a proxy for distance from the 50 km threshold as an indicator for the remoteness of the firm's location, which may affect investment ability.

Getting access to a proxy for firm age, currently not available in the firm panel, may provide an important robustness check to the findings in Table 9, to see whether results are driven by newer firms having a greater need to invest in plant and machinery to set up their operations.

Given the unavailability of precise distance data from the 50 km threshold, in particular around the threshold, which firms would qualify as potential beneficiaries raises operational concerns for the URA and the firms on the manipulability of the 50 km threshold. An alternative approach to assessing the viability of the reintroduction of the incentive would be a more in-depth analysis of whether firms investing with the availability of the incentive would, based on their profitability, not have been able to afford to do so without it.

5 Conclusions, policy relevance, and contribution

Uganda's policy goals of increasing its currently very low CIT collection rates and an urgent need to better understand its causes motivate our study. We aim to contribute to the understanding of the role of tax incentives and how they affect business behaviours. This research aims to provide useful insights that can empower Ugandan government agencies with the knowledge needed to make more informed decisions regarding tax incentives offered to firms in the future. We aim to contribute to the ongoing debate surrounding the necessity of competing with other countries on tax incentives, a practice that often fuels a race to the bottom regarding effective tax rates.

To address our objectives, we initiated our study by systematically mapping the corporate tax incentives Uganda has been offering over the tax years 2014–21. Uganda offers a comparable number of tax holidays to other countries in sub-Saharan Africa and worldwide. However, it is noteworthy that Uganda provides relatively fewer diverse tax holidays and places a greater emphasis on reduced tax rates and accelerated depreciation as incentive mechanisms compared to its sub-Saharan African counterparts. The number and type of tax incentives tell us little about the cost to the government. Understanding the cost to the government, the generosity of these incentives, and the conditions attached to them are essential for comprehending the scale at which these incentives are offered. Assessing the actual utilization of these incentives is equally significant.

The effectiveness of specific tax incentives in achieving their intended goals—such as attracting new investments in specific regions, promoting particular industries, or generating employment opportunities—is especially relevant for the refinement of future tax incentive policies in Uganda. Our study focuses on two distinct types of tax incentives. First, we study special tax holidays, which are granted to firms engaged in exporting more than 80 per cent of their products, newly established agro-processing businesses, and companies located in special zones and industrial parks. Second, we examine the acceleration of depreciation for plant and machinery, a tax incentive that was abolished in tax year 2015 and reintroduced from tax year 2018. These incentives represent crucial aspects of Uganda's tax landscape that warrant comprehensive analysis to discern their impact and effectiveness in achieving their intended objectives.

Our findings indicate that the revenue forgone due to special tax holidays varies throughout the sample period, ranging from UGX65.6 billion to over UGX160 billion annually. In 2021 this amount stood at UGX156 billion, equivalent to approximately 0.11 per cent. It's important to emphasize that the provided estimates represent the lower bounds of the cost associated with these tax holidays. This is primarily due to the fact that not all firms benefiting from tax holidays are obligated to file tax returns.

To obtain a comprehensive understanding of the full costs linked to these tax holidays, it is imperative to implement a system where all firms, regardless of tax exemptions, are mandated to submit tax returns. A full transition to electronic filing methods would enable a more thorough and quantitative analysis of the economic impact of these incentives.

The results show that all tax holidays are linked to larger investments. With the exception of tax holidays for agro-processing businesses, they are also associated with higher workforce-related expenses, as a proxy for employment levels. These findings remain consistent when the tax holidays are analysed at the aggregate level. As these results are, however, merely correlations we are without further research unable to say whether the tax holidays led to increases in investment and employment creation or have solely benefited those firms with the highest investment and employment numbers. Nonetheless, it shows that the largest firms operating in Uganda, including a large share of present MNCs, are the tax holiday beneficiaries, raising questions of whether these indeed require incentives for their operations in Uganda. Further analysis is essential to disentangle the specific benefits and costs associated with individual tax holiday types. This will enable a more nuanced assessment of whether each type of tax holiday benefits the country to some extent and under what circumstances the benefits may outweigh the costs of the revenue forgone.

Our analysis reveals a substantial increase in new investments in plant and machinery following the reintroduction of the accelerated depreciation benefit for investments situated more than 50 km from Kampala. While the persistence of elevated investment levels even in the fourth year after the reintroduction contradicts concerns that this effect may have been solely a timing adjustment, where firms delayed investments in anticipation of the reintroduction in 2018, a similar substantial increase in investments is also observed for the control firms within close proximity of Kampala. The results based on an event study methodology should be treated with caution as we did not find clear causal evidence for a significant difference in investment in plant and machinery between the treatment and control groups beyond and within 50 km of Kampala, before and after the reintroduction, using matched difference-in-difference methods. The absence of a definitive list of firms that qualify as potential beneficiaries based on their distance raises operational concerns for both the URA and the firms themselves regarding the manipulability of the 50 km threshold. Further research is needed to control for the remoteness of the firm location, beyond only the urban–rural distinction and firm age, to account for potential variations in capacity and necessity among firms investing in response to these incentives. Initial results thus suggest that the tax incentives definitely benefited the firms and in particular the large firms operating in Uganda, but pose a large cost to the Ugandan economy with—for now—no clear causal evidence of any benefits to the Ugandan economy.

Natural resource firms, which were excluded from this study as they use paper-based tax filing and so are not part of the URA firm panel, often come first to mind in relation to tax incentives, but for these firms tax incentives are not decisive. As for any other firms facing a positive profit margin in Uganda without tax incentives, the impact of tax incentives on new investment might be small. Considering that natural resources are not available or not widely available in other countries, moving the firm abroad is thus likely not an alternative, and the absence of tax incentives would not make the firm unprofitable, only less profitable, but tax revenue impacts for the government might be substantial. Hence, including natural resource firms in future research on the cost and benefits of tax incentives could give important insights, and highlights the importance of moving natural resource firms towards electronic filing so that their administrative tax data will be available in the URA firm panel for quantitative analysis.

In addition to their policy implications for Uganda, the outcomes of this study contribute to the existing body of knowledge in two significant ways. First, we augment the literature on the effects of tax incentives by examining their impact within a specific geographic scope. We acknowledge that tax incentives in less developed economies and distinct institutional contexts can yield different outcomes in terms of costs and benefits. Our study sheds light on this aspect, providing insights that can inform discussions on

tax incentives in similar contexts. Second, this study serves as a methodological exemplar, emphasizing the value of utilizing administrative tax data for research purposes and evidence-based policy-making. This methodology holds relevance not only in the context of Uganda but also more broadly, highlighting the potential of administrative tax data as a valuable resource for conducting research and shaping policies, especially in developing countries.

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Appendix A

Table A1: The frequency of tax incentives over time (2014–20)

	AD (buildings)	AD (computer)	AD (machinery)	Ext. LS backward	% Reduced tax liability	Reduced tax rate	Tax deduction ≤100%	Tax deduction >100%	Tax Holiday/ Tax Exemption	Total
2014	5	2	10	1	1	4	6	0	1	30
2015	0	0	0	1	1	1	5	0	2	10
2016	0	0	0	1	1	22	5	0	3	32
2017	0	0	0	1	1	22	5	1	2	32
2018	4	0	4	1	1	22	6	0	3	41
2019	4	0	4	1	1	22	6	0	7	45
2020	4	0	4	1	1	22	6	0	96	134
Total	17	2	22	7	7	115	39	1	114	324
Average	2.4	0.3	3.1	1	1	16.4	5.6	0.1	16.3	46.3

Note: 'AD' stands for accelerated depreciation and 'Ext. CL backward' stands for extended loss carry backward.

Source: authors' estimations.

Table A2: Firm benefiting from tax holidays

	Number of firms benefiting from tax holiday				
Tax year	Exporting >80%	Agro-processing	Industrial parks	Special zones	All firms
2014	8	9	65	15	30,362
2015	10	10	70	16	35,951
2016	11	10	80	19	41,280
2017	12	10	83	21	43,075
2018	14	11	86	26	47,056
2019	15	11	94	28	51,715
2020	15	11	93	28	56,519
2021	15	11	92	23	55,831
Total observations	100	83	653	176	361,789
Total MNC observations	8	24	108	52	
Distinct firms	15	11	104	33	
Benefiting firms not in firm panel	0	0	15	4	

Note: some benefiting firms are not in the firm panel because they either do not file their taxes at all because they benefit from a tax holiday anyway, or file on paper and therefore fall beyond the scope of the firm panel.

Source: authors' estimations.

Table A3: Effects of tax holiday for companies exporting over 80% (log transformation)

Variables	(1) Log (New investment in depreciable assets)	(2) Log (New investment in depreciable assets)	(3) Log. (Profit before tax)	(4) Log (Employee proxy)
Log (Total assets)	0.245***	0.242***	0.429***	0.342***
	(0.00910)	(0.00903)	(0.00607)	(0.00438)
Log (Turnover)	0.0486***	0.0491***	0.350***	0.378***
	(0.00854)	(0.00846)	(0.00785)	(0.00475)
Log (Administrative expenses)	0.337***	0.341***	0.0947***	
	(0.00999)	(0.00990)	(0.00595)	
Dummy exporting >80%	0.504*	0.559*	0.770***	0.0382
	(0.266)	(0.287)	(0.267)	(0.211)
Dummy MNC status	0.207***	0.217***	0.822***	1.111***
	(0.0689)	(0.0688)	(0.0534)	(0.0474)
One-digit ISIC sector	x	x	x	x
Tax year	x	x	x	x
Location (business district)		x	x	x
Constant	5.352***	5.967***	–0.0436	2.222***
	(0.143)	(0.368)	(0.318)	(0.251)
Observations	37,594	37,594	80,763	128,066
R-squared	0.461	0.467	0.665	0.632

Note: cluster robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, with clustering at the firm level. 'Employee proxy' refers to a variable created for the number of employees, based on the basic salary expense amount, and if this field of the tax return form is not filled or zero, it is substituted by the total administrative expense value, which captures any sort of employment-related expenses. 'New investment in depreciable assets' refers to the total new investments made in a specific tax year in any asset that falls into a depreciation category.

Source: authors' estimations.

Table A4: Effects of tax holiday for industrial park (log transformation)

Variables	(1) Log (New investment in depreciable assets)	(2) Log (New investment in depreciable assets)	(3) Log. (Profit before tax)	(4) Log (Employee proxy)
Log (Total assets)	0.244***	0.242***	0.429***	0.341***
	(0.00908)	(0.00901)	(0.00607)	(0.00438)
Log (Turnover)	0.0487***	0.0493***	0.350***	0.378***
	(0.00853)	(0.00846)	(0.00785)	(0.00475)
Log (Administrative expenses)	0.336***	0.341***	0.0947***	
	(0.01000)	(0.00991)	(0.00595)	
Dummy industrial parks	0.395**	0.353*	–0.0580	0.373***
	(0.192)	(0.195)	(0.141)	(0.112)
Dummy MNC status	0.203***	0.213***	0.820***	1.106***
	(0.0690)	(0.0690)	(0.0533)	(0.0474)
One-digit ISIC sector	x	x	x	x
Tax year	x	x	x	x
Location (business district)		x	x	x
Constant	5.379***	5.987***	–0.0502	2.237***
	(0.143)	(0.368)	(0.318)	(0.251)
Observations	37,594	37,594	80,763	128,066
R-squared	0.462	0.467	0.665	0.632

Note: cluster robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, with clustering at the firm level. 'Employee proxy' refers to a variable created for the number of employees, based on the basic salary expense amount, and if this field of the tax return form is not filled or zero, it is substituted by the total administrative expense value, which captures any sort of employment-related expenses. 'New investment in depreciable assets' refers to the total new investments made in a specific tax year in any asset that falls into a depreciation category.

Source: authors' estimations.

Table A5: Effects of tax holiday for the special zones (log transformation)

Variables	(1) Log (New investment in depreciable assets)	(2) Log (New investment in depreciable assets)	(3) Log. (Profit before tax)	(4) Log (Employee proxy)
Log (Total assets)	0.245***	0.243***	0.429***	0.341***
	(0.00910)	(0.00904)	(0.00607)	(0.00438)
Log (Turnover)	0.0491***	0.0497***	0.350***	0.378***
	(0.00853)	(0.00845)	(0.00785)	(0.00475)
Log (Administrative expenses)	0.336***	0.341***	0.0946***	
	(0.01000)	(0.00991)	(0.00596)	
Dummy special zones	0.324	0.313	0.317*	0.610***
	(0.215)	(0.214)	(0.182)	(0.207)
Dummy MNC status	0.204***	0.213***	0.816***	1.105***
	(0.0691)	(0.0690)	(0.0535)	(0.0474)
One-digit ISIC sector	x	x	x	x
Tax year	x	x	x	x
Location (business district)		x	x	x
Constant	5.342***	5.956***	–0.0520	2.217***
	(0.143)	(0.369)	(0.318)	(0.251)
Observations	37,594	37,594	80,763	128,066
R-squared	0.461	0.467	0.665	0.632

Note: cluster robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, with clustering at the firm level. 'Employee proxy' refers to a variable created for the number of employees, based on the basic salary expense amount, and if this field of the tax return form is not filled or zero, it is substituted by the total administrative expense value, which captures any sort of employment-related expenses. 'New investment in depreciable assets' refers to the total new investments made in a specific tax year in any asset that falls into a depreciation category.

Source: authors' estimations.

Table A6: Effects of tax holiday for agro-processing (log transformation)

Variables	(1) Log (New investment in depreciable assets)	(2) Log (New investment in depreciable assets)	(3) Log. (Profit before tax)	(4) Log (Employee proxy)
Log (Total assets)	0.362***	0.329***	0.330***	0.326***
	(0.0582)	(0.0600)	(0.0408)	(0.0271)
Log (Turnover)	0.0356	0.0600	0.493***	0.391***
	(0.0420)	(0.0467)	(0.0499)	(0.0273)
Log (Administrative expenses)	0.297***	0.301***	0.140***	
	(0.0582)	(0.0633)	(0.0411)	
Dummy agro-processing	0.389	0.0118	–0.123	–0.488**
	(0.355)	(0.449)	(0.453)	(0.228)
Dummy MNC status	0.555**	0.548**	0.580***	0.928***
	(0.238)	(0.260)	(0.211)	(0.161)
One-digit ISIC sector	x	x	x	x
Tax year	x	x	x	x
Location (business district)		x	x	x
Constant	4.095***	5.395***	–1.244***	2.083***
	(0.609)	(0.622)	(0.372)	(0.272)
Observations	1,409	1,409	1,550	2,906
R-squared	0.520	0.557	0.838	0.774

Note: cluster robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, with clustering at the firm level. 'Employee proxy' refers to a variable created for the number of employees, based on the basic salary expense amount, and if this field of the tax return form is not filled or zero, it is substituted by the total administrative expense value, which captures any sort of employment-related expenses. 'New investment in depreciable assets' refers to the total new investments made in a specific tax year in any asset that falls into a depreciation category.

Source: authors' estimations.

Table A7: Pooled and differential effects of different tax holidays (IHS transformation) for sample excluding MNC

Variables	(1) IHS (New investment)	(2) IHS (New investment)	(3) IHS (Profit before tax)	(4) IHS (Employee proxy)	(5) IHS (New investment)	(6) IHS (Profit before tax)	(7) IHS (Employee proxy)
IHS (Total assets)	0.0431***	0.0430***	0.173***	0.161***	0.0967**	0.0905	0.128***
	(0.00195)	(0.00195)	(0.00450)	(0.00280)	(0.0388)	(0.0840)	(0.0333)
IHS (Turnover)	0.0415***	0.0417***	0.430***	0.564***	0.0870	0.811***	0.579***
	(0.00231)	(0.00231)	(0.00644)	(0.00277)	(0.0669)	(0.158)	(0.0448)
IHS (Admin. expenses)	0.221***	0.221***	–0.350***		0.428***	-0.642***	
	(0.00272)	(0.00272)	(0.00730)		(0.0851)	(0.194)	
Dummy any tax holiday	5.067***	5.069***	0.476	1.883***			
	(0.593)	(0.593)	(1.027)	(0.253)			
Dummy agro-processing					2.241	4.358	–1.700*
					(4.230)	(4.177)	(0.932)
Dummy industrial parks					0.541	–3.949	–0.272
					(2.028)	(2.866)	(0.562)
Dummy special zones					0.0592	–10.69***	1.722***
					(2.192)	(3.565)	(0.646)
One-digit ISIC sector	x	x	x	x	x	x	x
Tax year		x			x	x	x
Tax year trend	x		x	x			
Location (business district)	x	x	x	x	x	x	x
Constant	–129.6***	0.312	89.79***	202.1***	8.153***	6.638	3.459***
	(11.19)	(0.541)	(27.26)	(10.96)	(2.992)	(5.315)	(1.166)
Observations	277,339	277,339	271,962	277,339	818	818	818
R-squared	0.179	0.179	0.094	0.607	0.420	0.207	0.748

Note: cluster robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, with clustering at the firm level. 'IHS' refers to inverse hyperbolic sine transformation using the Stata command 'asin' to avoid losing zero and negative values, which get lost in logarithmic transformations as the logarithm is not defined for zero and negative values. 'Employee proxy' refers to a variable created for the number of employees, based on the basic salary expense amount, and if this field of the tax return form is not filled or zero, thus is substituted by the total administrative expense value, which captures any sort of employment-related expenses. 'New investment' refers to the total new investments made in a specific tax year in any asset that falls into a depreciation category.

Source: authors' estimations.

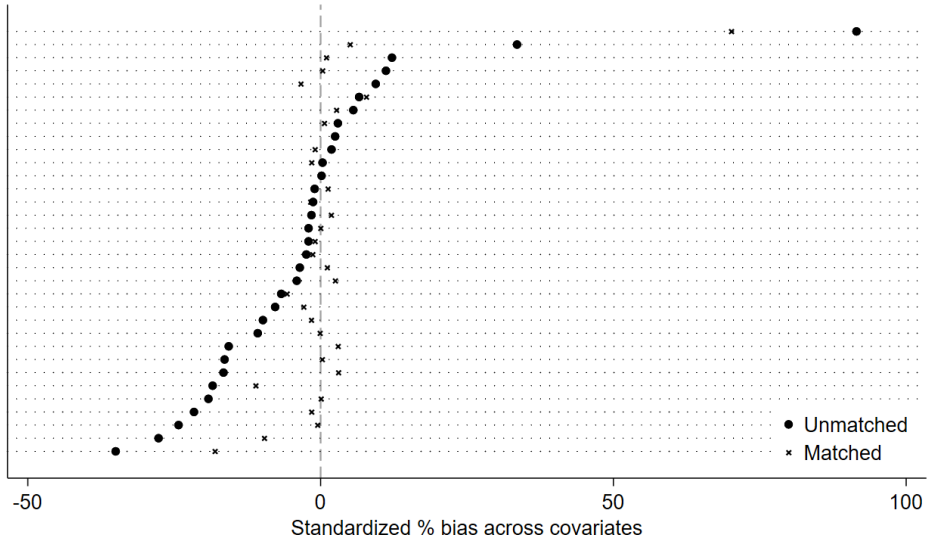
Table A8: Pooled and differential effects of different tax holidays (IHS transformation) for the sample including only MNC

Variables	(1) IHS (New investment)	(2) IHS (New investment)	(3) IHS (Profit before tax)	(4) IHS (Employee proxy)	(5) IHS (New investment)	(6) IHS (Profit before tax)	(7) IHS (Employee proxy)
IHS (Total assets)	0.0569***	0.0567***	0.320***	0.0605***	0.0350	0.0815	0.00906
	(0.0107)	(0.0107)	(0.0202)	(0.00931)	(0.0439)	(0.181)	(0.0544)
IHS (Turnover)	0.235***	0.235***	0.351***	0.547***	–0.0454	0.873**	0.566***
	(0.0212)	(0.0212)	(0.0446)	(0.0172)	(0.0945)	(0.360)	(0.159)
IHS (Admin. expenses)	0.325***	0.325***	–0.276***		0.827***	–0.814**	
	(0.0222)	(0.0222)	(0.0480)		(0.0833)	(0.340)	
Dummy any tax holiday	2.018**	2.016**	1.271	0.770			
	(0.800)	(0.798)	(2.932)	(0.672)			
Dummy agro-processing					–0.287	18.41***	–0.261
					(0.512)	(1.277)	(0.865)
Dummy industrial parks					0.275	18.36***	1.168
					(0.569)	(1.406)	(0.947)
Dummy special zones					6.360***	18.83**	–0.712
					(1.926)	(7.301)	(2.231)
One-digit ISIC sector	x	x	x	x	x	x	x
Tax year		x			x	x	x
Tax year trend	x		x	x			
Location (business district)	x	x	x	x	x	x	x
Constant	236.4**	4.778***	–1.132***	203.3**	–6.417**	–5.415	10.24*
	(97.09)	(1.145)	(238.5)	(86.33)	(2.977)	(11.93)	(5.042)
Observations	6,675	6,675	6,656	6,675	192	192	192
R-squared	0.398	0.398	0.140	0.503	0.464	0.310	0.503

Note: cluster robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, with clustering at the firm level. 'IHS' refers to inverse hyperbolic sine transformation using the Stata command 'asin' to avoid losing zero and negative values, which get lost in logarithmic transformations as the logarithm is not defined for zero and negative values. 'Employee proxy' refers to a variable created for the number of employees, based on the basic salary expense amount, and if this field of the tax return form is not filled or zero, thus is substituted by the total administrative expense value, which captures any sort of employment-related expenses. 'New Investment' refers to the total new investments made in a specific tax year in any asset that falls into a depreciation category.

Source: authors' estimations.

Figure A1: Bias reduction using propensity matching with nearest neighbour



Source: authors' estimations based on the URA firm panel.