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### Impact of Taxation on Investment for Mobile Network Operators in Zimbabwe

Dr. Gift Kallisto Machengete, PhD<sup>1</sup> & Dr. Vengesai Magadzire, PhD<sup>1\*</sup>

<sup>1</sup> Postal and Telecommunications Regulatory Authority of Zimbabwe, P. O. Box MP843, Harare, Zimbabwe.

\* Author for Correspondence Email: [machengete@potraz.zw](mailto:machengete@potraz.zw)

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**Keywords:**  
*Telecommunications,  
Mobile Network  
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Models.*

Using panel data of Mobile Network Operators in Zimbabwe, this paper investigates the impact of taxation on investment in the telecommunications industry in Zimbabwe. Using Dynamic Panel Data Models to address the heterogeneity of the individual telecommunication operators and by the use of lagged variables as instruments to deal with endogeneity, we find statistically strong evidence of a negative impact of taxation on investment by Mobile Network Operators. An increase in excise duty by 1 percent reduces investment by Mobile Network Operators by 0.13 percent. Relatedly, an increase in Value Added Tax by 1 percent reduces investment by 1.6 percent. Furthermore, based on a model with endogenous independent variables with six lags of the investment variable, an increase in Mobile Network Operators' revenue by 1 percent increases investment by 2.2 percent. From a policy perspective, the results give a further and deeper understanding of the complex and dynamic relationship between tax regulations and strategic decision-making in the telecommunications industry and inform evidence-based policymaking. The impact of taxation in the telecommunications sector is a multi-pronged issue that needs to be structured around not only the benefits it generates to the government but also the costs it causes to users, licensed operators and the economy in general. The findings help to illuminate the importance of adopting context-specific approaches to tax policy design, administration and reform. By combining empirical evidence and practical implications, this research contributes to a deeper understanding of the dynamics shaping tax systems in the telecommunications sector. Scope still exists for further interrogation by extending the analysis to Internet Access and Service Providers.

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## INTRODUCTION

It is widely accepted that one of the important factors that support sustainable economic growth is telecommunications (see e.g. Adak, 2015; Bertschek & Niebel, 2016; Datta & Agarwal, 2004; Erumban & Das, 2016; Lam & Shiu, 2010; Lee et al., 2011; Maneejuk & Yamaka, 2020). However, taxes on telecommunication services affect demand, penetration and usage. It curtails investment in the sector, which in turn has negative effects on the far reach and adoption of new services and better quality. In cases where taxation is imposed on ICT gadgets, this has an effect of impacting usage by deterring penetration and limiting the potential of economic spillovers linked to more time of use and more data transferred.

Telecommunications is the most taxed sector in Zimbabwe. From 2000 to around 2013, the sector, like all other sectors of the economy, was subjected to only corporate tax and VAT. In 2014, additional taxes were however introduced in the sector, with an excise duty on airtime of 5% being introduced in September 2014, and a 25% excise duty on gadgets also introduced in the same month. The excise duty on handsets was later removed in 2016. The government also introduced a health levy of 5% in 2018. These are sector-specific taxes that are not borne by other sectors except the telecommunications sector. In fact, between 35 cents to 39 cents of each dollar of airtime goes to taxes in the form of customs duties, corporate taxes, levies, value-added taxes, excise duties and withholding taxes. The list is not exhaustive with other taxes like special excise duty on airtime, non-

resident tax on fees and VAT on imported services also applicable.

A scan of the regional tax policies indicates that most countries in Southern Africa charge corporate tax and VAT with an average of 27.41% and 15.5%, respectively. Although Zimbabwe lies within the regional averages of the two taxes, it however, has some additional taxes which are not levied in other countries. These include excise duty on airtime of 5%, health levy of 5% as well as Customs duty on devices. These additional taxes introduce an extra tax burden that is only experienced by Zimbabweans and not by other users in the region.

Based on panel data collected by the Postal and Telecommunications Regulatory Authority of Zimbabwe from 2015 to 2022, this paper seeks to assess the impact of taxation on investment for Mobile Network Operators in Zimbabwe and offers the following major findings. Firstly, an increase in Excise duty by 1 percent reduces investment by Mobile Network Operators by 0.13 percent. Secondly, an increase in VAT by 1 percent reduces investment by Mobile Network Operators by 1.6 percent. Thirdly, in terms of background characteristics, investment in the past has a significant impact on current investment by Mobile Network Operators. For example, an increase in investment in the past four periods by 1 percent is predicted to increase current investment by 0.22 percent. Furthermore, an increase in revenue by 1 percent is predicted to increase investment by 2.2 percent. However, surprisingly there is no evidence suggesting that the number of subscribers has a significant effect on investment.

Whilst extant studies have shed light on taxation in the telecommunication sector, this paper expands on those studies by providing an analysis of the impact of taxation on investment by mobile network operators operating in a highly complex environment. It helps to give a further and deeper understanding of the complex and dynamic relationship between tax regulations and strategic decision-making in the telecommunication industry and informs evidence-based policymaking. This is timely in that the interplay between taxes, investment decisions, and market dynamics exposed in this research sheds light on the complex challenges faced by the telecommunications industry, particularly in the era of digital disruption and regulatory change. The influence of taxation on business strategies in the telecommunications industry is a complex and dynamic affair that begs thorough interrogation from various perspectives. The arrangement of the rest of this paper is as follows. The next section reviews relevant strands of the literature and clarifies the hypotheses to be tested in the paper. Section 3 details the design of the study, whilst Section 4 specifies the empirical strategy adopted and presents the estimation results. Finally, Section 5 concludes.

## LITERATURE REVIEW AND HYPOTHESIS

The telecommunication and/or the ICT sector is widely recognized as a key catalyst for economic development (see e.g. Bertschek et al., 2017; Crandall et al., 2007; Grajek & Kretschmer, 2010; ITU, 2013; Katz et al., 2010; Katz, 2010; Koutrompis, 2009; Kurniawati, 2022; Qiang et al., 2009; Waverman, et al., 2005). The idea of ICTs being placed in sustainable economic development has been adopted by many countries (Maneejuk & Yamaka, 2020), with telecommunications technology and innovation playing a pivotal role (Lam & Shiu, 2010), and telecommunication investment increasingly identified as key in improving economic productivity and growth (see e.g. Adak, 2015). The telecommunications industry serves as the mainstay of present-time

communication infrastructure, opening doors for connectivity through a myriad of channels, including voice, data, and multimedia services, playing an important role in fostering economic development, social interaction, and technological innovation (Astuti, 2024). Czernich et al. (2011) found that a 10-percentage-point increase in broadband penetration raises annual per capita growth by 0.9-1.5 percentage points. Mobile broadband is a key lever in addressing the digital gap (see e.g. Gruber et al., 2010; Hughes & Lonie, 2007; Loannides et al., 2008; Muto, 2008; Rice & Katz, 2003).

There is, however, robust empirical evidence pointing to the fact that taxation of mobile services has a negative impact on the telecommunications industry (see e.g. Clausing, 2019; Desai et al., 2018; Smith & Johnson, 2023). Telecommunication companies are bound to adjust their capital investment priorities in response to changes in tax incentives (see e.g. Clausing & Saez, 2016). Tax considerations influence investment decisions and financial performance (Lestari, 2023). For example, tax policies significantly shape telecommunications firms' cost structures, profitability, pricing strategies (Grubert & Slemrod, 2019; Lee & Kim, 2023; Lee & Kim, 2024), and market positioning (Astuti, 2024; Durst & Pirttilä, 2017).

Rota-Graziosi and Sawadogo (2022) estimated the tax burden on the mobile telecommunication sector in twenty-five African countries and discovered that the tax burden of the telecommunications sector is higher than that of the mining sector in 15 of the 19 countries for which they had mining data. On the other hand, in a quantitative analysis of the impact of levies on service adoption and economic growth, Katz et al. (2010) discovered that the taxation approaches of South Africa, Mexico, Brazil and Bangladesh have a negative impact on the diffusion of wireless broadband. There seems to be an association between the very high level of taxes in Brazil and its very low penetration level of 3G handsets. There also seems to exist an inverse

relationship between tax burden and adoption of data services when measured by wireless data as a percent of service revenues.

Taxes have large and significant adverse effect on investment (see e.g. Djankov et al., 2015); and increase the cost of access and use of mobile services (Henry, 2019; West, 2015). In a study by Vartia (2008), that uses industry-level data from a set of OECD countries, investment is shown to respond negatively to an increase in the corporate tax rate. Sector-specific taxes raise prices for consumers and costs for firms, reducing the use of mobile services and constraining externalities, distorting investment decisions (see e.g. Castells et al., 2019). By increasing prices for consumers and raising costs for firms, the taxes lead to lower performance (e.g. profitability) in the mobile market compared to other industries, leading to underinvestment in the mobile industry. Katz and Jung (2023) found strong evidence of a negative impact on investment from an increase in regulatory fees, profit taxes, and excise taxes. They also find some evidence of customs duties for equipment and smartphones on the decrease of investment in broadband network deployment and service adoption, respectively. Given this background, we formulate the following hypothesis linking taxation in the telecommunications sector and investments by Mobile Network Operators:

**Hypothesis 1:** Taxation reduces investment by Mobile Network Operators.

Although there is evidence of prior work on the impact of taxation on the telecommunications sector (e.g. Pedros & Sivakumaran, 2019; Rodgers & Pedros, 2017), it is important to note that countries do not follow a uniform approach to mobile services taxation (see e.g. Faccio & Zingales, 2017) and differ in the development of their respective telecommunication sector (see e.g. Rota-Graziosi & Sawadogo, 2022). Some countries impose high value-added taxes while avoiding the distortion effect of sector-specific taxes (e.g. in South Africa). Others combine value-added tax with sector-

specific levy (e.g. Argentina, Mexico, Brazil) while some leverage mobile communications as a source of direct taxation, by combining high value-added tax, high sector-specific taxes and/or a fixed levy (e.g. Bangladesh, Turkey). Taxation in the telecommunication sector is complex (see e.g., De Mooij & Ederveen, 2019), considering the variety of special taxes and regulatory fees (see e.g. Matheson & Petit, 2021); and hence remains an interesting area of study.

## METHODOLOGY

### Study Design

#### *Data*

Data was collected from Quarterly Returns submitted to the Postal and Telecommunications Regulatory Authority of Zimbabwe (POTRAZ) by telecommunications operators. It was collected quarterly over a period of 8 years from 2015 to 2022 on the only three Mobile Network Operators in Zimbabwe, effectively enabling us to build a Panel Data set with 96 observations. Data was also collected for three major Internet Service Providers over the same period. However, for the purpose of this paper, analysis is restricted to Mobile Network Operators due to the uniqueness of the tax regime in Zimbabwe across the ICT sector.

Cognizance was considered of the fact that literature does not specify the number of individual firms ( $n$ ) or time ( $t$ ) to classify our panel as long or short. A general rule, however, is that a suitable ( $n$ ) could be greater than 100, while the ( $t$ ) should not exceed 15 periods and ideally be less than 10 if the intention is to estimate dynamic models with panel data (see e.g., Labra & Torrecillas, 2018; Roodman, 2009).

In our study, we are interested in the impact of taxation on the telecommunication sector. To that effect, data was collected on excise duty, health levy, value-added tax, and corporate tax. Mobile Network Operators are obliged to effect a 5% tax on airtime and a healthy levy of another 5% over and above a 14.5% value-added tax. Although data was

collected on corporate tax, it was however not used owing to a lot of missing observations for two of the Mobile Network Operators. Data could not be obtained on the Intermediated Money Transfer Tax (IMMT). The IMMT is a tax calculated at the rate of USD 0.02 on every dollar transacted for each transaction (i.e., including mobile money transfers).

Data was also collected on investments, mobile data traffic, number of subscribers, revenue and infrastructure deployment (i.e., 2G, 3G, LTE and 5G). Mobile data traffic was collected in Megabytes.

### Descriptive Statistics

**Table 1: Descriptive Statistics**

	<b>Overall Sample (1)</b>	<b>Operator One (2)</b>	<b>Operator Two (3)</b>	<b>Operator Three (4)</b>
Investment	6.2 (18)	7.9 (11)	10.5 (29)	0.23 (0.51)
Excise Duty	406 (1288)	1153 (2222)	220 (493)	9.7 (14)
Value Added Tax	5.2 (6.4)	13.7 (4.9)	2.3 (1)	0.68 (0.57)
Mobile Data Traffic	1338 1993	2879 (2656)	942 (788)	128 (299)
Subscribers	4.3 (2)	8.1 (1.2)	3.8 (0.7)	1.2 (0.6)
Revenue	3878 (1240)	9400 (19942)	2358 (5377)	165 (282)

*Note.* Standard deviations in parentheses. The figures are in millions.

Table 1 above details the descriptive statistics on key variables that include investment, excise duty, value-added tax, mobile data traffic, number of subscribers and revenue and disaggregated by mobile network operators. Mobile Network Operator Three underperforms in all performance variables (i.e. investment, number of subscribers, traffic, and revenue). The average figures are for the period from 2015 to 2022.

### Estimation Strategy

To assess the impact of taxation on the telecommunications sector in Zimbabwe, Dynamic Panel Data models are adopted as the most appropriate empirical strategy. They are chosen because they allow for simultaneously addressing individual telecommunication operator effects, numerous periods, and endogeneity. Dynamic Panel data methodology is chosen over static because of

the possibility of addressing the heterogeneity of the individual telecommunication operators and the use of lagged variables as instruments to deal with endogeneity. This endogeneity is defined as the existence of a correlation between investment and the error term, which is related to the causal relationship between variables such as revenue, number of subscribers, data traffic etc. that explain the model, which is the effect of the past on the present or the causality of relationship between regressors and investment along the time.

Endogeneity in the assessment of the impact of taxation on the telecommunication industry is inherent considering that investment, for example, by telecommunication operators is influenced by revenue for example, which in turn is also influenced by investment. To deal with this, we adopted Dynamic Panel Functions that use

instrumental variables obtained through lags of the endogenous variables. The specification model is motivated as follows:

$$Y_{it} = \alpha Y_{i,t-1} + \beta X_{it} + \varepsilon_{it} \quad (1)$$

$$\varepsilon_{it} = \mu_i + \vartheta_{it} \quad (2)$$

$$E(\mu_i) = E(\vartheta_{it}) = E(\mu_i \vartheta_{it}) \quad (3)$$

Where:  $Y_{it}$  is the investment by a telecommunication operator at time  $t$ .

$X_{it}$  is a covariate that influences investment for a particular telecommunication operator at time  $t$ .

$\varepsilon_{it}$  is a composite error term.

$\mu_i$  represents time-invariant operator-specific unobserved heterogeneity.

$\vartheta_{it}$  captures idiosyncratic shocks, i.e. operator-specific unobserved heterogeneity that varies across time.

The strategy is implemented as Difference General Methods of Moment and System GMM and called as such because it uses as instruments the lags in difference as motivated by Arellano and Bond (1991) and in both level and differences (see Arellano & Bover, 1995; Labra & Torrecillas, 2018). The instruments in differences and in levels are specified in (4) and (5) below:

$$\Delta Y_{t-1} = Y_{t-2} - Y_{t-1} \quad (4)$$

$$Y_t = Y_{t-1} ; Y_{t-(n-1)} = Y_{t-n} \quad (5)$$

where,  $Y_{t-n}$  is the instrument of  $Y_{t-(n-1)}$ .

## ESTIMATION RESULTS

Table 2 shows the impact of taxation on investments for Mobile Network Operators in Zimbabwe based on models with endogenous independent variables. Columns I to IV show estimation results for endogenous independent variables with 4, 6, 8 and 12 lags of the investment covariate. Lag 4, for example, relates to the value of a variable from four periods prior to the current period. Since our data is

quarterly, it relates to the value of a variable four quarters prior. The analogue is the same for 6, 8, and 12 lags. Excise duty and Value Added Tax are the variables of interest. The inclusion of past investments as an instrument is consistent with work as motivated by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998).

From Column (I) of the table, we see that an increase in Value Added Tax by 1 percent reduces investments by Mobile Network Operators by 1.74 percent; an estimate which is significant at 5 percent. An increase in Excise duty by 1 percent is predicted to reduce investment by 0.47 percent. An increase in investment in the past 4 periods by 1 percent increases investment by Mobile Network Operators by 0.22 percent, significant at 1 percent. As may be expected, Mobile Network Operators' revenue has a positive and significant impact on investment.

Columns (I) and (IV) are included here for expositional purposes only. Since the data is quarterly, it is reasonable to assume that lagged variables will peak meaningful effect after the 4<sup>th</sup> quarter, hence the motivation for not basing our interpretation on results in Column (I). Results in Column (IV) are not preferred over results in Columns (II) and (III) because the number of observations falls from 47 to 38. For the purpose of interpretation, we rely on results in Columns (II) and (III). From the results in Columns (II) and (III), an increase in excise duty reduces investment by Mobile Network Operators. For example, a 1 percent increase in excise duty reduces investment by Mobile Network Operators by 0.13 percent; an estimate significant at 5 percent. Relatedly, an increase in Value Added Tax by 1 percent reduces investment by 1.6 percent, which is significantly different from zero at the 1 percent level.

Mobile Network Operators' revenue has a positive effect on investment, which is significantly different from zero. For example, results in Column (II), which are based on a model with endogenous

independent variables with six lags of the investment variable, indicate that an increase in Mobile Network Operators' revenue by 1 percent increases investment by 2.2 percent; an estimate which is strongly significant. This result is similar to the one obtained in the results presented in Column (III). On the other hand, the number of Mobile Network subscribers seems not to have a significant effect on investment.

Although investment by Mobile Network Operators is influenced by other factors that do not appear in our model, they were intentionally left out of the model. For example, Gross Domestic Product per capita was left out because of the fact that this variable tends to be constant for the greater part of the period under review and therefore lacks variability and is differenced away under the empirical strategy adopted in this paper.

**Table 2: Impact of Taxation on Investments for Mobile Network Operators – Models with Endogenous Independent Variables**

	<b>Model 1 (4 Lags)</b>	<b>Model2 (6 Lags)</b>	<b>Model 3 (8 Lags)</b>	<b>Model 4 (12 Lags)</b>
Log of Investment: Lag 1	0.23* (0.12)	0.25*** (0.09)	0.27*** (0.09)	0.13 (0.14)
Lag 2	0.00 (0.04)	0.01 (0.07)	-0.05 (0.05)	0.08 (0.15)
Lag 3	-0.13* (0.07)	-0.11 (0.10)	-0.04 (0.06)	0.16*** (0.05)
Lag 4	0.22*** (0.03)	0.20*** (0.02)	0.14*** (0.04)	0.29** (0.12)
Lag 5		-0.01 (0.05)	-0.05*** (0.00)	0.05 (0.05)
Lag 6		0.15 (0.18)	0.24** (0.10)	0.09 (0.06)
Lag 7			-0.05 (0.04)	0.06 (0.23)
Lag 8			-0.05 (0.09)	0.08*** (0.03)
Lag 9				-0.15 (0.20)
Lag 10				0.10 (0.26)
Lag 11				0.35*** (0.01)
Lag 12				0.34*** (0.06)
Log of Data Traffic	-0.24* (0.13)	-0.27* (0.16)	-0.12 (0.16)	1.37*** (0.19)
Log of Number Subscribers	0.88 (0.76)	0.39 (1.29)	0.12 (1.42)	6.93* (3.56)
Log of Revenue	2.24*** (0.38)	2.20*** (0.52)	1.82** (0.87)	1.35** (0.63)
Log of Excise Duty	-0.47 (0.41)	-0.53* (0.29)	-0.13** (0.06)	-0.29 (0.67)
Log of Value-Added Tax	-1.74** (0.71)	-1.52** (0.63)	-1.61*** (0.60)	-1.11*** (0.17)
Constant	-4.90	-1.47	3.42	-147.91**

	<b>Model 1</b> (13.49)	<b>Model2</b> (17.60)	<b>Model 3</b> (18.31)	<b>Model 4</b> (64.10)
Observations	47	47	46	38
Number of Operators	2	2	2	2

*Notes:* Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

## DISCUSSION

Quarterly data was collected for the three Mobile Network Operators in Zimbabwe for a period of 8 years from 2015 to 2022. However, Mobile Network Operator Number 3 underperformed across all the variables collected. For a considerable number of periods, it had an investment figure of zero. This is the reason why the number of observations fell from 96 to 47 because the logarithm of zero is undefined and as such they were technically differenced away from the regressions. The appropriate log-log functional form adopted in this study resulted in all observations with a value of zero for investment by the Mobile Network Operator technically differenced away from the regressions. This is a direct reflection of the structural weakness of the mobile network landscape in Zimbabwe which is predominantly dominated by two Mobile Network Operators.

The findings of this study indicate that taxes have a negative and significant impact on investment by Mobile Network Operators. This result supports the confirmation by Musgrave and Musgrave (2016) and Jones and Brown (2022) that tax policies determine and shape firms' investment decisions and resource allocation strategies. The findings of this paper, although framed differently, can be compared to Ohn's (2018) findings that a 1 percentage point reduction in tax rates increases investment by 4.7 percent of installed capital, increases payouts by 0.3 percent of sales, and decreases debt by 5.3 percent of total assets.

While decisions regarding taxation are driven by public policies guided by normative goals such as how much revenue should the state collect to pay for what type of services to be provided to its citizens (see e.g. Fjeldstad and Moore, 2020), fiscal policies

that apply a special tax to the telecommunication sector are inefficient and cause distortions that crowd out private spending. Special tax rates applied to the mobile sector distort the functioning of the mobile market compared to the rest of the economy. The effects evince across a wide array of domains, including investment decisions, pricing strategies, technological innovation (see e.g. Jones and Brown, 2022), and market competition (see e.g. Smith et al., 2023). Hence, any remodelling in the regulatory outlook has far-reaching implications, shaping the operational strategies and competitive dynamics of the telecommunications industry. For example, tax incentives invigorate innovation and investment in emerging technologies, such as 5G networks. Proactive policy interventions shield the telecommunications infrastructure and guarantee universal access to essential communication services.

Katz et al. (2010) discovered that wealth creation generated by lowering taxes is higher than the accumulated loss in tax collection, given the positive spillover effects of broadband diffusion. In 2017, Colombia removed value-added taxes on low-cost handsets and laptops and exempted certain plans and consumers from VAT increases. As a result, mobile phone sales increased, even for devices unaffected by the VAT exemption. Vendors played a role, with some repricing devices falling just below the VAT threshold, providing Colombians with a wider range of affordable devices.

According to the International Telecommunications Union (ITU GSR-16), sector-specific taxes raise consumption costs, tend to penalize lower-income consumers and can be politically unpopular. Given the enabling role of the telecommunications sector

to the overall growth of the economy, it is critical to put in place incentives for growth rather than interventions that stifle the growth of the sector through limited investment and increased costs of accessing services.

Taxation should depend on low rates and wide bases for it to be efficient. This is important to minimise the impact on consumption, investment and production while at the same time raising the required revenue for the government. Lower specific tax rates generate positive, broader economic and social (see e.g. Björkgren, 2019) impacts. The tax system should be efficient, simple and transparent (see e.g. Bird and Martinez-Vazquez, 2020; Liyana, 2021; Tenriwaru et al., 2021).

The results presented in this paper call for proactive engagement and collaboration between industry stakeholders and regulatory agencies in shaping tax policies that find a middle ground between revenue generation objectives and investment incentives for the telecommunications sector. The importance of engagement and collaboration among regulatory stakeholders for tax policy determination is also supported by Astuti (2024), Garcia and Smith (2023), and Rumasukun and Noch (2023). Insights and results from this research can inform evidence-based policy reforms geared towards promoting tax fairness, economic efficiency, and regulatory certainty and stability in the telecommunications sector.

## CONCLUSION

Taxes play a significant role in influencing investment decisions. The taxation policies implemented by governments can either encourage or discourage investments in various sectors of the economy. Understanding how taxes affect investment is crucial for policymakers, investors, and businesses alike.

Using panel data of Mobile Network Operators in Zimbabwe, this paper investigates the impact of taxation on investment in the telecommunication

industry in Zimbabwe. Using Dynamic Panel Data Models, we find statistically strong evidence of a negative impact of taxation on investment by Mobile Network Operators. The results give a further and deeper understanding of the complex and dynamic relationship between tax regulations and strategic decision-making in the telecommunications industry and inform evidence-based policymaking. Zimbabwe, just like many other developing countries, needs to embrace and adopt efficient non-distorting tax policies that minimize deadweight loss that may accumulate in the telecommunications sector and in the economy in general.

Along these lines, the impact of taxation in the telecommunications sector is a multi-pronged issue that needs to be structured around not only the benefits it generates to the government but also the costs it causes to users, licensed operators and the economy in general. The findings help to illuminate the importance of adopting context-specific approaches to tax policy design, administration and reform. Equitable and efficient tax systems promote inclusive growth. By combining empirical evidence and practical implications, this research contributes to a deeper understanding of the dynamics shaping tax systems in the telecommunications sector. Scope still exists for further interrogation by extending the analysis to Internet Access and Service Providers.

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