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# Mobile internet and tax collection: the end of the trade-off?

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GSMA

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# Contents

# Abstract

For decades, regions such as Latin America, South Asia and Africa have favoured sector specific taxes on mobile internet consumers and providers. Despite their known negative effects on internet adoption and investments, tax authorities generally considered these as an efficient way to generate tax revenues. Since then, fast growth in internet adoption and the ensuing broad digitalization of society have been increasingly linked with greater tax revenue collection by the public sector, with a series of direct and indirect channels through which the effect takes place. We conduct novel empirical research for one of these regions, Latin America and the Caribbean (LAC), and provide robust estimates through different empirical approaches. All our results confirm positive direct and indirect links between mobile internet adoption and usage and public sector tax revenue. Importantly, the net tax collection effects of the removal of sector-specific taxes on mobile internet consumers and operators are positive. The results have important implications for policymakers, especially tax authorities, and highlight the large opportunity cost in these regions not just in connectivity terms but also in foregone tax revenues.

The authors would like to thank Alejandra Pallás Villacampa (Universidad Pontificia Comillas) for her assistance in preparing the dataset for this empirical analysis. We are also grateful to Facundo Rattel (GSMA Intelligence) and Mireia Alvarez (KSNET) for their contributions through the elaboration process of the paper.

# 1. Introduction

Recent years have seen the emergence of a new branch in the specialized economic and fiscal literature that studies how the wide diffusion of digitalization across society can contribute to increase tax revenue collection by the public sector. This has been tested empirically by authors like Gnangnon and Brun (2018), Brun et al (2020), Adegboye et al (2022), and Tinta (2023). They all discuss the potential for digitalization to increase tax collection because it helps to improve the capacities of the tax administration, makes it easier for taxpayers to pay, digitalizes payment methods and decreases the opportunities for corruption. Additionally, several indirect effects from digitalization on tax collection have been argued, though not formally tested, through mediating variables like trade, foreign direct investment (FDI), economic growth, and greater formalization of economic activity.

The purpose of this study is to expand upon this literature by making additional empirical analyses in key not yet explored areas. More concretely, the contribution of this study is threefold.

First, we formalize a framework from where the different direct and indirect effects from digitalization to tax revenue collection can be decoded and tested. The cited research focusses only on the direct link between digitalization and tax revenue. Therefore, our aim is to expand the analysis to a broader context, focusing not only on these direct effects but also on indirect effects mediated through other economic indicators that typically benefit from digitalization spillovers.

Second, we provide evidence of the overall net effects after considering all possible sources of revenue gains and losses from tax reforms. Sector specific taxes on telecommunications services can increase tax revenue collection but also restrict the adoption and usage of digital services, which in turn has a negative effect on tax revenue. The net result after considering these two opposing effects has not been addressed yet and is the main question that is tested empirically through this research.

Third, we empirically test our hypothesis in Latin America and the Caribbean (LAC), a region that constitutes a very good test bed to check our hypothesis. Sector specific taxes on mobile internet consumption and production in LAC are still high after being introduced back in the early 2000s when connectivity services and devices were seen as a luxury good. To this day, these remain widespread in the region despite adoption and investments lagging behind. Currently, most countries in the region are still imposing sector-specific obligations on the operator’s side, while eight out of twenty-six countries analyzed are still imposing sector-specific taxes on consumers.

Our empirical results constitute a crucial input for policymakers, the private sector, and the telecoms industry. Sector specific taxes applied to mobile internet often generate discording views between sectoral authorities (prone to stimulate the diffusion of digital technologies) and those in charge of the treasury, that typically seek to maximize tax collection. The evidence provided in this paper shows that both visions should be more easily aligned going forward, with digitization increasingly becoming a key input for effective tax collection.

The rest of the article is structured as follows. In section 2 we provide a comprehensive literature review regarding the effects of digitalization in tax revenue, identifying all direct and indirect channels through which these effects can take place. In section 3 we present the dataset for the empirical analysis, and we report the main descriptive statistics and exploratory evidence. In section 4 we present the econometric analysis and discuss the main results. Section 5 develops a series of simulations of the net tax revenue effects of the elimination of sector-specific taxation on those Latin American countries that are currently imposing these. Finally, section 6 ends with key conclusions and recommendations.

# 2. Literature review on the effects of digitalization on government tax revenue

Researchers have recently made important advances in the study of the link between digitalization and government tax revenue. However, research in this area is still scarce and fragmented, with plenty of questions that remain unanswered. In this section, we summarize the literature conducted to date and sketch the main research questions to be studied empirically. We start by identifying the potential impact mechanisms according to the reviewed literature, before presenting empirical evidence on studies conducted to date.

## 2.1 Identification of mechanisms for potential effects of digitalization on tax revenue

The first channel identified in the literature is the role of digitalization in improving the capacities of tax offices for fiscal collection and control. One of the first contributions in this field is Gnangnon and Brun (2018), who studied how narrowing the internet usage gap can help countries to improve their tax revenue mobilization. They argue that tax and custom administrations can improve the effectiveness of their tasks due to digital technology, especially in non-high-income economies. They exemplify this as digitalization can facilitate tax collection by the administration. In the same vein, Tinta (2023) argues that digitalization can help tax administrations obtain more and better information from taxpayers, helping to create and relate data registers on wealth and capital income, savings, listed assets, privately held assets, and home ownership, thus helping to verify taxpayers' total capital income and wealth levels. Moreover, the increased use of digital payment systems by consumers can potentially allow governments to collect more information on their expenditure. Similarly, Adegboye et al (2022) and Jacobs (2017) argue that digitalization has a role in facilitating the conduction of more efficient controls and improving the enforcement capacity of the administration. Moreover, Adegboye et al (2022) argue that tax collection systems could leverage technology to promote ease of payment and prevent revenue losses. This is aligned with the findings of Wandaogo (2022), who found broad evidence on digitalization improving government effectiveness.

Second, tax payment procedures for individuals and firms can also be facilitated through digital technologies. This can be the case, for example, through VAT and income tax declarations and payments being made online (Gnangnon and Brun, 2018). Improved firm-level digitalization can provide further efficiency for those firms that act as tax collectors, and those that can experience reductions in costs associated with tax compliance (Brun et al, 2020).

In addition, Brun et al (2020) point out that digitalization acts as a factor of less corruption and enhanced fiscal discipline. As it reduces the need for taxpayers to travel to a tax administration

office, internet use removes corruption opportunities that may arise. In the same vein, Lio et al (2011) argue that internet adoption can contribute to reducing corruption from a broader perspective, which should translate into gains in revenue collection.

Moreover, the development of digital payment methods will make consumer transactions more likely to take place through digital channels, something that facilitates considerably the tax collection process. In turn, Aracil et al (2025) found that ICTs, through fintech applications, can lead to an improvement in financial inclusion in emerging economies, through increasing users of the formal financial system.

The literature also identifies a series of indirect channels through which digitalization can further contribute to increased tax collection. Gnangnon and Brun (2018) study how international trade is a potential channel through which internet usage can influence tax revenues. This is because internet usage intensity is expected to contribute positively to a country's international trade activity (Clarke and Wallsten, 2004; Freund and Weinhold, 2004; Lin, 2015) and to increase firm-level exports (Bianchi and Mathews, 2016), while on the other hand, trade has been identified as an important determinant of tax revenue collection (Gnangnon and Brun, 2017). In this respect, a more connected society can have better access to cheaper goods from abroad, while enterprises can also access lower cost inputs imported from other countries. This increase in trade activities is expected to contribute to an increase in tax revenues. More competitive firms due to stronger international linkages will contribute to increasing firm turnover and domestic wages (Gnangnon and Brun, 2017), inducing further increases in tax collection.

In addition, Gnangnon and Brun (2018) argue about other macroeconomic channels through which internet use can influence tax revenue, such as economic growth and foreign direct investment (FDI). For example, internet diffusion has been considered a driver of FDI inflows (Choi, 2003), which in turn should lead to increased tax revenues. Similarly, the internet stimulates economic growth (Koutroumpis, 2009; Czernich et al, 2011) and firm productivity gains (Arvanitis, 2005; Arvanitis and Loukis, 2009; Bertschek and Niebel, 2016; Hagsten, 2016; Paunov and Rollo, 2016), which should also increase tax revenues.

Another potential channel is that related to business formalization. Tinta (2023) argues that the improvement in the transaction traceability by the tax administration can encourage firms to formalize activities previously conducted under the shadow economy, thus prompting tax mobilization. Moreover, Chacaltana et al. (2018) indicate that ICTs are likely to promote transition to formality in the labor market. Similarly, Ndoya et al (2023) found that the use of ICTs (mobile phone and internet) decreased the spread of the informal economy in African countries, while Remeikienė et al (2022) found that growing ICTs lead to reduction on the size of the shadow economy for a sample of 11 European countries.

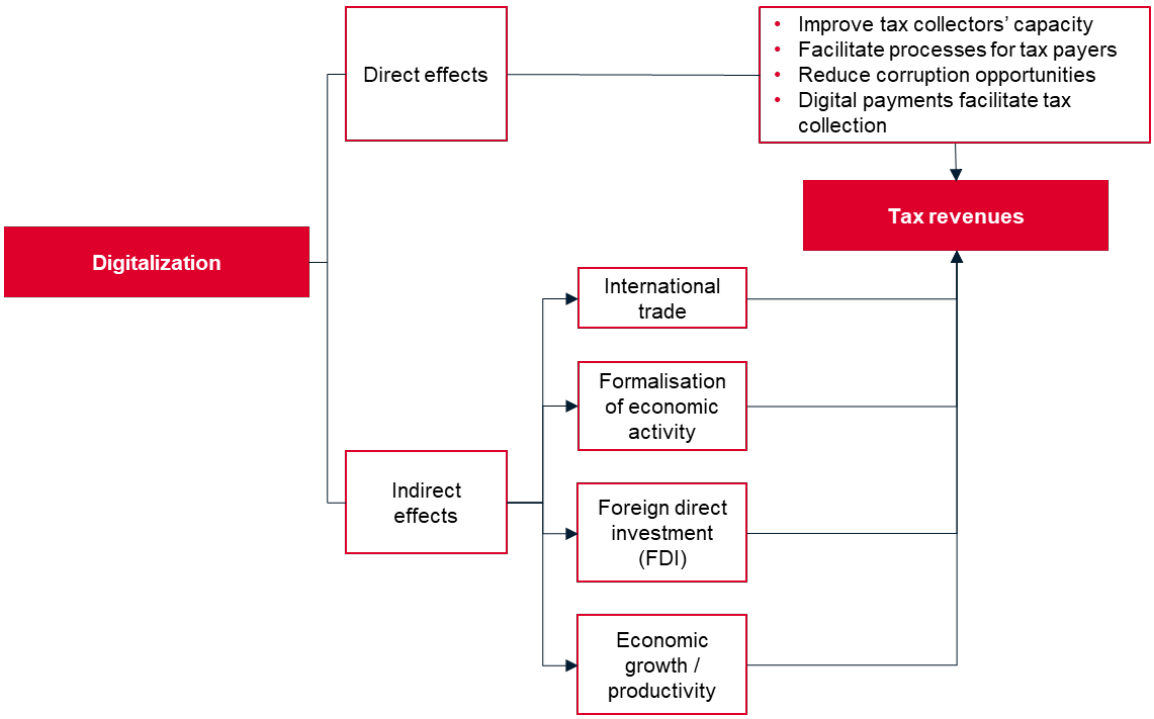
However, other authors have a more nuanced view regarding this. That is the case of Kpognon (2022), who argues that the link between ICTs and the informal economy is ambiguous. On the one hand, he argues that ICTs, as general-purpose technologies, have the potential to reduce barriers for the entry of firms into markets, thus facilitating the creation of new firms. This has also been argued by García-Murillo and Velez-Ospina (2017), who indicate that access to ICTs can

contribute for this removal of barriers through enhancing business skills and providing sectoral information and facilitating opportunities for scale-up. However, as technology reduces transaction costs of informal business, this can potentially lead to their growth. Similarly, Bhattacharaya (2019) argues that the impact of ICTs on informal enterprises is uneven, because the informal sector itself is heterogeneous. As evidence of these mixed effects, Elgin (2013) explored the link between internet usage and the size of the informal economy through cross-country panel estimations, with results indicating that internet usage and the size of the informal sector are negatively correlated with each other; however, as GDP per capita increases, this negative correlation is reduced and even overturned.

All in all, the mechanisms reviewed in the literature regarding the link between digitalization and tax mobilization are summarized in Figure 1.

**Figure 1. Mechanisms for digitalization impact on tax revenue mobilization**

Source: GSMA Intelligence




Having identified the main mechanisms through which digitalization can potentially impact tax revenue collection, we turn next into detailing the results for the limited number of studies that have empirically addressed this point.

## 2.2 Empirical results in the surveyed literature

The empirical work conducted by Gnangnon and Brun (2018) covered 164 countries for the period 1995-2013. Their analysis used as digitalization variable a measure of internet use intensity as compared to the world average levels. Their results verify that when a country reduces the internet

gap, it experiences over the short to medium term a rise in non-resource tax revenues. This result is especially relevant for those low-income economies. Empirically, the authors rely on Generalized Methods of Moments (GMM) dynamic panel estimations.

Brun et al (2020) estimate the impact of measures defined as ICT readiness and ICT usage (from the Network Readiness Index of the World Economic Forum) on tax revenue mobilization for a sample of developing countries during the period 2005-2016. They find that ICT readiness presents a non-significant effect, while on the other hand, ICT usage increases tax revenue. This positive effect was verified for the case of various taxes, especially direct ones and VAT. The authors use instrumental variables (IV) and GMM dynamic panel models.

More recently, Adegboye et al (2022) worked for a sample of 48 Sub-Saharan African countries during period 2004-2020. The authors used digitalization measures of telephone, mobile and internet penetration rates. Their results verified substantially positive net effects of ICTs on tax revenue, although they vary by technology. They found positive effects from telephone and internet penetration on both tax income and non-resource revenues; however, they found no evidence on the role of mobile telephony. In addition, they also disentangle different thresholds of ICT penetration for which these effects vary. The empirical strategy consisted of GMM dynamic panel estimations.

In turn, Tinta (2023) used data from 111 developing countries between 2005 to 2019, with results of the empirical estimations performed by the author effectively suggesting that digitalization positively influences non-resource tax revenue mobilization in developing countries. They rely on a series of digital indices built from ITU data. Empirically, the authors test their hypothesis through different approaches: OLS fixed effects models, while they control endogeneity concerns by using IV and dynamic panels through GMM.

## 2.3 Gaps in the literature and contribution of this research

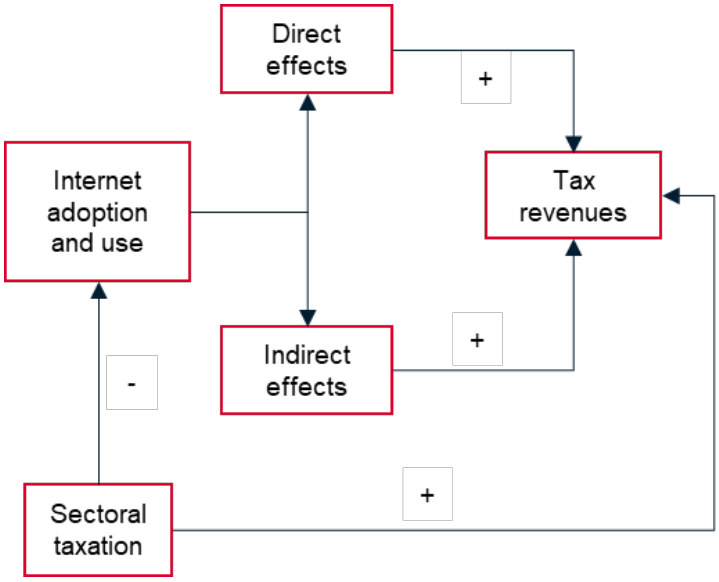
Based on the empirical evidence provided above, the main conclusion is that digitalization positively contributes to increase tax revenue collection, and that this effect is especially strong in the case of developing countries. Maciel and Zuchowski (2025) examine the impact of access to mobile internet infrastructure on local tax revenues in Brazil, finding a lasting increase. No other study has been conducted to date with a focus on Latin America, but there is enough evidence to hypothesize that in this region digital technologies may be playing an important role for tax mobilization too.

However, most of the studies conducted to date have focused only on the direct link between digitalization and tax revenue (this is the case of Gnangnon and Brun, 2018; Brun et al, 2020; Adegboye et al, 2022; and Tinta, 2023). An important gap is missing in the study of the topic through a broader context, intending to evaluate the overall tax regime involving connectivity and digitalization. If there is a positive link between digitalisation and tax revenue, does it make sense to tax connectivity services and devices, given they discourage the adoption and use of digital services? In theory, it depends. Taxing connectivity services generate direct tax revenues while at the same time negatively impact connectivity in the country, which indirectly reduces tax revenues. The net result after considering these two effects expected to go in opposite directions is the main

question that is tested empirically through this research. The answer is therefore an empirical question. Therefore, the aim of this study is to analyze the overall effect from sectoral taxation, that is expected, on the one hand, to directly increase revenue collection, but on the other hand, to constrain the demand of digital services and reduce tax revenue.

**Figure 2. Overall effects of sectoral taxation on tax revenue**

Source: GSMA Intelligence




The linkages that are estimated empirically are sketched in Figure 2. In each established relationship, we include the expected sign of the corresponding effect (+/-) according to the findings in the economic theory and empirical literature.

# 3. Data and exploratory analysis

For the purpose of the empirical investigation, a panel dataset comprising 26 LAC countries was constructed. The data collection period spans from 2008 to 2023, although it should be noted that due to limitations in data availability for certain variables, the precise temporal scope may vary slightly across individual estimations. Table 1 delineates the array of variables employed in the econometric analyses, providing a comprehensive overview that includes descriptions, data sources, and key descriptive statistics.

The main dependent variable in the study is tax revenue per capita, derived from OECD statistics. This variable, along with all other variables expressed in monetary units, has been converted to constant prices (2017 US dollars) using purchasing power parity (PPP). The conversion was performed using the converter factor provided by the International Monetary Fund (IMF).

The main variable of interest when it comes to its impact on tax revenues is the adoption of mobile internet, the main source of internet connectivity available for individuals and firms in Latin America. We employ two distinct indicators related to mobile broadband. The first indicator is the penetration rate, defined as the proportion of the population with connections of 3G or a higher technological standard. This metric provides insight into the breadth of mobile broadband adoption. The second indicator addresses usage intensity, measured by the average data traffic per connection in gigabytes (GB). This metric offers a perspective on the depth of mobile broadband utilization. Additionally, we approximate the price of mobile data by the average revenue per GB. These key variables have all been sourced from the GSMA Intelligence database.

Endogeneity is a common concern when it comes to analyzing the impact of ICTs on socioeconomic indicators. This problem can arise due to different reasons, such as reverse causality, omitted variables, or measurement errors. Therefore, we also consider the IV estimation approach, treating the right-hand side mobile regressors as endogenous, and relying on external instruments for first-stage estimates. The chosen instruments include competition intensity within the mobile sector, measured by the Herfindahl-Hirschman Index (HHI), and lagged values of voice traffic per connection. The HHI data is sourced from GSMA Intelligence, while the voice traffic indicator is compiled using data from both the International Telecommunication Union (ITU) and GSMA. Infrastructure based competition levels have well established but also complex links with outcomes in the mobile market, with the effects being often non-linear. On the other hand, there is no reason to expect a direct link between competition in this specific sector and national-level tax revenue collection, beyond the effect that takes place through the respective sectoral outcomes. In addition, we instrument current data traffic levels with lagged values of voice traffic. In this case, this is explained as a country with higher voice usage in the past (when this service was at its prime) should be linked to higher data usage levels now, because of underlying characteristics of the users, but not directly to current national-level tax collection.

The potential mediating factors linking mobile broadband adoption to tax revenue include trade, FDI, and GDP, all measured on a per capita basis, as well as the expansion of the informal

economy as a proportion of GDP. With the exception of GDP per capita, which is sourced from the IMF database, all other variables are obtained from the World Bank.

Finally, the remaining variables presented in Table 1 are used in the different estimations conducted as control variables, following the specialized literature on the drivers of each of the specific dependent variables to be estimated in course.

## Table 1. Variables for empirical estimations

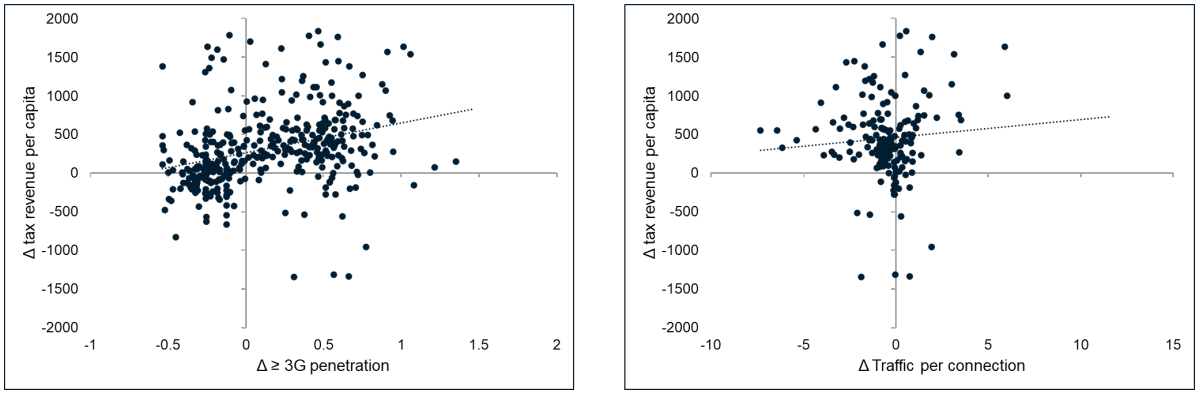
Source: GSMA Intelligence

| Variable | Description | Source | Obs. | Mean | Std. Dv. | Min | Max |
|---|---|---|---|---|---|---|---|
| Tax revenue pc | Tax revenue per capita (dollars constant prices 2017 - PPP) | OECD | 381 | 3,278.28 | 1,828.96 | 824.26 | 9,814.15 |
| ≥3G Connections penetration | Mobile broadband penetration from connections 3G, 4G and 5G (% population) | GSMA | 416 | 0.52 | 0.44 | 0.00 | 1.99 |
| Traffic per connection | Data traffic per connection (GB) | GSMA | 208 | 2.46 | 3.04 | 0.16 | 19.78 |
| Price per GB | Average revenue per GB of traffic (dollars constant prices 2017 - PPP) | GSMA | 208 | 26.14 | 30.38 | 0.59 | 207.32 |
| GDP pc | Gross domestic product per capita (dollars constant prices 2017 - PPP) | IMF | 416 | 15,840.06 | 7,967.93 | 4,458.81 | 47,939.01 |
| Trade pc | Trade per capita (dollars constant prices 2017 - PPP) | World Bank | 346 | 10,513.04 | 7,404.89 | 3,173.21 | 41,091.52 |
| FDI pc | Foreign direct investment, net inflows (dollars constant prices 2017 - PPP) | World Bank | 416 | 783.75 | 1,255.23 | 0.00 | 20,556.06 |
| Informal economy growth | Informal economy (% GDP) – yearly variation. From 2021 is extrapolated following past trend. | World Bank | 384 | -0.28 | 0.32 | -1.85 | 0.49 |
| Financial globalization | KOF Financial Globalisation Index, de jure | KOF | 364 | 59.24 | 15.51 | 25.68 | 83.42 |
| Education | Average years of schooling for adults aged 25 and over (mean years schooling) | Datalab | 390 | 8.82 | 1.66 | 4.04 | 12.73 |
| Agriculture | Share of agriculture value added (% GDP) | World Bank | 404 | 6.83 | 5.03 | 0.37 | 31.73 |
| Services | Share of services value added (% GDP) | World Bank | 404 | 59.13 | 9.63 | 19.27 | 82.39 |
| Industry | Share of industry value added (% GDP) | World Bank | 404 | 25.15 | 8.72 | 8.50 | 67.82 |
| Population | Total population | World Bank | 416 | 22,923,220 | 44,112,280 | 83,251 | 216,422,500 |
| Rural population growth | Variation in rural population (%) | World Bank | 416 | -1.06 | 1.15 | -4.51 | 1.20 |
| Exchange rate | Exchange rate (national currency per US dollars) | IMF | 410 | 390.92 | 1,195.12 | 1.00 | 7,288.87 |
| Natural resources rents | Total natural resources rents (% GDP) | World Bank | 357 | 3.96 | 4.99 | 0.00 | 33.68 |
| Labor force | Labor force (% population) | World Bank | 400 | 46.69 | 5.08 | 35.21 | 58.71 |
| Capital pc | Physical capital stock per capita (dollars constant prices 2017 - PPP) | PWT / IMF | 400 | 70,263.58 | 50,489.61 | 11,984.88 | 235,780.60 |
| Employment rate | Employed individuals (% labor force) | World Bank | 400 | 92.63 | 3.88 | 74.78 | 97.98 |
| Rule of Law index | Rule of law index from World Governance Indicators | World Bank | 416 | -0.31 | 0.73 | -2.33 | 1.35 |
| Inflation | Inflation, consumer prices (annual %) | World Bank | 389 | 5.67 | 14.88 | 0.02 | 254.95 |
| HHI | Herfindahl Hirschman Index for mobile connectivity | GSMA | 416 | 4,447.40 | 1,347.00 | 2,356.00 | 10,000.00 |
| Voice traffic | Voice traffic per connection | ITU / GSMA | 364 | 0.00 | 0.00 | 0.00 | 0.00 |

In Figure 3 we provide very preliminary evidence regarding the link between both the digital variables considered and tax revenue per capita, presented in deviations with respect to the respective country means to exploit the time-properties of the panel set.

**Figure 3. Scatterplots for variation in mobile variables and tax revenue per capita**

Source: GSMA Intelligence




In both cases presented in Figure 3 there seems to be a mild positive link between digitalization and tax collection, although it remains unclear if these links are robust to the addition of controls and after addressing endogeneity concerns. Therefore, more analysis is needed before reaching a firm conclusion.

# 4. Estimation results

To analyze the overall effect on tax revenues from the growth in digitalization and internet connectivity, our empirical strategy involves the application of multiple regressions techniques to confirm the robustness of any estimates to different empirical approaches: two-way fixed effects (TWFE), IV, dynamic panels and simultaneous equation models (SEM).

## 4.1 Estimation of demand functions

We start by estimating the demand function for mobile adoption and use. This is relevant to obtain a measure of price elasticity from which we can simulate how much mobile adoption, and traffic per connection vary as a result of changes in prices originated from sector specific taxes.

In Table 2 we first present results for mobile penetration demand. Estimations are conducted through TWFE with robust standard errors. As any conventional demand function, we must regress adoption over price and income. To account for income, we introduce the lagged GDP per capita. Starting with the penetration demand function, the accurate functional form is represented by the dependent variable in logs and the price regressor in levels. According to the results, the price presents a negative and highly significant coefficient, as expected from a demand function. However, that coefficient cannot be interpreted directly as elasticity, being necessary to multiply it by the price level. Taking average prices for the period under analysis, we calculate the price elasticity for mobile broadband adoption in -0.18%. In other words, these results indicate that a 1% increase in prices will reduce adoption by 0.18%. This is a low elasticity level, in particular when compared with those identified in other studies. For example, empirical evidence reviewed in GSMA and EY (2020) suggests that average mobile ownership elasticities for the service segment ranges from -0.90% in low-income to -0.65% in high income countries. However, our estimated value is closer to that found by Alderete (2022) on a study focused specifically on Latin America, who estimated a price elasticity for mobile broadband adoption ranging from -0.21% to -0.36%. On the contrary, higher elasticities were found in the region for the fixed broadband segment (Galperin and Ruzzier, 2013). Also, high effects were identified by Kammardi Sachidananda et al (2024) for the VAT exemption on smartphones approved in Colombia during 2017. The authors used synthetic control with data covering the period 2009-2021, finding that smartphone penetration in Colombia reached 66.8 percent in 2021, an increase of 7.6 percentage points over its synthetic counterpart. All in all, our estimation provides a conservative measure of the positive effects that may arise from tax reductions.

**Table 2. TWFE estimation of mobile adoption and use demand functions**

Source: GSMA Intelligence

| Dep. var.: | | Log(Traffic per connection) |
|---|---|---|
| Log(GDP pc) t-1 | 0.464*** | 0.419** |
| | [0.045] | [0.165] |
| Price per GB | -0.007*** | |
| | [0.002] | |
| Log(Price per GB) | | -0.332* |
| | | [0.182] |
| Country Fixed Effects | YES | YES |
| Year Fixed Effects | YES | YES |
| R-squared | 0.849 | 0.982 |
| Observations | 208 | 208 |
| Sample period | 2016-2023 | 2016-2023 |

Note: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

In the second column of Table 2 we calculate the demand for traffic per connection, as a proxy of usage intensity. In this case, the coefficient estimated from using both dependent and price variables in logs is negative and significant, while the good model fit also suggests that this can be considered an adequate functional form. From the reported coefficient it can be argued that a 1% increase in price is associated with a 0.33% reduction in traffic per connection. In this case, empirical evidence on data usage elasticity for the mobile sector ranges from -0.82% in high-income countries to -1.11% in low-income ones, according to GSMA and EY (2020). Therefore, our estimation is also conservative in this case.

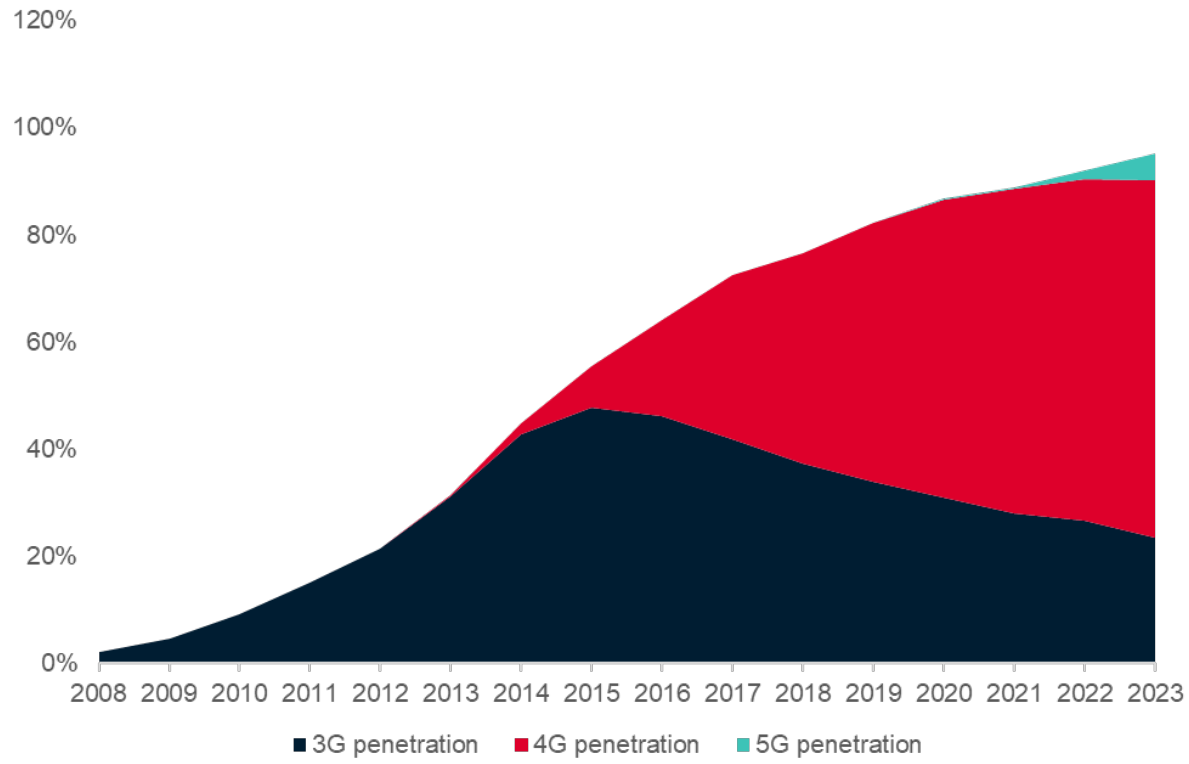
The discrepancy between the two estimates of elasticity (for adoption and use) can be explained by the fact that customers react more strongly to price changes in terms of usage intensity than in terms of their choice to subscribe to mobile internet services.

## 4.2 Estimation of direct impacts on tax revenue

For direct effects on tax revenue, we consider three alternative periods for the econometric analysis. The different periods can be associated with different technological phases experienced in the region throughout the years (Figure 4). This is important because most of the direct effects identified are expected to be either contingent on or to become stronger with higher speed mobile internet technologies associated with 4G mobile technology and hence in the most recent past period.

**Figure 4. LAC mobile broadband penetration by technology**

Source: GSMA Intelligence




First, we consider the longest possible period, 2009-2021. This is the period that covers first the full diffusion of 3G technology, from 4% penetration in 2009 to its peak of 54% in 2015, and then the diffusion of 4G from 2016 onwards. Overall, the predominant technology through the period was 3G, as depicted in Figure 4, with 4G increasing its participation rapidly in the second part of the period. The second sample considers the period starting from when 3G was able to reach a certain critical mass (16% penetration in 2011). As in the previous case, in this period 3G can also be considered the predominant technology. Finally, we take the period 2016-2021, where we include the effects derived from traffic per connection. In this case, it is 4G the predominant technology, as it already reached an important critical mass in 2016 (20%), before consummating the overtake on 3G in 2018.

In Table 3 we present the results of our estimates of the effect of several drivers on tax revenue per capita. Considering the expected correlation between both mobile broadband variables, we introduce first the penetration indicator as regressor, before adding the traffic per connection metric. All estimates include country and year fixed effects, which are crucial to control for unobservable factors that may be either time-invariant at the country level or annually based if affect the whole region (such as exogenous economic shocks). In addition, all estimations are conducted with robust standard errors.

The first estimate presented in column (i) is based on the period 2009-2021, with results from TWFE estimates suggesting a non-statistically significant effect on tax revenue per capita. In column (ii) we replicate the estimation but now through 2SLS IV estimate, using the HHI index (both in levels and squares) as instruments for broadband penetration. The IV methodology used is that of Limited Information Maximum Likelihood (IV-LIML). The instruments behave very well, being strong in the first stage,[1] while the tests conducted clearly validate the exclusion restrictions as they reject potential under and weak identification while not rejecting overidentification.

Results in this case suggest a positive and significant effect from mobile adoption on tax revenue, albeit significant at only 10%. In columns (iii) and (iv) we replicate the previous estimates but now reducing the timeframe of the panel, starting from 2011. This is relevant as back in the years 2009 or 2010 mobile broadband diffusion was in its early days in LAC, presenting low adoption levels for 3G technology. Results are clear to suggest that, when taking a closer-to-present period of time, the estimated impact from mobile penetration on tax revenue per capita increases considerably, as can be seen from comparing vis-à-vis these results with the corresponding estimates when using the larger period.

[1] See details of all the first stage estimated from IV models in Table A1 in Appendix.

**Table 3. Estimation of tax revenue per capita drivers**

Source: GSMA Intelligence

| Dep. var.: Log(Tax revenue pc) | (i) | (ii) | (iii) | (iv) | (v) | (vi) | (vii) |
|---|---|---|---|---|---|---|---|
| Log(≥3G Connections penetration) | 0.019 | 0.075* | 0.046* | 0.196*** | 0.400* | 0.443* | 0.298* |
| | [0.023] | [0.041] | [0.024] | [0.063] | [0.231] | [0.260] | [0.175] |
| Traffic per connection | | | | | 0.071** | 0.067** | 0.052*** |
| | | | | | [0.031] | [0.029] | [0.019] |
| Log(Trade pc) | 0.175 | 0.222*** | 0.192* | 0.337*** | 0.315* | 0.352* | 0.274** |
| | [0.112] | [0.052] | [0.103] | [0.077] | [0.180] | [0.188] | [0.134] |
| FDI pc | 0.000 | 0.000 | 0.000 | 0.000 | -0.000 | -0.000 | -0.000 |
| | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] |
| Log(GDPpc) | 0.620** | 0.527*** | 0.589** | 0.449*** | 0.294 | 0.246 | 0.440* |
| | [0.235] | [0.117] | [0.212] | [0.143] | [0.375] | [0.403] | [0.261] |
| Informal economy growth | -0.059** | -0.053** | -0.042* | -0.020 | 0.005 | 0.005 | 0.002 |
| | [0.022] | [0.024] | [0.021] | [0.024] | [0.024] | [0.024] | [0.022] |
| Education | 0.006 | 0.019 | 0.012 | 0.043 | -0.216*** | -0.213** | -0.175*** |
| | [0.020] | [0.018] | [0.018] | [0.034] | [0.082] | [0.085] | [0.066] |
| Financial globalization | -0.000 | -0.001 | -0.001 | -0.001 | -0.003 | -0.003 | -0.003 |
| | [0.003] | [0.001] | [0.002] | [0.001] | [0.002] | [0.002] | [0.002] |
| Agriculture | -0.020*** | -0.018*** | -0.026*** | -0.025*** | -0.003 | -0.004 | -0.010 |
| | [0.005] | [0.005] | [0.006] | [0.007] | [0.018] | [0.017] | [0.015] |
| Underidentification test | | 9.041** | | 9.007** | 2.479 | 1.910 | 8.884* |
| Weak identification test | | 38.237^ | | 18.184^ | 1.737^^ | 1.242^^^ | 1.543^^^^ |
| Hansen J statistic | | 0.712 | | 0.001 | n.a. | 0.576 | 2.523 |
| Country Fixed Effects | YES | YES | YES | YES | YES | YES | YES |
| Year Fixed Effects | YES | YES | YES | YES | YES | YES | YES |
| R-squared | 0.794 | 0.770 | 0.705 | 0.550 | 0.145 | 0.183 | 0.439 |
| Observations | 270 | 270 | 232 | 232 | 124 | 124 | 124 |
| Sample period | 2009-2021 | 2009-2021 | 2011-2021 | 2011-2021 | 2016-2021 | 2016-2021 | 2016-2021 |
| Estimation method | TWFE | IV-LIML | TWFE | IV-LIML | IV-LIML | IV-LIML | IV-LIML |

Note: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. (^) 10% max IV size: 8.68, (^^) 10% max IV size: 7.03, (^^^) 10% max IV size: 5.44, (^^^^) 10% max IV size: 4.32. "n.a." denotes not applicable.

In the second block of estimations reported in Table 3, in columns (v) to (vii), we introduce traffic per connection as an additional regressor. As traffic per connection is only available since 2016, the period of the panel is reduced in this case. Considering its high correlation with the adoption variable, we introduce the traffic metric in levels rather than in logs.[2] The estimate presented in column (v) does not add any new instrument, thus HHI and HHI in squares are the selected

[2] The Log(≥3G Connections penetration) and Log(Traffic per connection) present a correlation index of 0.498, providing difficulty for the identification of both effects due to the associated collinearity. That correlation decreases to 0.304 when we consider traffic per connection in levels instead of logs.

variables to explain both endogenous regressors in the first stage, while the model is exactly identified.

The results suggest that both adoption and usage intensity influence tax revenue, however, the under-identification test is not rejected (p-value is 0.115) and the instruments appear to be weak. In column (vi) we add the voice traffic per connection (with a 4-year lag) to account as instrument for data traffic. The rationale of this instrument is explained as a country with higher voice usage in the past should be linked to higher data usage levels now, because of underlying characteristics of the users, but not directly to national-level tax collection. Despite this newly added instrument being significant to explain current traffic patterns in the first stage, there is no major change in the main results and in the instrument contrasts. Finally, in column (vii) we add a further 4-year lag on voice per connection (8 years) and lagged values of HHI in squares, being now rejected the under-identification hypothesis. Overall, this evidence provides support for the direct effects from greater mobile broadband penetration and use on increased tax revenue per capita.[3]

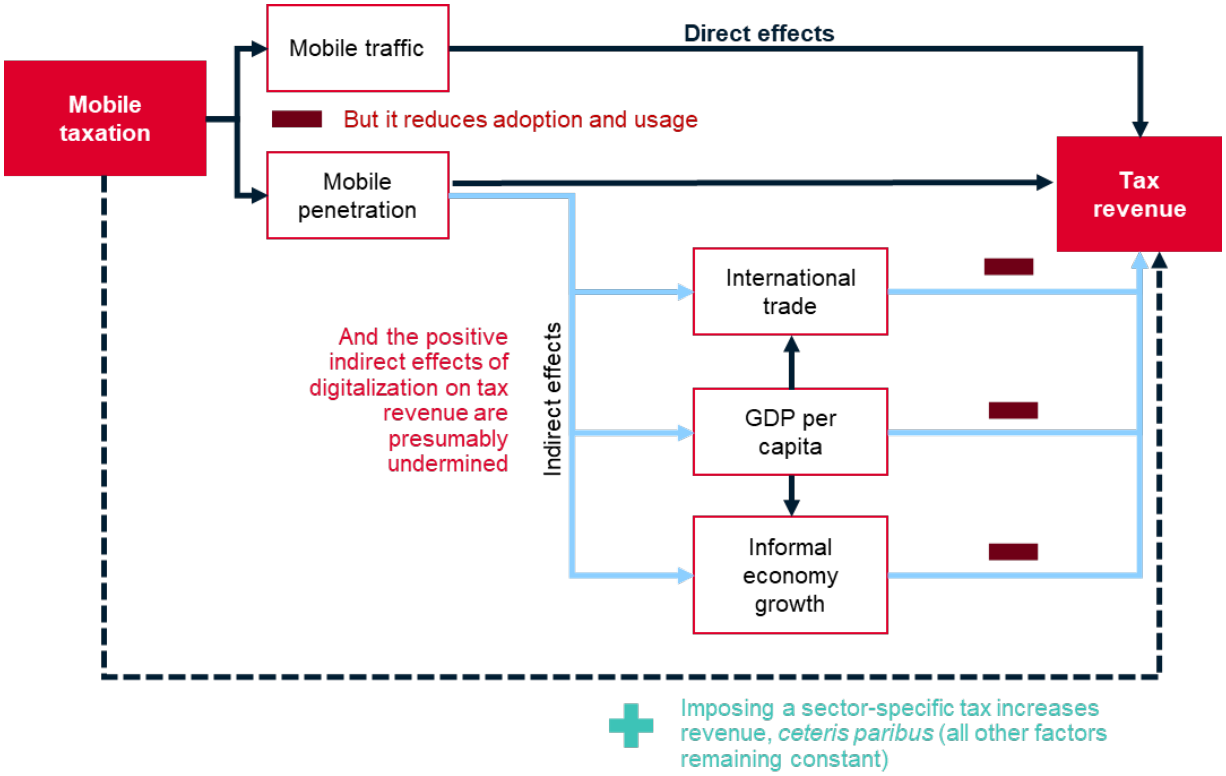
In most of the regressions presented in Table 3 there is a positive and statistically significant link between trade and GDP per capita on tax revenue collection, while in some cases the expected effect is also confirmed to be statistically significant for a reduction in the size of the informal economy.

In order to consider potential indirect effects from mobile broadband to tax revenue per capita such as those reported in Figure 1, we need to establish a link between mobile broadband and these variables. We can then estimate additional effects from the former on tax revenue, mediated by them. On the other hand, FDI per capita is never significant to explain tax revenue collection according to our results, meaning that we will not rely on this indicator for the estimation of indirect effects. All in all, the overall effects can be represented in the following diagram (Figure 5).

[3] In Appendix 2 we present the results using an alternative approach, through a dynamic panel model with the lag of the dependent variable included as regressor.

**Figure 5. Diagram of direct and indirect effects of mobile broadband on tax revenue**

Source: GSMA Intelligence




In Figure 5, the dotted line presents the positive direct effect from sectoral taxation on tax revenue collection, while all the effects that take place through mobile penetration and use to tax revenue per capita have been validated, at least partially, through the analysis presented in Table 3. Next, we estimate the effects from mobile broadband adoption on the three mediating variables: trade per capita, GDP per capita, and informal economy growth.

## 4.3 Estimation of indirect impacts from mobile broadband adoption on tax revenue

In this section, we start by estimating the impact of mobile broadband adoption on trade per capita (Table 4). As before, we present results both in TWFE and in IV-LIML, in the latest case using HHI (in levels and squares) as instruments for adoption. Results suggest a non-significant effect when estimating through TWFE, although under the IV-LIML there is a positive and significant (at 10%) coefficient suggesting a 0.057% increase in trade per capita from a 1% increase in adoption. Our estimation is much more conservative than that of Clarke and Wallsten (2004), who estimated a 0.8 elasticity of total exports with respect to internet use relying on an IV estimation for a panel of countries; although it is slightly above the one conducted by Lin (2015), who associated a 1% increase in the internet users to increases international trade by 0.02% to 0.04%. The instruments behave correctly, being strong and exogenous. Overall, the positive effect on trade identified in the IV-LIML estimation is aligned with the literature that argues that a wider diffusion of internet can

contribute positively to a country's international trade activity (Clarke and Wallsten, 2004; Freund and Weinhold, 2004; Lin, 2015) and to increase firm-level exports (Bianchi and Mathews, 2016).

**Table 4. Estimation of trade per capita drivers**

Source: GSMA Intelligence

| Dep. var.: Log(Trade pc) | (i) | (ii) |
|---|---|---|
| Log(≥3G Connections penetration) | -0.003 | 0.057* |
| | [0.015] | [0.033] |
| Services | -0.022*** | -0.025*** |
| | [0.007] | [0.004] |
| Industry | -0.019 | -0.022*** |
| | [0.014] | [0.006] |
| Agriculture | -0.019* | -0.018*** |
| | [0.011] | [0.006] |
| Rural population growth | 0.098 | 0.132*** |
| | [0.015] | [0.035] |
| Population | 0.000*** | 0.000*** |
| | [0.000] | [0.000] |
| Log(GDPpc) | 0.927*** | 0.862*** |
| | [0.195] | [0.117] |
| Exchange rate | 0.000*** | 0.000*** |
| | [0.000] | [0.000] |
| Underidentification test | | 6.509** |
| Weak identification test | | 27.714^ |
| Hansen J statistic | | 1.116 |
| Country Fixed Effects | YES | YES |
| Year Fixed Effects | YES | YES |
| R-squared | 0.660 | 0.637 |
| Observations | 335 | 335 |
| Sample period | 2008-2023 | 2008-2023 |
| Estimation method | TWFE | IV-LIML |

Note: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. (^) 10% max IV size: 8.68

Next, we estimate the effects of mobile broadband penetration on GDP per capita (Table 5). In this case, a positive impact is verified in both TWFE and IV-LIML models, although in the latter the coefficients decrease slightly in magnitude. These results are consistent with the vast literature that has related internet penetration to economic growth. Once again, the instruments behave correctly as expected, being strong to explain the endogenous regressor and at the same time verifying its exogeneity condition. In the IV-LIML estimation reported in column (ii), the estimated coefficient links a 1% increase in mobile penetration with a 0.071% growth in the GDP per capita. This estimate is conservative in comparison with other findings for the region, such as that of Katz and Callorda (2019), who found that a 1% increase in mobile broadband penetration yielded a GDP per

capita increase of 0.17%; and that of Alderete (2022), who estimated for Latin America that a 1% increase in mobile broadband penetration generates a 0.23% increase in GDP.

**Table 5. Estimation of GDP per capita drivers**

Source: GSMA Intelligence

| Dep. var.: Log(GDP pc) | (i) | (ii) |
|---|---|---|
| Log(≥3G Connections penetration) | 0.100* | 0.071** |
| | [0.056] | [0.030] |
| Log(Capital pc) | 0.266*** | 0.308*** |
| | [0.086] | [0.069] |
| Log(Education) | 0.676 | 0.671*** |
| | [0.450] | [0.231] |
| Employment rate | 0.001 | 0.002 |
| | [0.009] | [0.004] |
| Rule of Law index | 0.222 | 0.215*** |
| | [0.135] | [0.053] |
| Underidentification test | | 4.993* |
| Weak identification test | | 19.486^ |
| Hansen J statistic | | 0.127 |
| Country Fixed Effects | YES | YES |
| Year Fixed Effects | YES | YES |
| R-squared | 0.459 | 0.450 |
| Observations | 345 | 345 |
| Sample period | 2008-2023 | 2008-2023 |
| Estimation method | TWFE | IV-LIML |

Note: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. (^) 10% max IV size: 8.68.
Time-trend added to Latam countries to account for different economic cycles.

Finally, in Table 6 we estimate the effects of mobile penetration on informal economy growth. The coefficient of interest is not significant under the TWFE model, although in the IV-LIML it presents the expected result at a significance of 5%. This suggests that the larger the diffusion of mobile internet, the lower the informal economy growth. This result is aligned with the findings of previous empirical research conducted for other regions, such as Ndoya et al (2023) for African countries and Remeikienė et al (2022) for European economies. Although not directly comparable as they use informal economy variable in levels (not in growth as in our case), a one-percent increase in internet penetration and mobile phone use was found to decreases the size of the informal sector by 1.02 and 1.11 percentage points, respectively, in African countries.

In sum, the results presented in Tables 4 to 6 confirm the presence of positive effects from mobile internet on alternative economic variables which, in turn, have an influence on tax revenue. The point estimates are in line with the findings in the empirical literature and indicate that the overall impact of mobile broadband on tax revenue collection should be higher than that of the

corresponding direct coefficients reported in Table 3, once we contemplate the indirect impact mediated through other macroeconomic variables.

### Table 6. Estimation of informal economy growth drivers

Source: GSMA Intelligence

| Dep. var.: Informal Economy growth | (i) | (ii) |
|---|---|---|
| Log(≥3G Connections penetration) | -0.018 | -0.129** |
| | [0.030] | [0.065] |
| Log(GDP pc) | -0.983*** | -0.994*** |
| | [0.343] | [0.264] |
| Services | 0.039** | 0.044*** |
| | [0.014] | [0.011] |
| Industry | 0.038*** | 0.046*** |
| | [0.013] | [0.012] |
| Natural resources rents | 0.010 | 0.010 |
| | [0.008] | [0.008] |
| Inflation | -0.001 | -0.003 |
| | [0.002] | [0.003] |
| FDI pc | -0.000 | -0.000* |
| | [0.000] | [0.000] |
| Rural population growth | -0.055 | -0.099 |
| | [0.091] | [0.070] |
| Labor force | 0.010 | 0.008 |
| | [0.010] | [0.013] |
| Population | -0.000 | -0.000 |
| | [0.000] | [0.000] |
| Underidentification test | | 10.024*** |
| Weak identification test | | 32.304^ |
| Hansen J statistic | | 2.519 |
| Country Fixed Effects | YES | YES |
| Year Fixed Effects | YES | YES |
| R-squared | 0.256 | 0.226 |
| Observations | 280 | 280 |
| Sample period | 2009-2021 | 2009-2021 |
| Estimation method | TWFE | IV-LIML |

Note: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. (^) 10% max IV size: 8.68

## 4.4 Estimation through simultaneous equation model (SEM)

In this section we estimate under the same framework all the effects that have been individually estimated in sections 4.2 and 4.3.[4] While doing this has a setback in reducing the sample size, it allows us to test whether the set of direct and indirect effects that take place are not double counted when considered jointly under the same framework.

The estimation procedure is done through a three-stages least squares (3SLS) simultaneous equation model (Table 7). Overall, results regarding the series of direct and indirect effects that take place from mobile penetration to tax revenue per capita are verified, with the sole exception of the effect from mobile penetration to trade, that is positive but not statistically significant with the reduced sample. However, and contrary to the estimates presented in Table 3 for the same time-period, now the indirect effect that takes place through informal economy growth becomes significant and with the expected signs. We were unable to conduct a simultaneous estimation for the most recent period (from 2016 onwards) including traffic per connection as a driver of tax revenue, as the resulting dataset from estimating all equations under the same routine is largely reduced, providing unreliable results.

[4] We also include under the same routine the regression of mobile penetration against its instruments, to treat this variable as endogenous while complying with the exclusion restrictions.

## Table 7. 3SLS simultaneous equation model of mobile penetration effects

Source: GSMA Intelligence

| Dep. var.: Log(Tax revenue pc) | | |
|---|---|---|
| Log(≥3G Connections penetration) | 0.090*** | [0.029] |
| Log(Trade pc) | 0.243*** | [0.081] |
| FDI pc | 0.000 | [0.000] |
| Log(GDPpc) | 0.312*** | [0.111] |
| Informal economy growth | -0.216*** | [0.056] |
| Education | 0.044*** | [0.016] |
| Financial globalization | 0.003** | [0.001] |
| Agriculture | -0.031*** | [0.005] |
| Dep. var.: Log(Trade pc) | | |
| Log(≥3G Connections penetration) | 0.008 | [0.049] |
| Services | -0.019*** | [0.004] |
| Industry | -0.013*** | [0.005] |
| Agriculture | -0.013* | [0.007] |
| Rural population growth | 0.160*** | [0.046] |
| Population | 0.000*** | [0.000] |
| Log(GDPpc) | 0.211 | [0.156] |
| Exchange rate | 0.000*** | [0.000] |
| Dep. var.: Informal Economy growth | | |
| Log(≥3G Connections penetration) | -0.413*** | [0.128] |
| Log(GDP pc) | -0.554 | [0.389] |
| Services | 0.051*** | [0.011] |
| Industry | 0.036*** | [0.011] |
| Natural resources rents | 0.034*** | [0.009] |
| Inflation | -0.002 | [0.007] |
| FDI pc | -0.000* | [0.000] |
| Rural population growth | -0.253** | [0.117] |
| Labor force | 0.008 | [0.011] |
| Population | -0.000* | [0.000] |
| Dep. var.: Log(GDP pc) | | |
| Log(≥3G Connections penetration) | 0.041*** | [0.014] |
| Log(Capital pc) | 0.375*** | [0.036] |
| Log(HK) | 0.222*** | [0.068] |
| Employment rate | 0.006*** | [0.002] |
| Rule of Law index | 0.050*** | [0.013] |
| Dep. var.: Log(≥3G Connections penetration) | | |
| HHI | 0.001*** | [0.000] |
| HHI - squared | -0.000*** | [0.000] |
| Country Fixed Effects | YES | |
| Year Fixed Effects | YES | |

| | |
|---|---|
| Observations | 219 |
| Sample period | 2011-2021 |

Note: Standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. Time-trend added to Latam countries in GDP equation.

## 4.5 Overall effects

This section computes the total impact of price changes on per capita tax collection. Accordingly, we must take into account the entire set of direct and indirect effects that must be computed using the coefficients listed in Tables 2 through 7. Estimates are presented for both individual and simultaneous estimates. In the first case, we rely on IV-LIML results as they better account for endogeneity concerns.

For direct effects on tax revenue, we consider the three alternative periods from the results presented in Table 3. For the period 2009-2021, the reference here for effects on tax revenue per capita are the coefficients presented in column (ii) of Table 3. For the period that starts in 2011, we consider both individual and simultaneous estimates. In the first case, the reference for effects on tax revenue per capita are the coefficients presented in column (iv) of Table 3, while when using the simultaneous estimates, the coefficients of Table 7 are used. Finally, for the period 2016-2021, the reference for tax revenue per capita drivers are the coefficients presented in column (vii) of Table 3. Excepting the case of simultaneous equations, in the remaining scenarios the reference coefficients for the secondary equations are those reported in columns (ii) in Tables 4 to 6, while in all cases we use the elasticities estimated through the demand functions reported in Table 2.

From the selected scenarios, we simulate direct effects (those from adoption and traffic on tax revenue, respectively) and five distinct indirect effects (those from mobile penetration to tax revenue that materialize through trade, GDP per capita and informal economy growth).

Taking into account the price elasticities estimated in section 4.1, we present in Table 8 the specific and overall effects on tax revenue from a hypothetical increase of 1% in prices due to taxation.

**Table 8. End-to-end effects on tax revenue from a 1% increase in mobile prices**

Source: GSMA Intelligence

| Effect | Path description | (a) 2009-2021 | (b) 2011-2021 (simultaneous) | (c) 2011-2021 | (d) 2016-2021 |
|---|---|---|---|---|---|
| Direct | Price→Traffic per connection→Tax revenue | n.a. | n.a. | n.a. | -0.043% |
| | Price→Mobile penetration→Tax revenue | -0.014% | -0.016% | -0.036% | -0.055% |
| Indirect | Price→Mobile penetration→Trade→Tax revenue | -0.002% | n.a. | -0.004% | -0.003% |
| | Price→Mobile penetration→Informal economy growth→Tax revenue | -0.001% | -0.016% | n.a. | n.a. |
| | Price→Mobile penetration→GDPpc→Tax revenue | -0.007% | -0.002% | -0.006% | -0.006% |
| | Price→Mobile penetration→GDPpc→Trade→Tax revenue | -0.002% | n.a. | -0.004% | -0.003% |
| | Price→Mobile penetration→ GDPpc→Informal economy growth→Tax revenue | -0.001% | n.a. | n.a. | n.a. |
| | Total effect | -0.027% | -0.035% | -0.049% | -0.109% |

Note: the 2009-2021 scenario uses coefficients from column (ii) of Table 3 for drivers of tax revenue per capita. The 2011-2021 (simultaneous) scenario uses coefficients from Table 7 for all estimates. The 2011-2021 scenario uses coefficients from column (iv) of Table 3 for drivers of tax revenue per capita. The 2016-2021 scenario uses coefficients from column (vii) of Table 3 for drivers of tax revenue per capita. Excepting the simultaneous, the remaining scenarios rely on coefficients from columns (ii) in Tables 4 to 6 for remaining equations. “n.a.” denotes not applicable.

As depicted in Table 8, the overall effect from a 1% price increase on tax revenue collection will be negative, ranging from -0.027% to -0.109%, depending on the scenario. In addition, it seems clear that the main difference between both scenarios is mostly related to the growth of direct effects across the years. Beyond the inclusion of the effects derived from traffic per connection in the latest scenario, also the effect from mobile penetration becomes larger the most recent the period. This suggests that the wider diffusion of newer technology generations is associated with a larger impact in terms of tax collection. Considering that the increase in capacities of the tax administration may become marginal from a certain point, these large increases in the direct effect can be associated with the massification of digitization across society, increasing the use of digital payment methods and online shopping, thereby facilitating tax collection.

# 5. Removal of mobile internet sector-specific taxes: simulating the effect on net tax collection

The production and consumption of mobile internet in Latin America, despite its profound societal and economic benefits—such as fostering productivity, innovation, and digital inclusion—faces significant sector specific taxation levels, over and above general taxes subject to other goods and services. Most of these taxes were originally introduced when mobile goods and services were niche products that could be taxed as luxury goods. In countries with high levels of informal employment, where traditional tax collection methods are less effective, the sector has also been a more reliable source of tax revenues than economic sectors with higher levels of informality.

This large taxation pressure usually takes the form of sector-specific taxes. These taxes are normally associated with a distortion that makes mobile services more expensive and thus less affordable for the population. Examples of this are service activation or connection fees or excise taxes. According to Matheson and Petit (2017), these impositions are typically seen as harmful practices that ought to be avoided.

These sector-specific taxes applied to the mobile sector are an important source of fiscal revenues in the region. During 2023 the mobile sector paid an estimated $ 4.65 billion in sector-specific taxes and fees, which represent 6.5% of market revenue.

**Figure 6. Total tax payments and fees (as a % of market revenue)**

Source: GSMA Intelligence

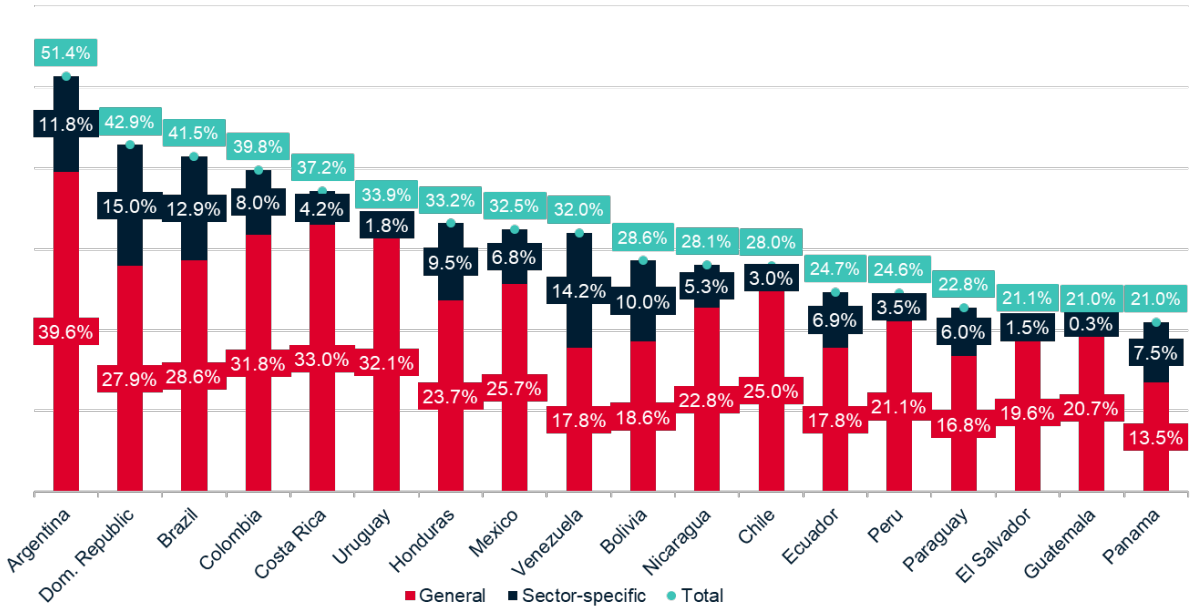


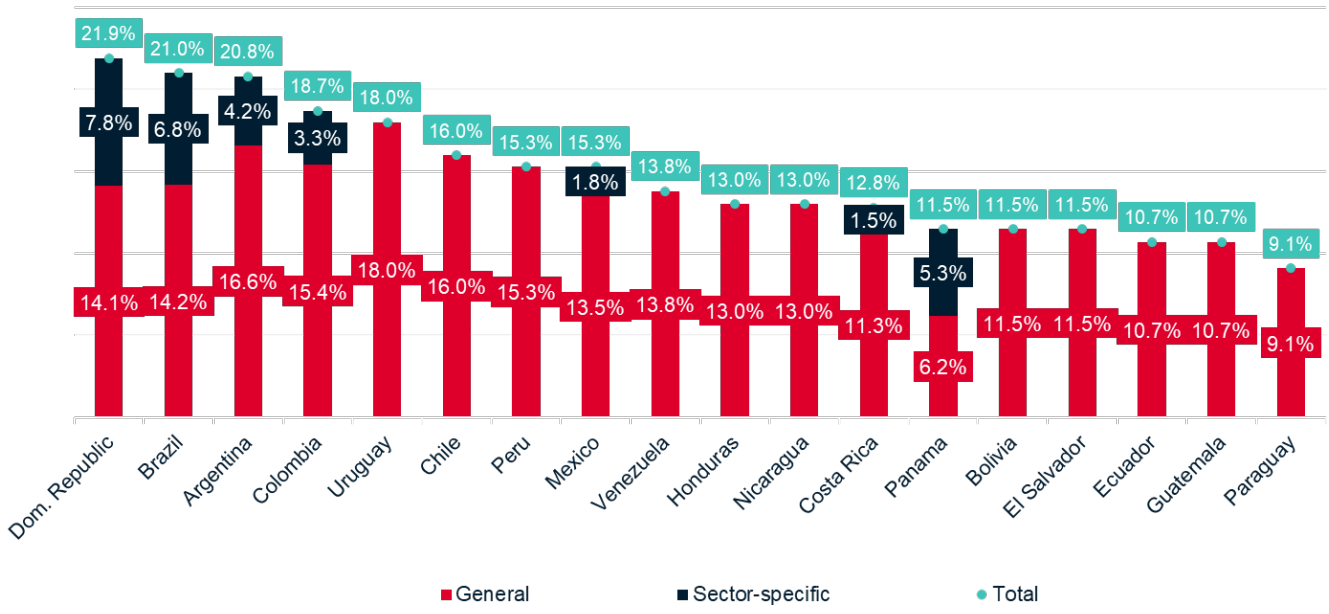
Figure 6 reflects the share of both general and sector-specific taxes (for both consumers and operators) in the market revenue, by country. Sector-specific taxes represented include those applicable to consumers (through data consumption and handsets) and to operators (through regulatory fees and universal service rates, to mention a few examples). In our simulation we focus first on the net tax revenue impact from the elimination of consumer sector specific taxes, as these have a direct translation into consumer prices. After that, the effect of a reduction in operator sector specific taxes is added to the simulation, assuming different levels of the price pass-through effects to consumers. The countries in which the simulations will be done are those where sector-specific taxes play have a significant incidence: Argentina, Brazil, Colombia, Costa Rica, Dominican Republic, Panama and Venezuela.

## 5.1 Simulating the effect on net tax collection from eliminating consumer sector-specific taxes

In Figure 7 we present the tax as a proportion of the cost per GB, reporting both general and sector specific taxes applicable on the consumer side. The countries in which consumer sector-specific taxes apply are Argentina, Brazil, Colombia, Costa Rica, Dominican Republic and Panama.

**Figure 7. Tax as a proportion of the cost of 1 GB data basket**

Source: GSMA Intelligence



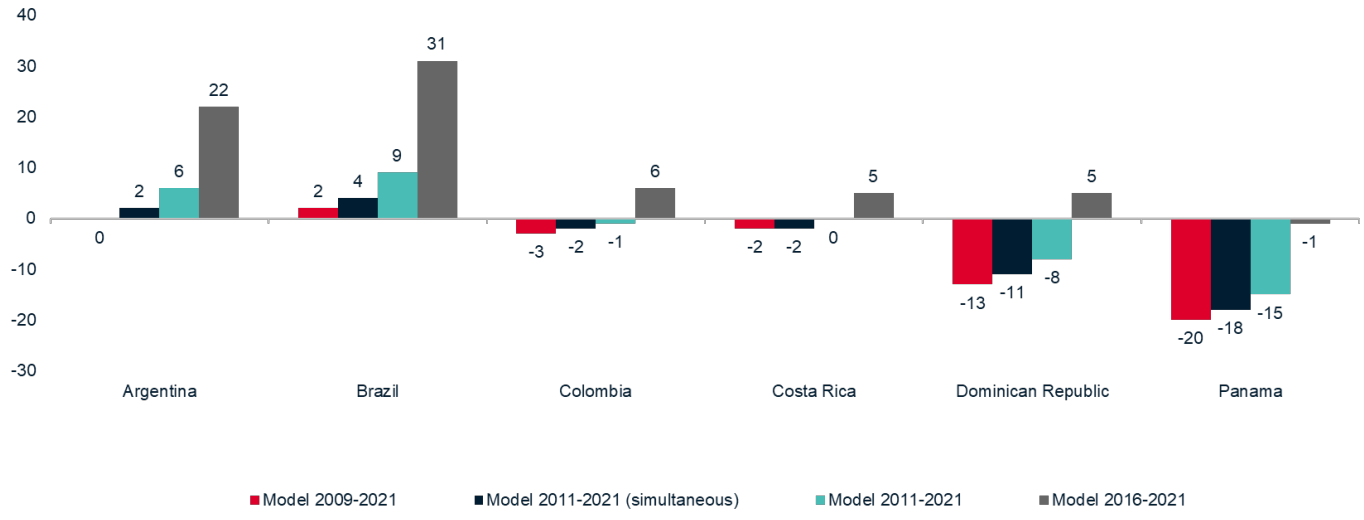

Dominican Republic has the largest sector-specific rates on mobile services, followed by Brazil, Panama, Argentina, Colombia and Costa Rica. In addition, prices per GB also vary significantly across these six countries, ranging from $1.22 in Dominican Republic to $8.88 in Panama (data for 2023).

From the elasticities presented in Table 8, we simulate a potential elimination of sector-specific taxes in those Latin American countries that are currently imposing these fees. Full results from simulating these service-specific taxes are presented for all the considered scenarios in Tables A3 to A6 in the Appendix 3.

Calculations are made for both revenue gains and losses for the tax administration. Gains are calculated using the elasticities presented in Table 8: if sector specific taxes are eliminated, prices will reduce and both penetration and traffic will grow according to our demand functions, triggering a series of direct and indirect effects that will end up increasing tax collection. However, we should also account for the losses, as the elimination of any tax generates an immediate fiscal revenue reduction. This is calculated by considering the prices per GB and the share of the price that accounts for sector-specific taxes to be eliminated (from both measures we get the tax revenue loss per GB). By calculating this figure by total traffic, we get a measure of overall revenue loss, that can be divided aftermath by the population to get a measure of the tax loss per capita, to be directly compared with the tax gains per capita calculated for each case. The net result for tax administration is the difference between gains and losses. Figure 8 summarizes all scenarios for the different countries considered.

**Figure 8. Net result for Tax Administration for eliminating consumer service-specific tax on mobile data**
$ per capita

Source: GSMA Intelligence




As can be seen, in Argentina the net result of eliminating a sector-specific tax is clearly positive with a net tax collection gain in three out of the four scenarios, with revenue gains reaching $22 dollars per capita if we look at the most recent period, where as expected the effects are stronger. In Brazil there seems to be a clear gain in all cases, ranging from $2 to $31 per capita. In the case of Colombia, Costa Rica and Dominican Republic, results present gains of $5-$6 per capita when the coefficients from the most recent period are used. Finally, in the only country where there are

no positive fiscal gains from the simulated scenario is Panama, where the net results range from -$20 to -$1 per capita. However, it has to be noted that even in this case the results for the most recent period (2016-2021) are essentially fiscally neutral. Further reductions observed in the price per GB in Panama in 2024 suggest that the net fiscal effect from the reform can be expected to be positive. In all cases, it seems clear that the more recent the period considered for the econometric analysis, the larger is the net positive effect to the tax administration.

Overall, the results of the simulations suggest that eliminating sector-specific taxes are likely to generate at least a neutral and most likely a net positive fiscal effect, as the results for the 2016-2021 models are the most accurate to reflect the expected direct effect today.

## 5.2 Simulating the effect on net tax collection from eliminating both consumer and operator sector-specific taxes

In this section we add operator sector-specific taxes and fees to the simulation. These impositions include license or regulatory fees, universal service rates, and other ad-hoc specific fees normally applied over revenues or profits. Regulatory fees, which usually take the form of a percentage of revenue, are intended to pay for the expenses of regulation. These impositions, however, come in a wide variety. Some nations, like Mexico or Chile, don't charge these fees. However, in Argentina, for instance, they account for 4% of total revenue. We will incorporate into the simulation the removal of any regulatory fees that exceed the 1% imposition, which we estimate can be deemed appropriate by international standards. Also, according to most benchmarks, universal service rates normally account for 1% of revenues; therefore, we will model the removal of these payments beyond that threshold. Finally, we add to the simulation any other sector-specific imposition on the operator's side (excepting spectrum fees).

Another relevant assumption to be made refers to the pass-through level, as operators normally translate only a part of the costs associated with these obligations to the consumers. Following GSMA and EY (2020), we will assume a 50% pass-through rate, although we will also conduct sensitivity analyses for alternative levels. It has to be noted that since the effects from the tax reduction that are not passed through to consumers are not considered in the analysis, the results of the simulation are likely to be downward biased.

Venezuela is added to the list of countries already included for the simulation on consumer taxes. Since this country does not impose service-specific taxes on consumers, it was excluded from the simulation shown in Figure 8. However, it is placing significant impositions on the operator's side, including a 2% service-specific tax over profits and a 3.3% regulatory fee rate. In addition, some of the remaining countries in the simulation have universal service rates (Brazil, Colombia, Costa Rica, and Dominican Republic) or regulatory fees (Argentina and Brazil) that are larger than 1%. Tables A7 through A10 in Appendix 3 display the complete outcomes of these simulations.

**Figure 9. Net result for Tax Administration for eliminating consumer and operator service-specific tax on mobile data**
$ per capita

Source: GSMA Intelligence

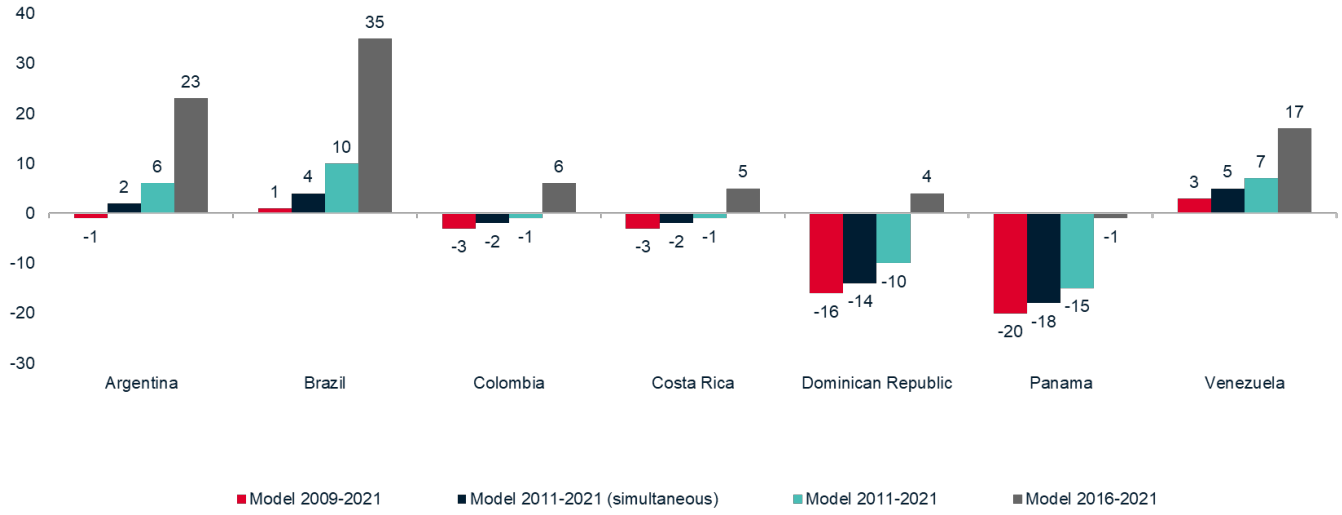



Figure 9 summarizes the net results for the tax administration office. The outcomes for Argentina and Brazil in terms of fiscal gains improve when the more recent period estimates are used. For Colombia and Costa Rica, the results are essentially unchanged. No changes are reported for Panama, given that the country does not impose service-specific charges on operators beyond the established thresholds. In contrast, the Dominican Republic's tax collection results are marginally poorer. Finally, significant increases are made in the instance of Venezuela, which can eventually reach $17 per capita.

Some cases of reductions in the net effects can be explained as follows. In comparison with eliminating taxes on the consumers side only, in the case of the operators this may yield lower results for the government’s net revenue. This is primarily due to the assumption of a partial pass-through. This means that the gains from direct and indirect effects are limited by the pass-through rate, which reduces the strength of any positive effects. In other words, the extent to which tax reductions are transmitted to final prices (pass-through) constrains the potential for increased economic activity or revenue recovery, making the net fiscal impact slightly less favorable when taxes are removed from operators rather than consumers.

In the Appendix we develop a sensitivity analysis to find out if the results presented in Figure 9 vary significantly under different pass-through assumptions. Full results are reported in Tables A11 to A14 in Appendix 3. When testing the 30% pass-through rate, the reductions in the net effects for the tax administration office are minimal, with the exception of Venezuela and Brazil. In the case of a 70% pass-through rate, results improve with respect to those reported in Figure 9, as price reductions are larger after eliminating taxes on the operator’s side. Overall, from this sensitivity analysis it can be concluded that main results do not vary dramatically if different assumptions are made regarding pass-through rates.

# 6. Conclusions and recommendations

The aim of this research is to expand the knowledge frontier of the emerging literature that has only recently started to empirically analyze how a wider diffusion of digitalization across society can contribute to increased tax revenue collection by the public sector. This is a relevant topic for the private sector, academic and policy authorities alike. In particular, the aim is to provide useful evidence for both fiscal policy and sectoral authorities in a context in which different policies, such as digital agendas and tax collection have to be balanced.

For decades, regions such as Latin America, South Asia and Africa have favoured sector specific taxes on mobile internet consumers and providers. Despite their known negative effects on internet adoption and investments, tax authorities generally considered these as an efficient way to generate tax revenues. For our empirical analysis, we conduct our research on one of those regions, the LAC region, where mobile internet services are highly taxed with several sector-specific impositions despite adoption and investments in mobile internet lagging behind.

All our results confirm positive direct and indirect links between mobile internet adoption and usage and public sector tax revenue. This verifies the different arguments highlighted in the literature as digitalization contributing to improving the capacities of tax administration, facilitating the payment process for taxpayers, while reducing the opportunities for corruption. These results are robust to a number of different specifications, including those that control for the potential endogenous relationship that exists between digital diffusion and tax revenue collection.

Importantly, the net tax collection effects of the removal of sector-specific taxes on mobile internet consumers are found to be positive, with the effect becoming stronger in the most recent period analyzed. Sector specific taxes are expected, on the one hand, to directly increase tax revenue collection, but on the other hand, to constrain the demand of digital services and reduce tax revenue. This study is the first one that robustly considers all these effects. To do so, we simulated the elimination of consumer and operator sector specific taxes in Latin American countries that still impose these obligations, with net results (under the scenario that considers the more recent period for econometric analysis) suggesting clear fiscal gains for all the countries except Panama.

These results can generate important implications for policymakers, especially for those authorities in charge of tax administration offices, which are typically reluctant to reduce taxation pressure to mobile services in developing countries, as it is usually considered an efficient way to generate tax collection. The evidence provided through this research can be an input for the reflection regarding the accuracy of current taxation frameworks.

Finally, it is worth commenting on the limitations that constrained our empirical analysis. First, building the data set proved to be challenging, considering that some variables are only available for reduced time periods. This is the case of data traffic, only available since 2016 for Latin American countries. Second, it remains to be seen if our conclusions can be extrapolated to other regions in the world, especially those emerging countries that impose high taxation and still have an important digital divide to close. Future research will have to make contributions regarding this.

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# Appendix 1 – First stage for IV estimations

### Table A1. First stage for IV estimations

Source: GSMA Intelligence

| Dep. var.: | Log(≥3G Connections penetration) | | | | | | | | Traffic per connection | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HHI | 0.0005*** | 0.0004*** | 0.0003** | 0.0003** | 0.0002* | 0.0003 | 0.0003 | 0.0005*** | -0.0031** | -0.0031** | -0.0040** |
| | [0.0001] | [0.0001] | [0.0001] | [0.0001] | [0.0001] | [0.0002] | [0.0002] | [0.0001] | [0.0013] | [0.0013] | [0.0016] |
| HHI – squared | -0.0000*** | -0.0000*** | -0.0000*** | -0.0000*** | -0.0000 | -0.0000** | -0.0000** | -0.0000*** | 0.0000** | 0.0000** | 0.0000** |
| | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] |
| HHI – squared t-1 | | | | | -0.0000 | | | | | | -0.0000 |
| | | | | | [0.0000] | | | | | | [0.0000] |
| Voice traffic per connection t-4 | | | | .33.936 | -30.075 | | | | | 443.409*** | 529.097*** |
| | | | | [22.788] | [24.820] | | | | | [168.693] | [182.444] |
| Voice traffic per connection t-8 | | | | | 23.887 | | | | | | 494.328* |
| | | | | | [38.273] | | | | | | [283.060] |
| Exogenous controls | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Country Fixed Effects | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Year Fixed Effects | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Observations | 270 | 232 | 124 | 124 | 124 | 335 | 345 | 280 | 124 | 124 | 124 |
| First stage for: | Column (ii) of Table 3 | Column (iv) of Table 3 | Column (v) of Table 3 | Column (vi) of Table 3 | Column (vii) of Table 3 | Column (ii) of Table 4 | Column (ii) of Table 5 | Column (ii) of Table 6 | Column (v) of Table 3 | Column (vi) of Table 3 | Column (vii) of Table 3 |

*Note: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.*

# Appendix 2 – Dynamic panel estimations

In this Appendix we perform estimates of tax revenue per capita drivers through GMM dynamic panel estimation (Arellano and Bond, 1991), as has been done by other authors (Gnangnon and Brun, 2018; Brun et al, 2020; Adegboye et al, 2022; and Tinta, 2023). While we understand the better approach for estimating these models is IV endogenizing mobile broadband variables through external instruments, the dynamic panel approach allows us to check if the significance of the coefficients of interest is robust to the addition of the lagged dependent variable as regressor. Estimations are presented in Table A2.

## Table A2. Estimation of tax revenue per capita drivers – dynamic panel estimation

Source: GSMA Intelligence

| Dep. var.: Log(Tax revenue pc) | (i) | (ii) |
|---|---|---|
| Log(Tax revenue pc) t-1 | 0.908*** | 0.869*** |
| | [0.023] | [0.041] |
| Log(≥3G Connections penetration) | 0.041*** | 0.106*** |
| | [0.013] | [0.037] |
| Traffic per connection | | 0.007** |
| | | [0.003] |
| Log(Trade pc) | 0.024* | 0.042** |
| | [0.014] | [0.020] |
| FDI pc | 0.000 | 0.000 |
| | [0.000] | [0.000] |
| Log(GDPpc) | 0.058** | 0.070* |
| | [0.028] | [0.037] |
| Informal economy growth | -0.014 | 0.003 |
| | [0.016] | [0.028] |
| Education | -0.004 | -0.006 |
| | [0.005] | [0.006] |
| Financial globalization | -0.001** | -0.001** |
| | [0.000] | [0.000] |
| Agriculture | -0.001 | -0.001 |
| | [0.002] | [0.003] |
| Arellano-Bond test for AR(1) in first differences | -3.36*** | -2.91*** |
| Arellano-Bond test for AR(2) in first differences | -2.30** | -1.21 |
| Hansen test of overidentification | 1.40 | 5.38 |
| Year Fixed Effects | YES | YES |
| Observations | 210 | 124 |
| Sample period | 2011-2021 | 2016-2021 |
| Estimation method | GMM Arellano-Bond | GMM Arellano-Bond |

Note: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

In column (i) we present the regression for mobile penetration but excluding traffic per connection. The coefficient associated with mobile penetration is positive and significant, proving that its effect is robust to the addition of the lagged dependent variable. However, the Arellano-Bond test for AR(2) in first differences rejects the null hypothesis at a 5% significance, suggesting the presence of serial correlation. In any case, this problem is corrected in the estimate reported in column (ii), that includes traffic per connection. In this latest estimate, both mobile penetration and traffic per connection present positive and statistically significant coefficients.

# Appendix 3 – Simulation of service-specific tax elimination

## Table A3. Net result for Tax Administration for eliminating consumer service-specific tax (Model 2009-2021)

Source: GSMA Intelligence

| Item | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | GSMA |
| (3) | Total service specific (% price) | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.03% | -0.03% | -0.03% | -0.03% | -0.03% | -0.03% | -0.03% | Table 8 – column (a) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.17% | -6.83% | -3.25% | -1.53% | -7.81% | -5.31% | 0.00% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.11% | 0.19% | 0.09% | 0.04% | 0.21% | 0.15% | 0.00% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 7.59 | $ 9.93 | $ 2.78 | $ 2.26 | $ 6.08 | $ 6.35 | $ 0.00 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.11 | -$ 0.12 | -$ 0.07 | -$ 0.06 | -$ 0.09 | -$ 0.47 | $ 0.00 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 358,490,476 | -$ 1,799,245,745 | -$ 286,218,846 | -$ 23,310,333 | -$ 217,393,196 | -$ 115,706,115 | $ 0 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 7.68 | -$ 8.31 | -$ 5.50 | -$ 4.47 | -$ 19.18 | -$ 25.90 | $ 0.00 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | -$ 0.09 | $ 1.62 | -$ 2.72 | -$ 2.21 | -$ 13.10 | -$ 19.54 | $ 0.00 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

## Table A4. Net result for Tax Administration for eliminating consumer service-specific tax (Model 2011-2021 - simultaneous)

Source: GSMA Intelligence

| Item | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | GSMA |
| (3) | Total service specific (% price) | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.04% | -0.04% | -0.04% | -0.04% | -0.04% | -0.04% | -0.04% | Table 8 – column (b) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.17% | -6.83% | -3.25% | -1.53% | -7.81% | -5.31% | 0.00% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.15% | 0.24% | 0.11% | 0.05% | 0.27% | 0.19% | 0.00% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 9.75 | $ 12.76 | $ 3.57 | $ 2.90 | $ 7.81 | $ 8.16 | $ 0.00 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.11 | -$ 0.12 | -$ 0.07 | -$ 0.06 | -$ 0.09 | -$ 0.47 | $ 0.00 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 358,490,476 | -$ 1,799,245,745 | -$ 286,218,846 | -$ 23,310,333 | -$ 217,393,196 | -$ 115,706,115 | $ 0 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 7.68 | -$ 8.31 | -$ 5.50 | -$ 4.47 | -$ 19.18 | -$ 25.90 | $ 0.00 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | $ 2.07 | $ 4.45 | -$ 1.93 | -$ 1.57 | -$ 11.37 | -$ 17.73 | $ 0.00 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

## Table A5. Net result for Tax Administration for eliminating consumer service-specific tax (Model 2011-2021)

Source: GSMA Intelligence

| Item | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | GSMA |
| (3) | Total service specific (% price) | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.05% | -0.05% | -0.05% | -0.05% | -0.05% | -0.05% | -0.05% | Table 8 – column (c) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.17% | -6.83% | -3.25% | -1.53% | -7.81% | -5.31% | 0.00% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.20% | 0.33% | 0.16% | 0.07% | 0.38% | 0.26% | 0.00% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 13.60 | $ 17.80 | $ 4.98 | $ 4.05 | $ 10.90 | $ 11.39 | $ 0.00 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.11 | -$ 0.12 | -$ 0.07 | -$ 0.06 | -$ 0.09 | -$ 0.47 | $ 0.00 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 358,490,476 | -$ 1,799,245,745 | -$ 286,218,846 | -$ 23,310,333 | -$ 217,393,196 | -$ 115,706,115 | $ 0 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 7.68 | -$ 8.31 | -$ 5.50 | -$ 4.47 | -$ 19.18 | -$ 25.90 | $ 0.00 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | $ 5.92 | $ 9.49 | -$ 0.52 | -$ 0.42 | -$ 8.29 | -$ 14.51 | $ 0.00 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

## Table A6. Net result for Tax Administration for eliminating consumer service-specific tax (Model 2016-2021)

Source: GSMA Intelligence

| Item | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | GSMA |
| (3) | Total service specific (% price) | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.11% | -0.11% | -0.11% | -0.11% | -0.11% | -0.11% | -0.11% | Table 8 – column (d) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.17% | -6.83% | -3.25% | -1.53% | -7.81% | -5.31% | 0.00% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.45% | 0.74% | 0.35% | 0.17% | 0.85% | 0.58% | 0.00% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 30.16 | $ 39.47 | $ 11.04 | $ 8.98 | $ 24.16 | $ 25.25 | $ 0.00 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.11 | -$ 0.12 | -$ 0.07 | -$ 0.06 | -$ 0.09 | -$ 0.47 | $ 0.00 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 358,490,476 | -$ 1,799,245,745 | -$ 286,218,846 | -$ 23,310,333 | -$ 217,393,196 | -$ 115,706,115 | $ 0 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 7.68 | -$ 8.31 | -$ 5.50 | -$ 4.47 | -$ 19.18 | -$ 25.90 | $ 0.00 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | $ 22.47 | $ 31.16 | $ 5.54 | $ 4.51 | $ 4.98 | -$ 0.65 | $ 0.00 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

## Table A7. Net result for Tax Administration for eliminating consumer and operator service-specific tax (Model 2009-2021)

Source: GSMA Intelligence

| Item | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.27% | 1.02% | 0.21% | 0.19% | 0.61% | 0.00% | 5.84% | GSMA |
| (3) | Total service specific (% price) | 4.44% | 7.85% | 3.46% | 1.72% | 8.42% | 5.31% | 5.84% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.03% | -0.03% | -0.03% | -0.03% | -0.03% | -0.03% | -0.03% | Table 8 – column (a) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.44% | -7.85% | -3.46% | -1.72% | -8.42% | -5.31% | -5.84% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.12% | 0.21% | 0.09% | 0.05% | 0.23% | 0.15% | 0.16% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 8.09 | $ 11.42 | $ 2.96 | $ 2.55 | $ 6.55 | $ 6.35 | $ 4.58 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.12 | -$ 0.15 | -$ 0.08 | -$ 0.08 | -$ 0.11 | -$ 0.47 | -$ 0.07 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 405,492,397 | -$ 2,337,711,266 | -$ 323,040,835 | -$ 29,191,937 | -$ 251,277,054 | -$ 115,706,115 | -$ 34,149,786 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 8.69 | -$ 10.80 | -$ 6.20 | -$ 5.60 | -$ 22.17 | -$ 25.90 | -$ 1.18 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | -$ 0.60 | $ 0.62 | -$ 3.25 | -$ 3.06 | -$ 15.62 | -$ 19.54 | $ 3.40 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

**Table A8. Net result for Tax Administration for eliminating consumer and operator service-specific tax (Model 2011-2021 - simultaneous)**

Source: GSMA Intelligence

| Item | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.27% | 1.02% | 0.21% | 0.19% | 0.61% | 0.00% | 5.84% | GSMA |
| (3) | Total service specific (% price) | 4.44% | 7.85% | 3.46% | 1.72% | 8.42% | 5.31% | 5.84% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.04% | -0.04% | -0.04% | -0.04% | -0.04% | -0.04% | -0.04% | Table 8 – column (b) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.44% | -7.85% | -3.46% | -1.72% | -8.42% | -5.31% | -5.84% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.16% | 0.28% | 0.12% | 0.06% | 0.30% | 0.19% | 0.21% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 10.39 | $ 14.67 | $ 3.80 | $ 3.27 | $ 8.42 | $ 8.16 | $ 5.89 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.12 | -$ 0.15 | -$ 0.08 | -$ 0.08 | -$ 0.11 | -$ 0.47 | -$ 0.07 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 405,492,397 | -$ 2,337,711,266 | -$ 323,040,835 | -$ 29,191,937 | -$ 251,277,054 | -$ 115,706,115 | -$ 34,149,786 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 8.69 | -$ 10.80 | -$ 6.20 | -$ 5.60 | -$ 22.17 | -$ 25.90 | -$ 1.18 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | $ 1.70 | $ 3.87 | -$ 2.40 | -$ 2.33 | -$ 13.75 | -$ 17.73 | $ 4.70 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

## Table A9. Net result for Tax Administration for eliminating consumer and operator service-specific tax (Model 2011-2021)

Source: GSMA Intelligence

| Item | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.27% | 1.02% | 0.21% | 0.19% | 0.61% | 0.00% | 5.84% | GSMA |
| (3) | Total service specific (% price) | 4.44% | 7.85% | 3.46% | 1.72% | 8.42% | 5.31% | 5.84% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.05% | -0.05% | -0.05% | -0.05% | -0.05% | -0.05% | -0.05% | Table 8 – column (c) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.44% | -7.85% | -3.46% | -1.72% | -8.42% | -5.31% | -5.84% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.22% | 0.38% | 0.17% | 0.08% | 0.41% | 0.26% | 0.29% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 14.49 | $ 20.47 | $ 5.30 | $ 4.56 | $ 11.75 | $ 11.39 | $ 8.21 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.12 | -$ 0.15 | -$ 0.08 | -$ 0.08 | -$ 0.11 | -$ 0.47 | -$ 0.07 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 405,492,397 | -$ 2,337,711,266 | -$ 323,040,835 | -$ 29,191,937 | -$ 251,277,054 | -$ 115,706,115 | -$ 34,149,786 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 8.69 | -$ 10.80 | -$ 6.20 | -$ 5.60 | -$ 22.17 | -$ 25.90 | -$ 1.18 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | $ 5.80 | $ 9.67 | -$ 0.90 | -$ 1.04 | -$ 10.43 | -$ 14.51 | $ 7.03 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

## Table A10. Net result for Tax Administration for eliminating consumer and operator service-specific tax (Model 2016-2021)

Source: GSMA Intelligence

| | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.27% | 1.02% | 0.21% | 0.19% | 0.61% | 0.00% | 5.84% | GSMA |
| (3) | Total service specific (% price) | 4.44% | 7.85% | 3.46% | 1.72% | 8.42% | 5.31% | 5.84% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.11% | -0.11% | -0.11% | -0.11% | -0.11% | -0.11% | -0.11% | Table 8 – column (d) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.44% | -7.85% | -3.46% | -1.72% | -8.42% | -5.31% | -5.84% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.48% | 0.85% | 0.38% | 0.19% | 0.91% | 0.58% | 0.63% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 32.14 | $ 45.38 | $ 11.75 | $ 10.11 | $ 26.04 | $ 25.25 | $ 18.20 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.12 | -$ 0.15 | -$ 0.08 | -$ 0.08 | -$ 0.11 | -$ 0.47 | -$ 0.07 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 405,492,397 | -$ 2,337,711,266 | -$ 323,040,835 | -$ 29,191,937 | -$ 251,277,054 | -$ 115,706,115 | -$ 34,149,786 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 8.69 | -$ 10.80 | -$ 6.20 | -$ 5.60 | -$ 22.17 | -$ 25.90 | -$ 1.18 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | $ 23.44 | $ 34.58 | $ 5.55 | $ 4.51 | $ 3.87 | -$ 0.65 | $ 17.02 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

## Table A11. Sensitivity analysis for eliminating consumer and operator service-specific tax assuming 30% pass-through (Model 2009-2021)

Source: GSMA Intelligence

| Item | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.16% | 0.61% | 0.13% | 0.12% | 0.37% | 0.00% | 3.50% | GSMA |
| (3) | Total service specific (% price) | 4.33% | 7.44% | 3.38% | 1.64% | 8.18% | 5.31% | 3.50% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.03% | -0.03% | -0.03% | -0.03% | -0.03% | -0.03% | -0.03% | Table 8 – column (a) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.33% | -7.44% | -3.38% | -1.64% | -8.18% | -5.31% | -3.50% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.12% | 0.20% | 0.09% | 0.04% | 0.22% | 0.15% | 0.10% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 7.89 | $ 10.82 | $ 2.88 | $ 2.43 | $ 6.36 | $ 6.35 | $ 2.75 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.12 | -$ 0.15 | -$ 0.08 | -$ 0.08 | -$ 0.11 | -$ 0.47 | -$ 0.07 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 405,492,397 | -$ 2,337,711,266 | -$ 323,040,835 | -$ 29,191,937 | -$ 251,277,054 | -$ 115,706,115 | -$ 34,149,786 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 8.69 | -$ 10.80 | -$ 6.20 | -$ 5.60 | -$ 22.17 | -$ 25.90 | -$ 1.18 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | -$ 0.80 | $ 0.02 | -$ 3.32 | -$ 3.17 | -$ 15.81 | -$ 19.54 | $ 1.56 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

**Table A12. Sensitivity analysis for eliminating consumer and operator service-specific tax assuming 30% pass-through (Model 2011-2021 - simultaneous)**

Source: GSMA Intelligence

| Item | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.16% | 0.61% | 0.13% | 0.12% | 0.37% | 0.00% | 3.50% | GSMA |
| (3) | Total service specific (% price) | 4.33% | 7.44% | 3.38% | 1.64% | 8.18% | 5.31% | 3.50% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.04% | -0.04% | -0.04% | -0.04% | -0.04% | -0.04% | -0.04% | Table 8 – column (b) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.33% | -7.44% | -3.38% | -1.64% | -8.18% | -5.31% | -3.50% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.15% | 0.26% | 0.12% | 0.06% | 0.29% | 0.19% | 0.12% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 10.13 | $ 13.91 | $ 3.71 | $ 3.12 | $ 8.18 | $ 8.16 | $ 3.53 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.12 | -$ 0.15 | -$ 0.08 | -$ 0.08 | -$ 0.11 | -$ 0.47 | -$ 0.07 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 405,492,397 | -$ 2,337,711,266 | -$ 323,040,835 | -$ 29,191,937 | -$ 251,277,054 | -$ 115,706,115 | -$ 34,149,786 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 8.69 | -$ 10.80 | -$ 6.20 | -$ 5.60 | -$ 22.17 | -$ 25.90 | -$ 1.18 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | $ 1.44 | $ 3.11 | -$ 2.50 | -$ 2.48 | -$ 14.00 | -$ 17.73 | $ 2.35 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

## Table A13. Sensitivity analysis for eliminating consumer and operator service-specific tax assuming 30% pass-through (Model 2011-2021)

Source: GSMA Intelligence

| Item | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.16% | 0.61% | 0.13% | 0.12% | 0.37% | 0.00% | 3.50% | GSMA |
| (3) | Total service specific (% price) | 4.33% | 7.44% | 3.38% | 1.64% | 8.18% | 5.31% | 3.50% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.05% | -0.05% | -0.05% | -0.05% | -0.05% | -0.05% | -0.05% | Table 8 – column (c) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.33% | -7.44% | -3.38% | -1.64% | -8.18% | -5.31% | -3.50% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.21% | 0.36% | 0.17% | 0.08% | 0.40% | 0.26% | 0.17% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 14.14 | $ 19.40 | $ 5.17 | $ 4.36 | $ 11.41 | $ 11.39 | $ 4.93 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.12 | -$ 0.15 | -$ 0.08 | -$ 0.08 | -$ 0.11 | -$ 0.47 | -$ 0.07 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 405,492,397 | -$ 2,337,711,266 | -$ 323,040,835 | -$ 29,191,937 | -$ 251,277,054 | -$ 115,706,115 | -$ 34,149,786 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 8.69 | -$ 10.80 | -$ 6.20 | -$ 5.60 | -$ 22.17 | -$ 25.90 | -$ 1.18 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | $ 5.45 | $ 8.60 | -$ 1.03 | -$ 1.24 | -$ 10.77 | -$ 14.51 | $ 3.74 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

## Table A14. Sensitivity analysis for eliminating consumer and operator service-specific tax assuming 30% pass-through (Model 2016-2021)

Source: GSMA Intelligence

| Item | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.16% | 0.61% | 0.13% | 0.12% | 0.37% | 0.00% | 3.50% | GSMA |
| (3) | Total service specific (% price) | 4.33% | 7.44% | 3.38% | 1.64% | 8.18% | 5.31% | 3.50% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.11% | -0.11% | -0.11% | -0.11% | -0.11% | -0.11% | -0.11% | Table 8 – column (d) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.33% | -7.44% | -3.38% | -1.64% | -8.18% | -5.31% | -3.50% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.47% | 0.81% | 0.37% | 0.18% | 0.89% | 0.58% | 0.38% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 31.34 | $ 43.02 | $ 11.46 | $ 9.66 | $ 25.29 | $ 25.25 | $ 10.92 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.12 | -$ 0.15 | -$ 0.08 | -$ 0.08 | -$ 0.11 | -$ 0.47 | -$ 0.07 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 405,492,397 | -$ 2,337,711,266 | -$ 323,040,835 | -$ 29,191,937 | -$ 251,277,054 | -$ 115,706,115 | -$ 34,149,786 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 8.69 | -$ 10.80 | -$ 6.20 | -$ 5.60 | -$ 22.17 | -$ 25.90 | -$ 1.18 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | $ 22.65 | $ 32.21 | $ 5.26 | $ 4.06 | $ 3.12 | -$ 0.65 | $ 9.74 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

## Table A15. Sensitivity analysis for eliminating consumer and operator service-specific tax assuming 70% pass-through (Model 2009-2021)

Source: GSMA Intelligence

| Item | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.38% | 1.43% | 0.29% | 0.27% | 0.85% | 0.00% | 8.18% | GSMA |
| (3) | Total service specific (% price) | 4.55% | 8.26% | 3.54% | 1.79% | 8.66% | 5.31% | 8.18% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.03% | -0.03% | -0.03% | -0.03% | -0.03% | -0.03% | -0.03% | Table 8 – column (a) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.55% | -8.26% | -3.54% | -1.79% | -8.66% | -5.31% | -8.18% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.12% | 0.23% | 0.10% | 0.05% | 0.24% | 0.15% | 0.22% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 8.29 | $ 12.01 | $ 3.03 | $ 2.66 | $ 6.74 | $ 6.35 | $ 6.41 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.12 | -$ 0.15 | -$ 0.08 | -$ 0.08 | -$ 0.11 | -$ 0.47 | -$ 0.07 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 405,492,397 | -$ 2,337,711,266 | -$ 323,040,835 | -$ 29,191,937 | -$ 251,277,054 | -$ 115,706,115 | -$ 34,149,786 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 8.69 | -$ 10.80 | -$ 6.20 | -$ 5.60 | -$ 22.17 | -$ 25.90 | -$ 1.18 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | -$ 0.41 | $ 1.21 | -$ 3.17 | -$ 2.94 | -$ 15.43 | -$ 19.54 | $ 5.23 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

## Table A16. Sensitivity analysis for eliminating consumer and operator service-specific tax assuming 70% pass-through (Model 2011-2021 - simultaneous)

Source: GSMA Intelligence

| Item | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.38% | 1.43% | 0.29% | 0.27% | 0.85% | 0.00% | 8.18% | GSMA |
| (3) | Total service specific (% price) | 4.55% | 8.26% | 3.54% | 1.79% | 8.66% | 5.31% | 8.18% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.04% | -0.04% | -0.04% | -0.04% | -0.04% | -0.04% | -0.04% | Table 8 – column (b) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.55% | -8.26% | -3.54% | -1.79% | -8.66% | -5.31% | -8.18% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.16% | 0.29% | 0.12% | 0.06% | 0.30% | 0.19% | 0.29% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 10.65 | $ 15.43 | $ 3.89 | $ 3.42 | $ 8.66 | $ 8.16 | $ 8.24 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.12 | -$ 0.15 | -$ 0.08 | -$ 0.08 | -$ 0.11 | -$ 0.47 | -$ 0.07 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 405,492,397 | -$ 2,337,711,266 | -$ 323,040,835 | -$ 29,191,937 | -$ 251,277,054 | -$ 115,706,115 | -$ 34,149,786 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 8.69 | -$ 10.80 | -$ 6.20 | -$ 5.60 | -$ 22.17 | -$ 25.90 | -$ 1.18 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | $ 1.95 | $ 4.63 | -$ 2.31 | -$ 2.18 | -$ 13.51 | -$ 17.73 | $ 7.06 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

## Table A17. Sensitivity analysis for eliminating consumer and operator service-specific tax assuming 70% pass-through (Model 2011-2021)

Source: GSMA Intelligence

| Item | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.38% | 1.43% | 0.29% | 0.27% | 0.85% | 0.00% | 8.18% | GSMA |
| (3) | Total service specific (% price) | 4.55% | 8.26% | 3.54% | 1.79% | 8.66% | 5.31% | 8.18% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.05% | -0.05% | -0.05% | -0.05% | -0.05% | -0.05% | -0.05% | Table 8 – column (c) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.55% | -8.26% | -3.54% | -1.79% | -8.66% | -5.31% | -8.18% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.22% | 0.40% | 0.17% | 0.09% | 0.42% | 0.26% | 0.40% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 14.85 | $ 21.53 | $ 5.43 | $ 4.77 | $ 12.09 | $ 11.39 | $ 11.49 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.12 | -$ 0.15 | -$ 0.08 | -$ 0.08 | -$ 0.11 | -$ 0.47 | -$ 0.07 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 405,492,397 | -$ 2,337,711,266 | -$ 323,040,835 | -$ 29,191,937 | -$ 251,277,054 | -$ 115,706,115 | -$ 34,149,786 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 8.69 | -$ 10.80 | -$ 6.20 | -$ 5.60 | -$ 22.17 | -$ 25.90 | -$ 1.18 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | $ 6.16 | $ 10.73 | -$ 0.78 | -$ 0.83 | -$ 10.09 | -$ 14.51 | $ 10.31 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

## Table A18. Sensitivity analysis for eliminating consumer and operator service-specific tax assuming 70% pass-through (Model 2016-2021)

Source: GSMA Intelligence

| Item | Description | Argentina | Brazil | Colombia | Costa Rica | Dominican Republic | Panama | Venezuela | Source |
|---|---|---|---|---|---|---|---|---|---|
| (1) | Consumer sector specific taxes (% price) 2023 | 4.17% | 6.83% | 3.25% | 1.53% | 7.81% | 5.31% | 0.00% | GSMA |
| (2) | Operators service specific taxes (% price) 2023 | 0.38% | 1.43% | 0.29% | 0.27% | 0.85% | 0.00% | 8.18% | GSMA |
| (3) | Total service specific (% price) | 4.55% | 8.26% | 3.54% | 1.79% | 8.66% | 5.31% | 8.18% | GSMA |
| (4) | Tax revenue per capita average ($) | $ 6,656.45 | $ 5,319.24 | $ 3,123.83 | $ 5,420.61 | $ 2,846.23 | $ 4,376.97 | $ 2,869.10 | OECD |
| (5) | Percentual revenue increase after 1% mobile data price reduction | -0.11% | -0.11% | -0.11% | -0.11% | -0.11% | -0.11% | -0.11% | Table 8 – column (d) |
| (6) | Data price variation if service-specific taxes are eliminated | -4.55% | -8.26% | -3.54% | -1.79% | -8.66% | -5.31% | -8.18% | GSMA |
| (7) | Percentual revenue increase after elimination of service-specific taxes | 0.49% | 0.90% | 0.39% | 0.19% | 0.94% | 0.58% | 0.89% | (5)*(6)*100 |
| (8) | Tax revenue per capita increase after elimination of service-specific taxes ($) | $ 32.93 | $ 47.74 | $ 12.03 | $ 10.57 | $ 26.80 | $ 25.25 | $ 25.49 | (4)*(7) |
| (9) | Data price per GB ($) | $ 2.61 | $ 1.71 | $ 2.13 | $ 3.99 | $ 1.22 | $ 8.88 | $ 0.59 | GSMA |
| (10) | Tax collection reduction due to service-specific tax elimination ($ per GB) | -$ 0.12 | -$ 0.15 | -$ 0.08 | -$ 0.08 | -$ 0.11 | -$ 0.47 | -$ 0.07 | (6)*(9) |
| (11) | Total traffic GB | 3,293,501,000 | 15,367,730,000 | 4,134,841,000 | 383,118,700 | 2,289,061,000 | 245,522,900 | 495,813,900 | GSMA |
| (12) | Total tax collection reduction due to service-specific tax elimination ($) | -$ 405,492,397 | -$ 2,337,711,266 | -$ 323,040,835 | -$ 29,191,937 | -$ 251,277,054 | -$ 115,706,115 | -$ 34,149,786 | (10)*(11) |
| (13) | Population | 46,654,581 | 216,422,446 | 52,085,168 | 5,212,173 | 11,332,972 | 4,468,087 | 28,838,499 | World Bank |
| (14) | Total tax collection per capita reduction due to service-specific tax elimination ($) | -$ 8.69 | -$ 10.80 | -$ 6.20 | -$ 5.60 | -$ 22.17 | -$ 25.90 | -$ 1.18 | (12)/(13) |
| | Net result for Tax Administration ($ per capita) | $ 24.24 | $ 36.94 | $ 5.83 | $ 4.97 | $ 4.62 | -$ 0.65 | $ 24.30 | (8)+(14) |

Note: last available data taken for Tax revenue per capita (2022 for all countries except for Venezuela that is 2013), Data price per GB (2023), Total traffic GB (2023) and Population (2023)

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