REGULATORY AND MARKET ENVIRONMENT

The impact of taxation ON THE DIGITAL ECONOMY

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The impact of taxation on the digital economy

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Executive Summary

The purpose of this study is to review and discuss policy issues related to the taxation of firms operating within the digital sector, as well as levies imposed on consumers purchasing digital goods and services. As indicated in the title, its scope is wider than just telecommunication services, although it also addresses taxation of telecommunication operators.

A diversity of taxes is imposed on firms operating within the digital eco-system. To begin with, corporate taxes and value-added taxes are typically applied to all firms in the digital sector. In addition, import duties are generally imposed on all types of digital equipment, whether they are consumer-oriented (such as smartphones) or needed by infrastructure operators (such as switches and servers). Finally, a number of sector-specific taxes can be collected within the digital eco-system, either applied to the selling of digital goods (like video-streamed movies) or the ownership of wireless devices.

Telecommunication operators typically pay corporate taxes on profits, but are also expected to contribute at several levels (for example, import duties and sales taxes on equipment purchased from overseas suppliers, property taxes on buildings and land owned where equipment is installed). Beyond taxes imposed on telecommunication operators, Internet service providers (ISPs) can also be subject to sector specific levies (for example, conventional corporate taxes, sales taxes on initial equipment purchase, and property taxes for physical assets). In most cases, the burden of taxation is primarily borne by the operator, although in some cases taxes will be passed through to consumers, thereby increasing the cost of acquiring broadband service.

On the consumption side, wireless users in most countries pay taxes at the time of service acquisition (generally linked to handset activation) and on an ongoing basis (linked to service delivery). On the service side, most countries impose some form of value-added tax (VAT), a general sales tax or a similar consumption tax calculated as a per cent of the total monthly bill. Some countries also charge an additional special communications tax as a per cent of the service bill. Finally, some countries also charge a fixed tax that could be either driven by general communications or wireless usage. Beyond service taxes, levies can also be imposed on handset acquisition. Broadband consumption taxes, generally referred to as Internet Access Taxes, are not uniformly applied across countries. In some cases, since broadband is considered to be a critical need, regulators have chosen to exempt broadband service from any consumption tax. In other cases, governments consider the ever-growing Internet access an attractive source of revenue and therefore, subject to taxation.

Beyond telecommunication and broadband provisioning, taxation of other players in the digital value chain, such as digital advertisers, content over-the-top distributors, and electronic commerce platforms, presents numerous conceptual problems, which result in a much more diverse set of approaches. There is still no consensus among policy makers as to what category should digital goods fall into, or whether a digital good should be taxed at all.

The ongoing debate around taxation policy in the digital economy entails multiple issues:

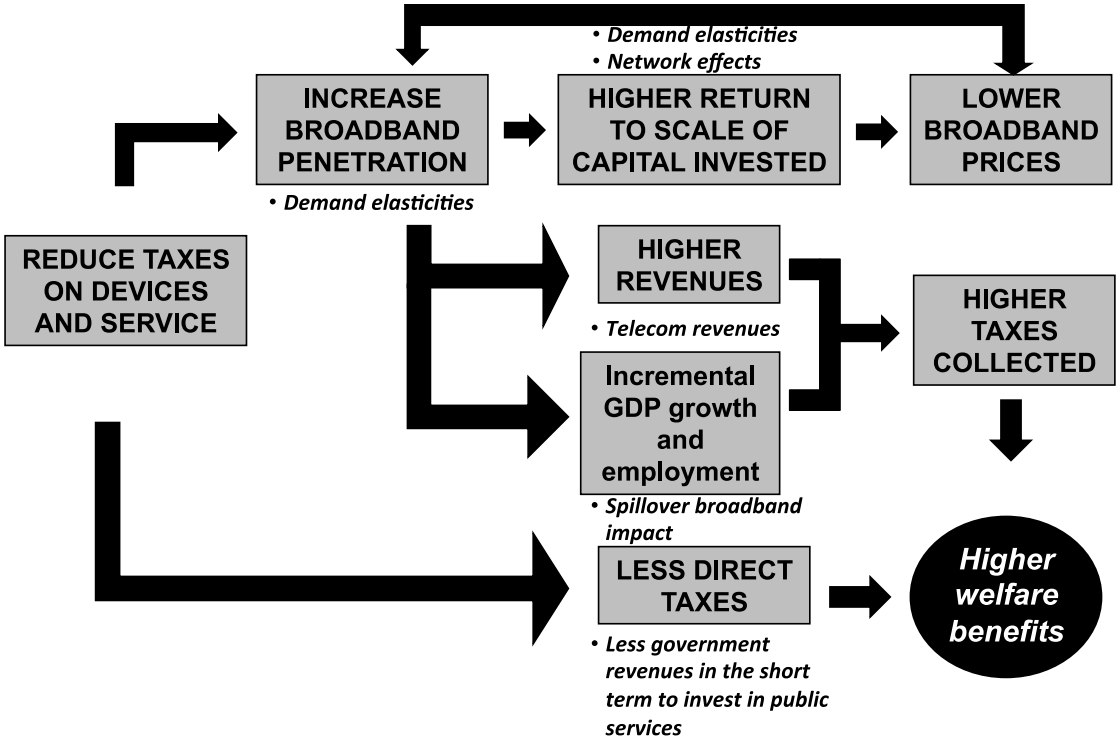
- What is the appropriate level of taxation on capital equipment purchased by telecommunication operators?
- How should Internet sales be taxed?
- How should consumption of digital goods be taxed?
- Should the consumer purchasing wireless devices and personal computers be taxed?
- Should the providers of digital platforms, such as Google and Facebook, be taxed at the country where revenues are generated, or should they benefit from international rules that allow them to take corporate tax exemptions in certain locations?

- Should Internet service providers pay taxes the same way as telecommunication carriers?

The list of issues could be extended, but the cases mentioned above serve to raise the point that taxation in the digital economy is one of the most important policy issues in today's environment. Valid policy arguments and trade-offs could be raised on every one of them.

At the highest level, two opposing trends can be detected in terms of digital taxation policy: one aims to maximize collections based on exponentially growing digital flows; the second one recognizes that lowering taxation benefits consumers and businesses, and consequently, economic growth. According to the first trend, governments recognize that digitization is critical in their generation of revenues and are putting in place more mechanisms to maximize collection in these domains of economic activity. On the other hand, some countries consider that lowering taxes on the digital sector of the economy triggers spillovers that are larger than the foregone taxes. This effect in the case of broadband taxes is depicted in the following Figure A.

Figure A: Virtuous circle of tax reduction on broadband devices, equipment and services



Source: Katz, R. and Berry, T. (2014) Driving Demand of Broadband Networks and Services. London: Springer

As Figure A indicates, a reduction of taxes on devices and service has a positive impact on broadband penetration as a result of demand elasticities. The increase in broadband penetration improves the number of households connected (in fixed broadband) and the number of mobile broadband subscribers per infrastructure deployed. This increase in penetration enhances the return on the network capital invested. A higher return on capital allows the broadband service provider to lower prices, which in turn has a positive impact on penetration. At the same time, an increase in broadband penetration has direct and indirect effects. On the direct side, it means an improvement in the revenues of broadband operators. On the indirect side, it enhances the contribution of broadband to economic growth and employment. Both effects increase the taxable base, which in turn grows the collected taxes beyond the amount foregone by reducing taxes on broadband devices and services. This effect yields higher welfare benefits.

In principle, taxation should attempt to be neutral and equitable across all sectors of the economy. A distortion occurs when a change in the price of a good resulting from taxation triggers different changes

in supply and demand from what would occur in the absence of taxes. Taxes can create distortions if they affect the choices made by market agents, which in the digital space could be the following:

- consumers, particularly those that are price sensitive, face an affordability barrier in the adoption of technology if taxes increase the total cost of ownership;
- telecommunications/ICT service providers reduce their rate of investment in infrastructure if taxes reduce the total available capital to be spent;
- global digital technology providers adapt their deployment footprint according to a minimization of tax burden; and
- different tax regimes within the digital eco-system create asymmetries across industrial sectors.

This study identifies the distortive effect of taxes in the digital eco-system on three levels:

1. Potential disparity in tax burdens imposed on telecommunication operators when compared to other operators of the digital eco-system (for example, digital advertisers, social networks).
2. Taxation asymmetry among global players in the digital sector.
3. In country taxation asymmetry between the telecommunication sector and other providers of other goods and services.

Governments should examine these asymmetries to determine whether they are a source of distortion. Furthermore, considering the significant indirect impact of digital platforms (such as new business creation, and transaction efficiencies), governments should examine the issue of taxation of digital players in a careful manner. In developing fiscal policies, governments need to consider the trade-offs between revenue generation and the potential negative impact on the development of the digital sector. Recognizing that answers to these questions should be developed based on country-specific policy trade-offs between revenue generation and the potential negative impact on the development of the digital sector as well as the telecommunication/ICT market environment, the evidence provided in this report should help understand the implications of these decisions.

The evidence regarding the economic impact of digital industries, ranging from fixed broadband to computing, the Internet, and mobile broadband, continues to grow. From that perspective, the argument to reduce potential distortions emerging from over-taxation of the sector is gaining ground. As others have argued, the reduction in digital sector taxes needs to be weighed in terms of the potential reduction in revenues. Having said that, the need to establish a balanced view of tax policy across sectors in order to eliminate distortions is a tall order.

Table of Contents

List of tables, figures and boxes

Tables

Figures

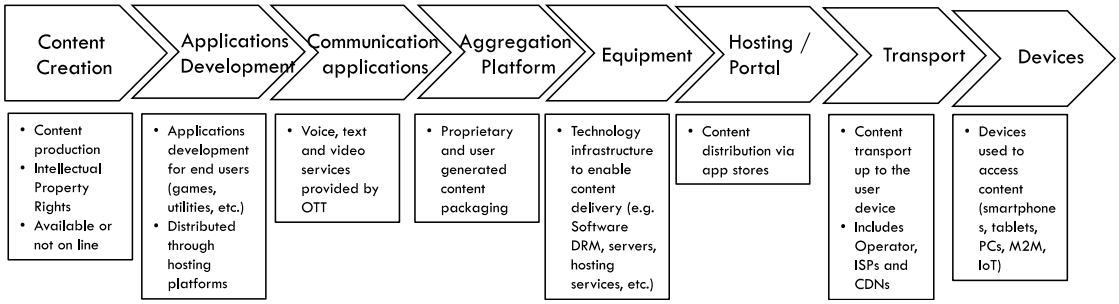
Boxes

Introduction

Decisions regarding taxation are driven by public policies guided by normative goals (how much revenue should the state collect to pay for what type of services to be provided to its citizens?) and the cost/ benefit equation incurred to meet those objectives. While the benefits of taxes relate to general policies (e.g. raising revenues to support the public administration) or specific objectives (e.g., support the development of broadband in schools), economic theory also shows that, in general terms, taxation affects market equilibrium by shifting the demand and supply curves as a result of raising prices with the consequent reduction in the quantity of goods. Along these lines, the impact of taxation in the digital economy is a multi-pronged debate that needs to be structured around not only the benefits it generates, but also the costs in lost surplus it may imply.

In the case of the digital economy, the debate around taxation entails multiple issues. Let's start by assuming that the concept of digital economy encompasses all firms involved in the generation, processing, consuming, storing, and transferring digital goods and services. In general terms, the digital eco-system involves all firms operating in the following value chain (see Figure 1).

Figure 1: Value chain of the digital economy



Source: ITU

The digital economy value chain comprises firms operating within an eco-system delivering content and applications to consumers and enterprises. The first three stages are focused in developing raw content, providing applications such as games and other platforms, and offering communications utilities. In the far left of the chain, content creation firms assume responsibility for developing news, video, music, etc. In the next step, a number of players develop applications and services, such as games (e.g. Zynga), electronic commerce (e.g. eBay), and other utilities. In the next stage, the developers of communications applications operate messaging (e.g. WhatsApp, Viber), and VoIP (e.g. Skype) platforms. The aggregation platforms, located in the fourth stage, are either social networks (e.g. Facebook, LinkedIn) or search utilities (e.g. Google, Bing) that are a point of access to content, utilities and communications applications operating in the first three stages. The equipment stage comprises firms providing technology inputs to service providers, while the hosting stage of the value chain comprises a range of infrastructure companies supporting the ecosystem: data centre operators, hosting services (e.g. IBM, Amazon Web Services), and companies that offer back-office services (such as authentication, billing, marketing, and analytics). The transport stage comprises traditional telecommunication operators providing connectivity, while the device suppliers are the manufacturers of smartphones, PCs, tablets, and associated software.

In theory, it could be assumed that each stage of the value chain should be taxed according to standard and uniform fiscal policy principles. However, since a lot of the firms operating within this eco-system do so on the basis of new business models (with little infrastructure, no presence in countries where the service is purchased, or delivering intangible products) the principles of taxation do not seem to be clearly defined. In fact, several policy decisions regarding taxation in this sector of the economy are currently being widely debated:

- **What is the appropriate level of taxation imposed on capital equipment purchased by telecommunication operators?** In many countries around the world, broadband and mobile

service operators pay sales taxes and import duties on the acquisition of network equipment. In some cases, the argument justifying taxes is focused on protecting local technology industries. However, certain governments (e.g. Malaysia, some states in the United States of America) have decided to exempt carriers from paying sales tax on equipment. The argument in this case is that, by collecting taxes, the rate of deployment of broadband networks might be negatively affected. If this is the case, the spillover benefits of broadband might be limited.

- **How should Internet sales be taxed?** Consumers pay sales taxes at the time of purchasing of a good based on the location of the physical store at which the consumption is conducted. However, governments find it difficult to tax Internet sales because there is no retail address. In theory, the consumer is required to pay the tax to the government authority where he resides. Some countries, such as Switzerland, have been successful at implementing this. However, this is not always the case. While the volume of e-commerce as a proportion of retail trade continues to increase around the world, sales taxes on goods purchased on the Internet are not paid in many cases. Some governments are trying to redress this imbalance by taxing e-commerce sales.
- **How should consumption of digital goods be taxed?** The issue raised in the point above could be extended to the purchasing of digital goods (such as the payment of a monthly fee for video streaming services). In most cases, payment of video streaming subscriptions from providers like Netflix or Apple TV does not include taxes. In a recent case, the municipal government of Buenos Aires, Argentina imposed a tax on Netflix subscriptions to be collected on the basis of monitoring of relevant credit card transactions. The purpose of the tax was to protect local providers of competing services.
- **Should the consumer purchasing wireless devices (smartphones, and tablets) and personal computers be taxed?** In most countries of the world, consumers pay a wide range of taxes at the time of acquisition of digital equipment (in most cases, they include a sales tax and import duties, but they might also include sector specific taxes). Some countries have imposed unusually high import duties and sales tax with the purpose of protecting national assembly sectors or collecting revenues. For example, Argentina collects a 35 per cent import duty and 21 per cent sales tax on imported mobile phones. Brazil imposes a 19 per cent duty and a whole range of additional taxes that could reach up to a 40 per cent rate. Venezuela collects an import duty of 14 per cent and imposes 12 per cent in sales tax. On the other hand, other countries, such as Colombia, assuming that taxes increase the cost of acquiring service, thereby reducing ICT adoption, have decided to exempt digital devices from import duties and even sales taxes for underprivileged citizens.
- **Should the providers of digital platforms such as Google and Facebook be taxed at the country where revenues are generated, or should they benefit from international rules that allow them to take significant corporate tax exemptions?** Some governments argue that, to avoid distortions and asymmetries, these operators should pay taxes at all locations where digital advertising in their platforms is fulfilled. Others are reluctant to impose levies given these operators' significant indirect economic contributions (e.g. new business creation, efficient market signalling and distribution).
- **Should Internet service providers pay taxes the same way as telecommunication carriers?** Examples around the world provide a sense of how complex this issue is. For example, the recent debate over net neutrality in the United States hit a taxation snag. Since 2002, the Federal Communications Commission voted to classify cable modem service as an "information service", falling under Title I of the Communications Act. At the time, the explanation was that less regulation would "promote investment and innovation", which would yield "better quality, lower prices, and more choices for consumers". In 2015, however, the FCC "reclassified" Internet service providers as common carriers under Title II of the Communications Act of 1934. In this context, the FCC requires all telecommunication carriers to contribute 16.1 per cent of interstate telecommunication revenues to the Universal Service Fund (USF). Additionally, by reclassifying ISPs under Title II, broadband access could be potentially affected by multiple taxes and fees commonly imposed on telecommunication carriers by state and local governments. In practice, reclassification would

mean consumers would pay more for broadband, potentially triggering disconnects and raising economic barriers for disadvantaged consumers. While the issue is not completely settled, the move raises the question of appropriate compromise between network neutrality and increased taxation. One approach would be that, in light of the economic effects mentioned above, network neutrality regulation should be tackled without including its taxation dimensions.

In another highly publicized case, the government of Hungary tried in 2014 to impose a tax on ISPs, requiring them to pay 150 forints (EUR 0.49) for every gigabyte of data traffic over their network. While the Hungarian government stipulated that it would make sure that the tax was not passed along to consumers, the measure faced harsh criticism. In the end, after large-scale protests, the tax plan was dropped[1]. Taxation of ISPs could also be applied in an indirect fashion. For example, in Ghana ISPs pay taxes on access modems to be installed in consumers' premises. In this case, this levy is passed on to consumers, which increases the cost of acquiring broadband service[2].

The question raised by these examples is whether a broadband tax is likely to stifle innovation and limit adoption of what is recognized as a general-purpose technology that contains important economic spillovers.

The list of issues could be extended, but the cases mentioned above serve to raise the point that taxation in the digital economy is one of the most important policy issues of the day. Furthermore, as indicated above, none of the cases have easy answers, since they entail normative objectives and have to be assessed with the help of rigorous cost/ benefit analysis.

This study attempts to shed some light on the state of the debate. Rather than taking a position on each of the issues, its purpose is to explain the theory and provide some of the evidence behind the choices governments need to make on the issue of taxation in the digital sector. These choices will certainly affect the evolution of the digital ecosystem in the years to come.

The paper begins by presenting in Chapter 1 the evidence and principles defined so far regarding the impact of taxation on consumption and capital investment. Chapter 2 presents an overview of taxation approaches on sub-sectors of the digital eco-system. Chapter 3 provides a perspective of how different countries approach the definition of taxation regimes in the digital economy. Chapter 4 raises the issue of distortion in digital sector taxation. Chapter 5 deals with potential barriers facing governments attempting to collect taxes in the digital world. Chapter 6 provides evidence of how taxation regimes might have a positive or negative economic impact. Chapter 7 presents cases where taxation regimes in the digital eco-system may contribute to generate distortions. Chapter 8 wraps up the analysis, highlighting some practices and recommendations.

1 Research on the impact of taxation on consumption and capital investment

The most important function of taxes is to raise revenue to finance government activities, ensure delivery of public goods, such as education, health, security, and deploy public infrastructure. In principle, governments maximize benefits to society only if they choose to tax when the marginal benefit of the services provided with the revenue derived from taxation exceeds the cost of the tax in terms of economic surplus. Taxes are typically raised on both net income and consumption of goods and services. The first type is collected over income generated in a fiscal year, while the second one is linked to the acquisition of a good or service (for example retail sales tax, value-added tax, and

[1] Fiscutean, A. (2014). "Plan to tax Internet traffic in Hungary sees protesters take to the streets". *Central European Processing*; "Hungary's Government Walks back Internet tax schemes after protests". *Latin American Herald Tribune*, March 2, 2015.

[2] "ISPs push for tax waivers on modems". *Business News (Ghana),* May 8, 2013.

import duties)[3]. In a specific case of income taxes, the corporate income tax is assessed either from the firm's income statement (profits after expenses) or the value of the net assets in the balance sheet. This section presents research on the impact that taxation can have on a corporation's capital flow and gross fixed capital formation, as well as on individual consumption.

1.1 Impact of taxation regimes on capital flows and gross fixed capital formation

The research literature tends to concur that a rise in the corporate tax rate in an open economy causes a net capital outflow, and negative economic welfare. Since taxes tend to raise the required pre-tax rate of return of capital invested, the aggregate capital stock in a given economy depends on the effective tax rate[4].

In general terms, most research literature has found that taxation regimes play an important role in driving capital flows, when controlling for economic development, unemployment and currency fluctuations[5]. Accordingly, when a firm has to make an investment decision, taxation plays a significant role. Taxes affect both the incentives of a company to make investments and reduce the supply of funds available to finance them. Several empirical studies indicate that, all things being equal, marginal and average tax rates have a negative effect on investment decisions. It should be noted here before going further that this research evidence has been generated in a pre-digital age context. Given the "intangible nature" of digital goods and the structure of digital firms' business models, one could argue that the influence of taxation on capital flows and firm behaviour might not be the same as in the case of physical goods (or at least, that the dynamics might be slightly different). The topic will be addressed further in this document.

Since investment is one of the engines of long-term economic growth, taxation plays a direct role in this equation. Research has shown that a reduction of corporate income taxation determines, over time, an increase in the level of gross fixed capital formation[6]. Research has also found this effect to be more important in emerging market economies, where investment needs are greater.

However, taxes are just one of the many factors driving capital investment decisions. Beatty et al. (1997) showed that high net equity financing activity (access to low cost funds) and high stock returns (market signalling) are also important variables in explaining high future net capital expenditures[7]. Similarly, as expected, the authors found that high net income and low dividend pay-outs are important predictors. Nevertheless, when controlling for these factors, the authors also found that, for instance, changes in the tax code in the United States in 1986 had a real effect on the investment behaviour of US-based firms[8].

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3 See OECD. *Addressing the tax challenges of the Digital Economy.* Paris, 2014.

4 As Devereux, M.P. states, "(If a) company should invest up to the point at which the marginal product of capital equals the cost of capital (…) the impact of taxation should be measured by the influence of (an effective marginal tax rate) on the cost of capital". (*The impact of taxation on the location of capital, firms and profit: a survey of empirical evidence.* Oxford University Centre of Business Taxation. Working paper WP 07/02, 2006).

5 See Slemrod, J. "Tax effects on Foreign Direct Investment in the United States: evidence from a cross-country comparison", in A. Razin and J. Slemrod eds. *Taxation in the Global Economy*, Chicago: University of Chicago Press, 1990, pp. 79-117.; Devereux, M. and Freeman, H. "The impact of tax on foreign direct investment: empirical evidence and the implications for tax integration schemes" *International Tax and Public Finance,* 2, 1995, 85-106.; Jun, 1994. *How taxation affects foreign direct investment (country-specific evidence),* Policy Research Working Paper 1307, Washington DC: World Bank.; Billington, N. "The location of foreign direct investment: an empirical analysis", *Applied Economics,* 31, 1999, 65-76.

6 Talpos, I. and Vancu, I. (2009). "Corporate Income Taxation Effects on Investment Decisions in the European Union", *Annales Universitatis Apulensis Series Oeconomica*, 11 (1), pp. 513-518.

7 Beatty, R., Riffe, S., Welch, I. (1997). "How Firms make capital expenditures decisions: financial signals, internal cash flows, income taxes and the Tax Reform Act of 1986". *Review of Quantitative Finance and Accounting*, 9 (1997): 227-250.

8 In 1986, the U.S. Congress passed the Tax Reform Act (TRA) to simplify the income tax code, broaden the tax base and eliminate many tax shelters and other preferences. The act raised overall revenue by USD 54.9 billion in the first fiscal year after enactment. As of 2014, the Tax Reform Act of 1986 was the most recent major simplification of the tax code, drastically reducing the number of deductions and the number of tax brackets (for the individual income tax) to three.

The mechanisms by which taxes affect technology (particularly telecommunications) investment are fairly complex. In general terms, Devereux (2006) considers that taxation first affects two binary decisions: in **which business** to invest (e.g. wireless, broadband, or other) and, in **which geographic location** to invest (e.g. a specific country)[9]. In addition, taxes also influence a continuous choice: once a business and locations are agreed upon based on taxation attractiveness, levies affect their capital expenditure allocation process. In other words, taxes will influence **how much** investment will favour certain locations to the detriment of others.

It should be noted that changes in tax regimes do not affect investment decisions instantaneously. Investment decisions are partially driven by variables that only change gradually (e.g. changes in the cost of capital). As a result, a modification of taxation regimes (e.g. a change in the sales tax rate affecting the initial purchasing of network equipment) might affect the incentives to invest immediately, but translate in investment decisions only gradually[10]. An implication of the evidence that indicates that corporate investment behaviour lags changes in tax regimes is that countries that constantly change tax policies introduce another layer of complexity for firms planning future investment. In other words, by the time the firm is ready to adjust to the tax regime imposed in past years, a new change imposed by the government modifies the underlying premise of future investment. This situation, which is rather common in the telecommunication industry, makes it very complex for operators to plan future capital investments.

The factors outlined above are even more important in capital-intensive industries such as telecommunications. Typical capital planning processes in telecommunications comprise decisions in three domains: maintenance of existing plant (e.g. replacement of depreciated equipment), network modernization (e.g. deployment of 4G networks, deployment of fibre in the access network, deployment of DOCSIS 3.0), and capacity upgrades (e.g. investment to accommodate growth in demand). Each investment domain is driven by different time constraints. For example, maintenance capital investment is typically multi-year and mostly non-discretionary; therefore, it is largely predictable and relatively less subject to taxation effects. Network modernization capital, while also being multi-year, could be affected by capital allocation decisions influenced by taxation (in other words, if taxation reduces the supply of funds, it could impact investment thereby affecting the rate of network modernization). On the other hand, capacity upgrades have a long-term component driven by demand forecast, but also a very short-term component focused on surgical infrastructure upgrades (e.g. accommodate spikes in demand in certain portions of the network). This area of capital investment might be less affected by taxation regimes since it is directly linked to revenue generation opportunities.

Again, this last finding does not necessarily apply to digital players, such as Google or Facebook, which are less burdened by capital investments than conventional telecommunication operators. First, digital firms such as social networks or digital advertisers have limited infrastructure needs when compared to a network operator. Second, technology needs of digital firms are highly scalable ("pay as you go"), which limits the risk of stranded capital. Third, rather than requiring deployment over multiple countries like it is the case of telecommunication service providers, the resource conditions of digital operators allow them to centralize their infrastructure, thereby limiting the exposure to different tax regimes. All these differences indicate that digital operators behave in a different way when it comes to taxation, since they have much more flexibility to devise tax strategies.

The impact of taxation on corporate behaviour tends to vary according to the economic cycle, and evidence exists that in periods of economic expansion, the negative impact of taxation on investment affects primarily the supply of funds and not the incentives to invest[11]. Lintner states that, "So long

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9 Devereux, M (2006). The impact of taxation on the location of capital, firms and profit: a survey of empirical evidence. Oxford University Centre of Business Taxation. Working paper WP 07/02.

10 See (Auerbach, 2005).). *Taxation and capital spending*. Paper prepared for the Academic Consultants Meeting of the Board of Governors of the Federal Reserve System. University of California and NBER, September 2005.

11 Lintner, J. (1954), *Corporate Income Taxes: Their Effect on Investment*. Proceedings of the Academy of Political Science, Vol. 25, No. 4, The American Economy, Keystone of World Prosperity (Jan., 1954), pp. 14-26.

as profit positions are not unacceptably low and the necessary funds are available, very substantial amounts of new investment will be undertaken even where there is no very clear enough evidence that the individual investment moves will add enough to net profit to make them worthwhile".

The incentives mentioned include maintaining or improving a company competitive position, or increasing market share. Conversely, in periods of economic downturn, the effects of taxes on investment incentives would be relatively more important, and the availability of funds becomes less important in influencing investment decisions[12].

1.2 Taxation and consumption of consumer goods

Consumers are taxed based on their acquisition of goods and services. Taxes on consumption are important because they can affect the behaviour of users with regards to purchasing and use of digital goods and telecommunication services. The most prominent tax paid by consumers in some countries is sales taxes. As mentioned above, sales taxes are paid by retailers on the basis of the price of the good being sold. Although stores could simply incorporate the tax into the price of their goods, most stores add the tax onto the bill after the initial sale is calculated, to make the consumer aware of it. Because the burden of the sales tax depends on the price elasticity of the good, consumers will tend to assume the burden if demand is inelastic (in other words, if they cannot change their behaviour if a sales tax is imposed). Alternatively, if consumers shift their behaviour as a result of the tax (for example, stop purchasing the good once the tax is assessed because it is unaffordable by their budget), the burden of taxation is born by the supplier. In fact, while there are goods for which demand is inelastic (e.g. cigarettes) or completely elastic (e.g. luxury cars), the burden of taxation is, in most cases, shared between suppliers and consumers based on the relative elasticities of supply and demand.

The elasticity of telecommunication services is a function of penetration. At low levels of adoption, demand is fairly elastic, while elasticity diminishes over time. By compiling evidence of broadband service elasticity over time in the United States, it has been shown that, with growing penetration, elasticity coefficients tend to diminish significantly[13]. The same effect would apply to mobile telephony. Under inelastic conditions of telecommunications at high levels of penetration, consumers are expected to bear most of the taxation burden. This topic will be addressed in detail in section 6.2.

Beyond sales taxes, value-added taxes (VAT) and other consumption taxes are also designed to be indirect taxes because they are collected from the suppliers rather than consumers. The VAT is the primary form of consumption tax for most countries around the world. While similar to the sales tax in that it is imposed on consumption, but contrary to single-stage levy imposed on the final consumer, this tax is collected through a staged-process, whereby each entity in the value chain is responsible for collecting the tax on its output.

The third category of consumption tax comprises levies on specific goods and services, consisting primarily of excise taxes, customs and import duties, and taxes on specific services (e.g. tax on purchase of mobile handsets).

Research on consumer response to taxation varies according to the policy being considered. For example, under a tax reduction policy, consumers are expected to increase consumption. However, research has found that they will increase spending if the reduction in tax liabilities becomes permanent. In addition, consumers will wait to increase spending until a tax reduction affects their take-home pay, not before[14]. On the other hand, an increase in taxes, even a small change, has an impact on consumer behaviour, by eliciting a reduction in consumption. This has been shown to be the

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12 See also Fazzari, S; Hubbard, G; and Petersen, B. (1988). "Financing constraints and corporate investment", *Brookings papers on economic activity*.

13 Katz, R. and Berry, T. (2014). *Driving demand of Broadband Networks and Services*. London: Springer., p. 141.

14 See Steindel, C. (2001). "The effect of tax changes on consumer spending", *Federal Reserve Bank of New York. Current Issues in Economics and Finance*, volume 7, number 11.

case in fuel taxes[15], and would also be the case for telecommunication services. The popular reaction against an Internet tax in Hungary cited above would prove this point. In a recent study, it was also found that the imposition of a sales tax on products purchased on line in the United States (called the "Amazon tax") had an impact on consumer behaviour: consumers that face a tax on Amazon purchases tend to partly shift back to local "brick and mortar" retailers, or increase purchasing from competing non-taxed online retailers[16]. This particular finding will be discussed in detail in section 6.3.

1.3 Taxation and public policy objectives

As mentioned above, the primary policy goal of taxation is to provide a fair, efficient, and predictable way of financing government expenditures and delivery of public services. However, taxes can also be implemented to protect domestic industries, raise funds for specific public objectives (e.g. address the digital divide) and the like. To achieve these multiple objectives, governments select a mix of taxes. The mix of taxes varies across countries and even sub-sovereign entities (states, cities, etc.) because of the different objectives governments are attempting to maximize. Broadly speaking, a tax structure comprises income, sales, corporate, capital gains, property, inheritance, wealth (or net worth), and sector specific (such as insurance, energy, etc.). In this section, a brief description is provided of the general characteristics of taxes that have an impact on the dynamics of the digital eco-system.

1.3.1 Sales taxes (national, state and local)

Sales taxes are collected when a good or service is sold to its final consumer. The amount of the tax varies although it is usually based on a percentage of the sale amount. Sales taxes are typically collected at the national, state, and local level. Since there can be several jurisdictions charging a sales tax, the retailer must add the amount of tax for each of them to calculate the Combined Sales Tax Rate. In the case of Internet sales, the rate used is that of the location where the consumer resides.

Other taxes that are similar to the sales tax are the excise tax (charged on goods or sales produced within the country), and the gross receipt tax (charged on the gross revenues of a business or company). The fundamental difference in these cases is that both of them are charged to the firm producing the good (such as a telecommunication operator) rather than the consumer, although the operators transfer them to consumers if taxes are part of their cost of capital.

From a policy standpoint, sales taxes are considered as an alternate way for collecting revenue, as many governments rely primarily on this approach to avoid income taxes. In addition to the general sales tax rate, governments can enact taxes that affect the sale of specific goods and services (e.g. beer, wine, tobacco, luxury cars). In this case, the objective is to discourage consumption, in addition to raising revenue. Conversely, sales taxes can be exempted in case of ordinary clothing and food to give low income segments a slight advantage. This has also been the case in telecommunication services. For example, Colombia has exempted the three lowest social strata from paying value added taxes on broadband services. This results in a 16 per cent reduction in subscription tariffs for these customers[17].

1.3.2 Import duties

Custom duties are put in place as a measure to limit imports in order to protect nascent industries until they develop comparative advantage, protect declining industries in order to slow down their rate of decline, protect strategic industries (such as energy, steel, armaments, and food), protect non-renewable resources, and deter unfair competition (such as dumping by foreign firms). Custom

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15 See Fowler, J. and Li, S. and Muehlegger, E. (2011). Gasoline taxes and consumer behavior", John F. Kennedy School of Government, Harvard University.

16 See Baugh, B., Ben-David, I., and Park, H. (2014). "The "Amazon tax": Empirical evidence from Amazon and Main Street retailers", *National Bureau of Economic Research NBER Working paper No. 20052*.

17 Katz, R. and Callorda, F. (2015). *Experiencia de planes subsidiados o con tarifas sociales*. Study commissioned by the Government of Ecuador. Ministry of Information Society and Telecommunications. New York.

duties are imposed usually in an *ad valorem* form, as a percentage increase on the price of the imported product.

In general terms, an import duty results in a rising price for the consumer, with the consequent loss of consumer surplus. On the other hand, the loss in consumer surplus would have to be assessed in light of a gain in producer surplus resulting from price protection of domestic producers, and the consequent protection of local employment. Research, however, indicates that the reduction of consumer surplus resulting from custom duties is greater than the increase in producer surplus. This issue will be revisited in the context of digital products and services since additional negative effects of custom duties in this domain could range from a reduction in service adoption (as a result of higher prices), and a slowdown in the country's rate of technological innovation.

1.3.3 Sector specific taxes

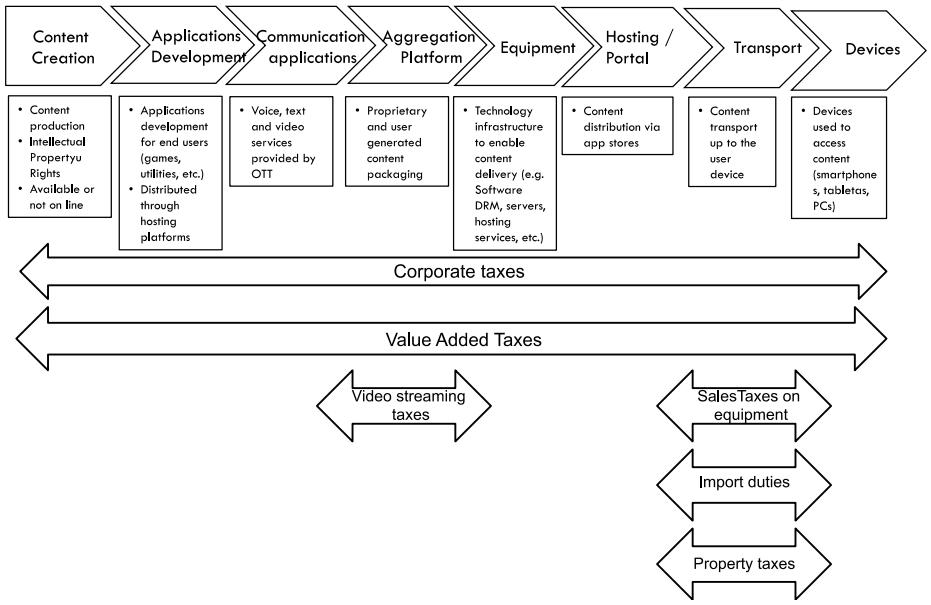
Sector-specific taxes are generally imposed on profitable sectors to raise funds for specific purposes (e.g. improve health care public service). These taxes are advantageous in terms of their predictability, sustainability, and low transaction costs. On the other hand, by raising the consumption costs, they tend to penalize the lower-income consumers, and they can be politically unpopular. From an institutional standpoint, it is often the point where sector-specific taxes are difficult to "ring-fence" in order to address the specific purpose for which they were collected, and they end up being used for other government priorities.

Having provided a review of the evidence regarding the general impact of taxation on the behaviour of firms and consumers as well as the different types of taxes, the next chapter presents how these are imposed in the case of the digital eco-system.

2 An overview of taxation on sectors of the digital eco-system

The digital eco-system is taxed by multiple levies at all stages of its value chain (see examples in figure 2).

Figure 2: Example of taxes at stages of the digital eco-system value chain



Source: ITU

As Figure 2 shows, corporate taxes and VAT are typically applied to all firms in the digital value chain. Import duties are included in all types of equipment, whether they are consumer-oriented or needed by infrastructure operators. Finally, firms within the eco-system can also be taxed through a number of sector-specific taxes, whether they are applied to the selling of digital goods (like video-streamed movies) or the ownership of wireless devices.

The following chapter will review the taxes imposed within five stages of the value chain:

- telecommunication operators;
- telecommunication consumers (including wireless and broadband users);
- Internet service providers;
- over-the-top players (comprising content providers, digital advertisers, and e-commerce players); and
- application developers.

2.1 Taxes applied to Telecommunications operators

Telecommunications operators typically pay corporate taxes on profits, but are also expected to contribute at several levels. First, in many countries operators pay import duties on equipment purchased from overseas suppliers. Second, service providers pay property taxes on buildings and land owned where equipment is installed. Third, telecommunication operators also pay sales taxes on equipment purchased. Sales taxes can be collected at three levels: national, state or province, and local. Finally, operators pay also taxes on local and international interconnection revenues.

In the first three cases - import duties on purchased equipment, property taxes, and sales tax on equipment - the burden of taxation is borne by the operator. In the fourth case, the burden is shared between providers and final users. As discussed in the general section, and will be further explained in section 6.1, the impact of these taxes is that they can potentially reduce the availability of investment funds[18]. Since, as mentioned above, taxes raise the required pre-tax rate of return of capital invested, aggregate capital stock depends on the effective tax rate. This can act as a disincentive to invest in network modernization and prompt carriers to continue operating with obsolete or capacity-constrained equipment, ultimately affecting consumer welfare, and telecommunication socio-economic contribution.

This last factor is the reason why some governments have made the decision to reduce equipment purchase taxes in order to stimulate the deployment of more advanced technologies. For example, of the fifty states in the United States, twenty exempt sales taxes on the purchasing of equipment by broadband providers. As in the case of Malaysia, the purpose is to treat broadband provisioning as a critical contributor to economic growth. In addition, research indicates that the spillover effects of deployed broadband amply compensate the foregone telecommunication tax by expanding the tax base.

Telecommunication operators are also imposed a tax payment on interconnection revenues, where double taxation raises the prices of telecommunication services, diminishing demand and additionally affecting tax revenues. This topic will be addressed below in section 4.2.

2.2 Taxes applied to the consumption of telecommunication services

Consumption in the telecommunication industry is affected by several types of taxes. As mentioned above, some taxes are directly borne by the consumer (e.g. fees attached to the acquisition of devices), while others, such as sales tax on services, while included in the subscriber bill, are shared by providers

[18] It is important to note, however, that, as mentioned above, taxation is only one of many variables affecting telecommunication investment.

and consumers. This section reviews taxes on wireless services (including mobile broadband), and fixed broadband.

2.2.1 Wireless users

In most countries, wireless users pay taxes at the time of service acquisition (generally linked to handset activation) and on an ongoing basis (linked to service delivery). Three types of taxes exist in the wireless services sector:

1. Value added or sales tax: most countries impose some form of value-added tax, a general sales tax or similar consumption tax as a per cent of the total monthly bill.
2. Telecom specific taxes: some countries charge an additional special communications tax as a per cent of the service bill.
3. Fixed taxes: in addition to the tax as a percentage of usage, some countries charge a fixed tax that could be either driven by general communications or wireless usage.

In addition to service-based taxes, other levies can be imposed on handsets (related to activation):

- Value-added or sales tax: these represent the taxes paid directly by the consumer at time of purchasing a subscription or handset, as well as when exchanging the device.
- Customs duty: this tax is already included in the retail price of the handset.
- Other taxes: telecommunication specific taxes on handsets (e.g. royalties calculated on the cost of handset).
- Fixed taxes**:** special fixed duties on handset, such as ownership fees and fees for recycling[19].

In more detail, taxes on consumption of wireless include some or all of the following (see Table 1).

Table 1: Examples of consumer taxes impacting total cost of ownership of mobile telecommunications (2014)

	Initial purchase (taxes on devices)	Ongoing use (taxes on service)
GENERAL TAXES	• Sales tax on handset (United States) • Customs duty imposed on device (Argentina, Brazil, Pakistan, Panama, Peru, Tanzania) • Ownership fees • Excise tax (Argentina) • Special consumption tax on discretionary spending (Panama)	• Excise tax on usage (charged on calls, SMS, monbile broadband or m-Money) (Argentina) • Federal and provincial sales tax on service (Brazil, Pakistan, United States)
SECTOR SPECIFIC TAXES	• SIM card tax (Argentina, Bangladesh, Brazil, Chad, Egypt, Pakistan, Peru, Turkey) • Activation VAT (Tanzania)	• *Impuesto especial sobre producción y servicios (Mexico)*

Source: ITU

[19] In Switzerland for example, 1 CHF is added to the price of all electronic appliances as an anticipated recycling fee.

Some of these taxes are specific to some countries[20]. For example, box 1 describes the taxes imposed on the wireless sector in the United States.

Box 1. Taxes on wireless telecommunications in the United States

Wireless operators in the United States are subject to them following taxes and contributions:

- Federal USF tax: The programme subsidizes telecommunications services for schools, libraries, hospitals, and rural telephone companies operating in high cost areas. The USF is assessed on a provider's interstate revenues, which the FCC deems to be 37.1 per cent of the wireless bill for customers purchasing calling plans that do not distinguish between interstate and intrastate calls.
- Most states in the US impose 911 fees to fund capital expenses for the emergency system, and in some cases, the fees fund 911 operations as well.
- State USF funds: some states have their own USF that provide subsidies for many of the same purposes as the federal USF. State USF surcharges are imposed on revenues from intrastate telecommunication services, while the federal USF applies to revenues from interstate services.
- State-level gross receipt wireless taxes: In addition to 911 fees and state USF charges, a total of 13 states impose taxes on wireless service at the state level that are considered either in addition to sales taxes or in lieu of sales taxes but at a higher rate than the state sales tax.
- Local taxes: Local governments in 12 states currently impose some type of local tax or fee on wireless consumers. With the exception of California, which does not impose a sales tax on wireless service, these local taxes are in addition to any applicable state-level tax on wireless service.

According to this list of taxes, US consumers pay an average of 17.05 per cent in combined federal, state, and local tax and fees on wireless service. This is comprised of a 5.82 per cent federal rate and an average 11.23 per cent state-local tax rate. Because of the decentralization of tax policy, the tax rate can reach 18.6 per cent (Washington State) or Nebraska (18.48 per cent). In addition, due to local nature of some taxes and fees, four cities – Baltimore, Chicago, New York City, and Omaha – have effective tax rates in excess of 25 per cent of the customer bill. In sum, the average rates of taxes and fees on wireless telephone services are more than two times higher than the average sales tax rates that apply to most other taxable goods and services (Mackey and Henchman, 2014).

The Universal Service can also be considered a contribution insofar that its purpose is to address a specific market failure with a social policy. See comments below.

In Brazil[21], the mobile taxation system is fairly complex. A calculation shows that of every Brazil Real that a consumer pays for telecommunication services, about 0.65 goes to the government. The basic tax structure comprises an internal VAT (ICMS) that is calculated over revenues and is set by each state in Brazil. It ranges from 18 per cent to 35 per cent, and thus, is equivalent to 22 per cent to 54 per cent of an internationally understood VAT. Additionally, there are two other contributions: PIS and Cofins, at the rates of 0.65 per cent and 3 per cent, a universal service contribution (1%) and a contribution

[20] See chapter 3 on detailed review of taxes applied in each country.

[21] Katz, R., Flores-Roux, E., and Mariscal, J. (2011). The impact of taxation on the development of the mobile broadband sector. London: GSMA. Deloitte (2012). Mobile telephony and taxation in Latin America. London: GSMA.

to pay for Anatel (regulator) running costs (0.5%). There is also an additional per subscriber (initial tax) charge of about BRL 25 in mobile telephony. Most of these taxes also apply to handsets, though certain types of handsets are also subject to import duties. Except the VAT and the universal service contribution, all of these taxes work in "cascade mode", meaning they are paid on every transaction (this is relevant on interconnection payments). In sum, the total tax on the Brazilian consumer total cost of ownership of a wireless phone is estimated at 43.3 per cent. Services are taxed at 40.2 per cent and handsets at an average of 57.3 per cent, assuming 30 per cent of handsets are imported[22].

In a recent case, the government of El Salvador has introduced a bill proposing a 10 per cent tax on telecommunication services, with the intention of raising funds for implementing El Salvador's insurance plan[23].

An issue worth mentioning here in terms of contributions borne by the wireless consumer is the universal service obligation. In principle, this amount, which is typically included in the subscriber bill, should not be considered a tax. If taxes are considered as revenues to the general treasury of a country to cover government needs, the universal service fund is effectively a contribution used for purposes of addressing the telecommunication supply gap (e.g. service provision in remote and isolated areas). On the other hand, in many countries, fund revenues are not distributed in terms of service deployment in unserved areas but tend to support government needs (for example, it is considered part of the budget of the Ministry of Communications). Along those lines, the difference between a conventional sales tax and a universal service fund contribution becomes less clear. Finally, regardless from the purpose of the monies collected, the burden of the universal service fund needs to be borne by either suppliers or consumers. With wireless telephony becoming less elastic as a result of growing penetration, it would be correct from an economic standpoint to consider the universal fund contribution to be a type of tax. Countries and market players tend to differ with respect to this issue. For example, in the United States, the universal service fund is considered a tax.

2.2.2 Broadband users

Broadband consumption taxes, generally referred to as Internet access taxes, are not uniformly applied across countries. They take the form of taxation on Internet service providers, which in turn levy these charges on consumers. In some cases, since broadband is considered to be a critical socio-economic need, regulators have chosen to exempt broadband service from any consumption tax. In other cases, governments consider the ever-growing Internet access an attractive source of revenue and therefore, subject to taxation.

All in all, attempts to introduce a tax on broadband usage has been met with considerable opposition from either advocates of network neutrality, or telecommunication/ICT operators, both concerned that an increase in taxes will raise the total cost of ownership of a broadband subscription, thereby limiting service adoption. For example, the issue was raised in France in 2008 when the opportunity of an Internet access tax was presented as a way to fund the country's state-owned television stations[24]. The tax was originally conceived as a way of helping suppress advertising on public channels by creating other sources of revenues. However, the proposal did not prosper.

In May 2013, the France Government considered the enactment of a 1 per cent "Internet tax" on smartphones and tablets[25]. Again, the objective was to help the development of French cultural content. After strong opposition of device manufacturers, the proposal was scrapped in September of 2013[26].

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22 According to the Association of Brazilian Electronics Manufacturers (ABINEE), Brazil exported 7.4 million smartphones and imported 7.5 million. Foxconn assembles the iPhone in a plant located in Brazil employing 6 000 workers and is planning to start sourcing components (cables, cameras, and touch-sensor screens in the country in 2016.

23 Telegeography. El Salvador government proposes a 10% tax on telecoms services. September 21, 2015.

24 "French President proposes Internet Tax", *Daily Tech*, January 11, 2008.

25 "France set to introduce 1% 'Internet Tax' on smartphones and tablets". *Daily Mail*, May 13, 2013.

26 "France postpones smartphone tax", *The Hollywood Reporter*, September 13, 2013.

Similarly, the Government of Hungary proposed an Internet tax in October 2014. The levy was set at 150 forints (EUR 0.49, USD 0.62) per gigabyte of data traffic. While the tax would have been paid by ISPs, the government assured that it would prevent the tax to be transferred to consumers. The government estimated tax revenues derived from the tax to reach 20 billion forints (or EUR 65 million). Hungarian consumers already have a tax on phone calls and text messages, but the maximum amount paid is capped. Individuals pay a maximum of 700 forints (EUR 2.27) a month, while companies have a 5 000 forint (EUR 16.26) limit. After mass protests, the government decided a month later to cap the tax at 700 forints (USD 2.90) per month for consumers[27]. In September of 2015, a 19.5 per cent tax on broadband usage was introduced in Pakistan[28].

In the United States, as established by the Internet Tax Freedom Act (ITFA), the Federal government does not collect sales taxes on broadband subscriptions. However, as part of a compromise ten states are allowed to collect taxes on access charges higher than USD 25.00 per month.

2.3 Taxation of Internet service providers

Beyond taxes on Internet consumption, ISPs can also be subject to sector specific levies. These could appear in the form of conventional corporate taxes, sales taxes on initial equipment purchase, indirect taxes on equipment to be installed at customer premises, and property taxes for physical assets.

Corporate taxation of ISPs profits is fairly universal, although rates vary by country. For example, in Tanzania, the corporation tax affecting ISPs amounts to 30 per cent, while in Pakistan it is 34 per cent (with an additional 17 per cent on revenues)[29]. In Panama, the corporate tax rate on profits is 27.5 per cent[30], while in Colombia it reaches 33 per cent. In this last case, if the company does not generate a profit, they are charged 3 per cent of equity value. Finally, in Argentina corporate taxes reach 35 per cent of profits.

In addition, taxation of ISPs could also be applied in an indirect fashion. For example, ISPs in Ghana pay taxes on access modems to be installed in consumers' premises. In this case, this levy is passed on to consumers, thereby increasing the cost of acquiring broadband service[31]. In this case, ISPs consider that, by raising the cost of service acquisition, collecting taxes on customer premise modem equipment raises the broadband adoption hurdle.

Sales tax on initial equipment purchase is another conventional way by which ISPs contribute to the treasury. As in the case of telecommunication operators, sales taxes are collected at either the national or federal, state or provincial, or local municipal level. Rates in this case could reach up to 10 per cent, to which customs duty on network equipment should be added. In Chile, for example, the customs duty is 6 per cent. In Mexico, the duty on imported network equipment varies by type of device, ranging between 5 per cent and 15 per cent[32].

Another type of ISP taxation is that of property taxes. For example, in the United States these operators pay property taxes for the physical assets they own in each state, as well as sales tax on the equipment purchased to support the delivery of broadband service. Payment of property taxes is based on the notion that broadband providers are "utilities", and as such, they need to pay taxes originally established for railroads. The amount is calculated by valuing the entire business enterprise, rather than summing up the fair market value of specific fixed assets owned by the business[33]. The key ratio

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27 Source: Fiscutean, A. "Plan to tax Internet traffic in Hungary sees protesters take to the streets". *Central European Processing*. October 23, 2014.

28 BBC News. Broadband tax hits Pakistan Internet users. September 13, 2015.

29 Source: International Bureau of Fiscal Documentation; Pakistan Telecommunications Authority.

30 KPMG (2015). *Corporate tax rate tables.*

31 "ISPs push for tax waivers on modems". *Business News (Ghana),* May 8, 2013.

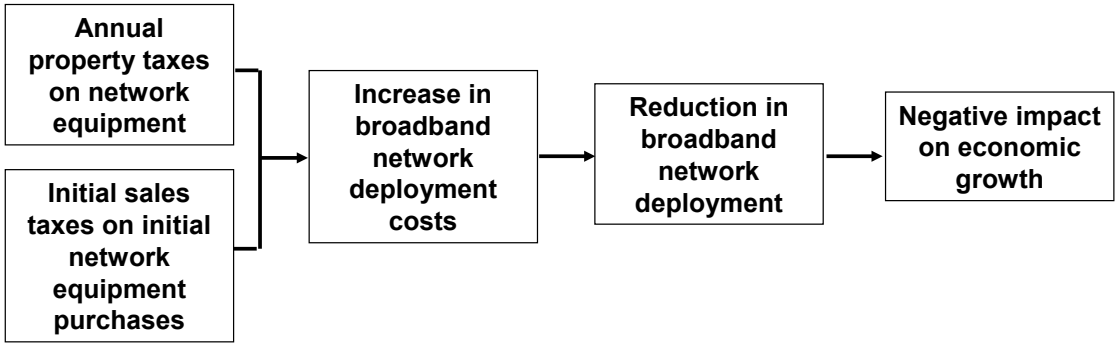
32 Import Duty Calculator www.dutycalculator.com/popular-import-items/import-duty-and-taxes-for-network-equipment/

33 See Bierbaum, D., Fenwick, J. and Mackey, S. (2011). *Property Tax Discrimination: Barrier to broadband*. Presentation at the ALEC Spring Conference. Cincinnati, OH, April 29, 2011.

in determining the tax to be paid is the so-called "assessment ratio", which is the proportion of the property value that the tax rate is applied in establishing the amount to be paid in property taxes. In an example of sector discrimination, a number of states define higher assessment ratios to the property of telecommunication companies than the ratio applied to property of general businesses. In another case of discriminatory practices, some states in the United States apply higher tax rates to the property of broadband providers companies. The Colombia Government also collects property taxes ranging between 0.1 per cent and 1.6 per cent of the value of physical assets.

Direct taxes (particularly annual property levies on network equipment and sales taxes imposed on initial network equipment purchases) imposed on ISPs have a negative economic impact. The underlying causality of this effect is depicted in figure 3.

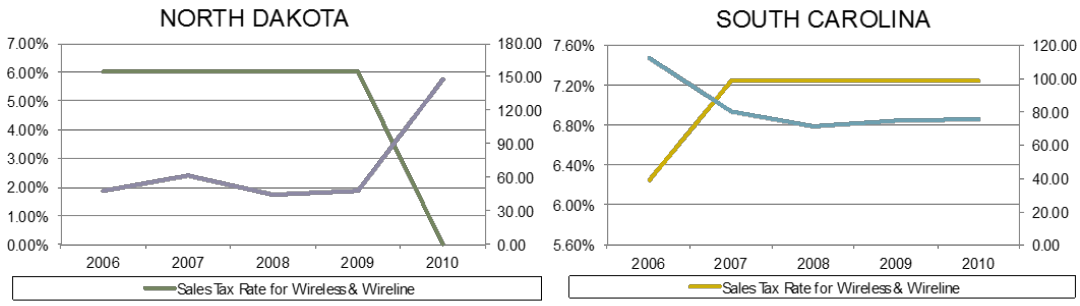
Figure 3: Impact of taxes on broadband network investment



Source: ITU

According to the logic presented in Figure 3, taxes on network equipment in the two dimensions mentioned above – property taxes and sales tax on equipment - tend to affect the deployment of broadband infrastructure by telecommunication carriers and cable TV operators. Suppliers of broadband services have their capital investments pre-determined by financial benchmarks (e.g. carriers typically tend to spend 13 per cent of their sales in capital expenditures). Taxes on equipment purchases negatively impact deployment. For example, in a study done by the author, the negative effect of the sales tax rate and capital spending of telecommunication companies in the United States was verified in specific states (see the examples in Figure 4).

Figure 4: Sales tax rate on telecom equipment and telecommunication capital spending (2006-2010)



Source: Katz, R., Flores-Roux, E., and Callorda, F. (2012). Assessment of the Economic Impact of Taxation on Communications Investment in the United States. New York: Telecom Advisory Services LLC

In North Dakota (chart on the left), the state government adopted a six-year phase-out of the sales tax on network equipment purchases. As a result, telecommunication investment increased three-fold from USD 48 to USD 148.30 per capita. In an opposite case, South Carolina (chart of the right) increased the sates tax rate from 6.25 per cent in 2006 to 7.25 per cent in 2007. The resulting effect was that telecommunication investment decreased 33 per cent from USD 115.37 to USD 77.44 per capita.

Based on the well-proven evidence that broadband has a positive impact on economic growth and job creation[34], a reduction in deployment will have a negative impact on penetration and, consequently, diminished macro-economic contribution. Conversely, a reduction in taxation could result in an increase in capital invested in broadband. An acceleration of deployment will have an impact on broadband penetration, which by having a positive impact on the economy actually increases the base over which taxes can be collected, while contributing to job creation and growth.

According to the above rationale, some governments have exempted ISPs from paying sales tax on equipment. For example, Malaysia approved tax allowances on expenditure on last-mile broadband equipment as an incentive for operators to roll out their networks[35]. Among them, last mile network facilities providers are given an investment allowance of 100 per cent on capital expenditures incurred for broadband for a limited period of time. This approach to taxation reflects a government policy aimed at promoting broadband adoption throughout the economy.

2.4 Over-the-top (OTT) players taxation

The delivery of OTT content refers to the distribution of audio, video and other media over the Internet without the involvement of a distributor, such as a cable TV operator, in the control or management of the material. This model contrasts with the acquisition or rental of content from an ISP. Additionally, OTT platforms enable the distribution of targeted advertising, which have the capability of leveraging their deep understanding of customer demographics. Finally, OTT platforms include merchants capable of conducting all commercial transactions online leading to the purchasing of a physical good. Table 2 presents global revenues of several operators providing services operating over-the-top.

Table 2: Global annual revenues of OTT firms (in USD '000) (2013)

Category	Player	Revenues
Content providers	Netflix	USD 4 374 562
	Google	USD 15 707 000
Digital advertisers	Twitter	USD 664 890
	Facebook	USD 2 585 000
E-commerce	Amazon	USD 74 450 000
	EBay	USD 16 050 000

Source: Annual Reports

The growth in business of OTT players raises the issue of how to tax the distribution of digital goods. For the time being, however, those have been largely untaxed. This situation applies not only when they are provided by foreign operators, but also in many cases, within a given country.

2.4.1 Content providers

OTT content comprises a range of digital goods and services, such as e-books, digital music, applications and video streaming. Taxation of digital content, in particular video streaming services such as Netflix, varies by country and even, within countries. Part of the variance has to do with the struggle to define what digital content is. In general terms, two options are available for classifying goods and services in order to determine their sales tax rate: tangible personal property or enumerated services. Beyond

[34] See Katz, R. (2012). *Impact of broadband on the economy: research to date and policy issues*. Geneva: International Telecommunications Union.

[35] Katz, R. and Berry, T. (2014). *Driving demand of Broadband Networks and Services*. London: Springer, p. 141

determining whether a digital good falls into one or the other category, it should be established whether it makes a difference if the good is streamed over the top or downloaded directly to a device.

As of today, there is no consensus among policy makers as to what category should digital goods fall into, or whether a digital good should be taxed at all. For example, in the United States several states impose no sales tax on digital goods. California applies sales tax only to tangible products, which implicitly excludes digital goods. Missouri, and Virginia have ruled that video streaming content is not subject to sales tax. However, other states, such as Colorado, have extended the definition of tangible personal property to digital goods. In order to fit digital goods into the tangible personal property category, the state of Louisiana defines the latter to include anything "perceptible to the sense", which encompasses software, electronic files, "on demand" video and audio downloads. Finally, some states exempt digital goods from taxation but apply a communications service tax to video streaming.

Video and audio streaming presents policy makers with an interesting quandary when it comes to taxation. Unlike regular downloads, like a song from iTunes, where the purchaser owns the rights to the content that is stored in his or her device, audio and video streamed content is only "used" by the acquirer for a limited period of time[36]. This would be similar to a leasing transaction. In order to deal with this issue, some governments determined that streaming video and music content should be subject to a tax similar to the sale of a cable TV subscription.

Another layer of complexity in taxing digital goods has to do with the physical location of purchasing. For example, the acquisition of the digital good may be conducted at one location, while the property (content) resides on a server located at another location, and the user consuming the good is resident in yet a third site. Under these conditions, which location should apply the sales tax? The source one, the one where purchasing took place or the one where consumption actually occurs? To make things even more complex, what happens if the good (say, a Netflix subscription) is consumed by more than one individual located in a different site?

Part of the inconsistency in the taxation treatment of digital goods relates to the fact that policy makers are trying to fit video streaming, as a new service, within pre-existing frameworks and classifications[37]. This problem is starting to be addressed in countries like the United States, where the Streamlined Sales Tax Project was created to standardize definitions of digital products with the purpose to adapt sales and use taxes to the new era. While affiliation to the project is voluntary, already 23 states have become full members. Among the rules the project has established, the sourcing guidance is quite useful:

- If the digital good is received by the purchaser at the location (country or state) of the seller, sales tax is collected at that location.
- If the product is not received at the location of the seller, sales taxes are paid at the location where the purchaser receives the product (assuming the seller knows where that location is).
- If neither case applies, the seller should attempt to find an address for the purchaser at the time of the transaction.
- Yet, if the last case is not applicable, taxation should occur at the location of the seller.

In this context, some local jurisdictions in the United States have imposed a 9 per cent tax on cloud services. For example, a tax requiring users of streaming entertainment services (like Netflix) and online databases or computing platforms (such as Amazon) was introduced in the city of Chicago[38].

The issue of taxation of digital goods, particularly video streaming services, has started to be raised in other geographies beyond the United States. In Europe, in order to respond to a significant loss of cable television customers to streaming services, regional tax authorities are implementing VAT to be levied on subscribers rather than providers. Implementing such measures could prove highly

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36 Jensen, J. and DoVale, A. (2014). "The next debate: Taxation of Digital Goods and Services". *The Tax Adviser*.
37 Sawyer, David (2014). "Netflix Streaming Suits Highlight Tax-Tech Mismatch", *Taxanalysts*.
38 Cullen International. *Taxing cloud services: trends from America*. 9 July, 2015.

difficult given the range of local VAT rates across locations[39]. In a highly publicized case, the French government introduced a 2 per cent tax on video on demand from foreign operators[40]. Since January 2015, international online video streaming services are liable for payment.

The move in France came together with the issuance of the EU VAT directive for electronic B2C services, implemented in January of 2015. Echoing the discussion in the United States, the new European VAT rules shift the country of taxation from the location in which the service provider is located to the place where the consumer purchases the good[41]. A location of a consumer is defined as where the customer is registered, has its permanent address, or usually lives. Consumer location will be identified either through the IP address of the device or the address in the credit card. If the customer lives outside the European Union but "uses and enjoys" the good within its boundaries, then VAT is charged at the place of consumption. To identify the location, the rule assumes that the Wi-Fi hot spot, restaurant or hotel indicate place of use. The new tax affects not only Netflix and Amazon, but also iTunes, Google Play and Microsoft.

Similarly, Japan has also announced that effective October 2015 it will impose a consumption tax on payments for digital goods purchased from overseas suppliers. This new regulation requires off-shore digital content providers that distribute digital products to consumers in Japan to register with the Japanese tax authorities, appoint tax administrators, file returns and pay taxes in Japan[42].

In a move aimed at protecting local content distributors, the Brazil movie authority *Agencia Nacional Cinematografica* (Ancine) has required Netflix and Apple TV to pay a fee equivalent to USD 1 400 for each movie, and USD 340 for each episode of a TV show distributed in Brazil[43]. Considering the size of the catalogue of both operators, the tax would amount to approximately USD 5.5 million per annum[44].

In a similar move, the South Africa Government electronic services regulations enacted in June 2014 imposed a 14 per cent VAT on foreign services who "sell e-books, music and other digital goods and services[45].

2.4.2 Digital advertisers

As of 2014, the digital advertising sector (both in fixed and mobile devices) represented 12.1 per cent of global advertising spend (or USD 132 972 million), overtaking newspapers and consumer magazines combined. Of this amount, North America represents USD 41 830 million (or 31%). Digital advertising spend is growing at 10.7 per cent worldwide, although advertising in mobile devices is increasing at 21.5 per cent indicating a shift to wireless devices[46].

Internet based advertising comprises three components: display ads, search ads, and native advertising. Display ads represent the original approach to online advertising and are in the form of banners, which advertisers pay to have posted on web sites. Search advertising was originally developed by Overture but expanded to its current configuration by Google, through implementation of a two sided-market, where consumers search for content, and are presented, in addition with the requested content, with web links related to the content that is being searched. In this context, advertisers are required to bid

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39 The standardization of VAT rates across European countries is currently being addressed through the recently launched initiative: European Commission. *A Digital Single Market for Europe; Commission sets out 16 initiatives to make it happen*. Brussels, May 6, 2015.

40 See Nigmatulina, K. (2014). "France introduces new tax on VoD operators based abroad". *HIS Technology.*

41 The "destination principle" is a means of reducing both potential double taxation (meaning that the good is taxed in both the source and the destination country) and under-taxation (when neither country imposes a tax).

42 Baker & McKenzie. (2014). *Japan to impose consumption tax on payments for digital products or services provided by overseas suppliers*. April.

43 See Variety (October 2013). "Netflix to distribute 'Apenas o fim' worldwide".

44 Netflix has confronted demands for local payment of taxes in Argentina, and Canada, among others (see section 4.3 below).

45 See Business Tech (February 2014). "Why digital tax is good for South Africa"; Vermeulen, J. (2014). "New digital tax for South Africa postponed", *mybroadband.*

46 PricewaterhouseCoopers. *Global Entertainment and Media Outlook 2014-2018*. Internet Advertising.

on search keywords. The placement of the ad in the list resulting from the consumer search depends on the amount of the advertiser's bid (the higher the bid, the higher the position of the add in the list of ads). Native advertising integrates ads into the content and context of the user's experience. Unlike banners, native ads appear in non-traditional ad positions in a user's content stream (such as the Facebook Newsfeed, Tumblr, Pinterest, or Twitter Promoted Tweets)[47]. The position of the ad in the user's stream is also contingent upon a bid amount (the higher the bid, the most prominent position in the feed).

Pricing for digital advertising responds to different models. Originally, ads were priced according to their position in the site (this reflected traditional advertising pricing methods). Over time, pricing shifted to formulas driven by performance. For example, Google includes in its pricing formula a cost-per-click factor, which means that revenues materialize once the user clicks on the ad. However, in an attempt to push pricing further to reflect customer "engagement" rather than "clicking", digital advertisers generate income through a "cost per action" formula, where income is generated when the user takes an action that benefits the advertiser (for example, register in a site, purchase a product, click the "like" button on a Facebook page)[48]. This point will become increasingly important from a taxation standpoint because according to the price per performance approach, it is the end user that, while it receives the service for free, is the agent that triggers income generation. In other words, if the end-user does not "engage", the advertiser does not pay the publisher.

The two-sided or multi-sided nature of Internet platforms engaged in digital advertising presents a number of taxation challenges. Contrary to raising taxes as a result of a transaction involving a seller and a buyer, in digital advertising the revenue is generated when the user, who is getting the ad for free, has acted in a way that triggers income recognition[49]. As mentioned above, Google's pricing algorithm is based on actual "click through rate" as a variable affecting the original bid. In this context, the pricing model of digital advertisers involves three parties (the publisher such as Google, the advertiser, and the user), each of which could be located in different jurisdictions or countries.

Under the principles of cross-border taxation, a country has a right to tax income that is economically related to it by way of where it is generated (source-based) or where the good is being consumed (residency-based)[50]. Countries tend not to uniformly adhere to one or the other system. For example, the United States follows a mix of both principles (depending on the place of residence and whether income is generated within the country). In the context of taxation of online advertising, determining the source of the income remains a critical issue. Let's assume a three country advertising transaction where the server where the ad is published is based in country Y, the advertiser resides in country X, and the customer clicking on the ad resides in country Z. Where is the source of income?

An emerging view posits that online advertising should be taxed in three jurisdictions (where the servers are located, where the employees delivering the services reside, and the place of residence of end-users that trigger the income-generating transaction). The first two categories of jurisdiction are self-explanatory, while the third one raises some sourcing problems[51]. In addition, complexity would arise in terms of calculating the portion of income to be distributed across the three jurisdictions.

2.4.3 Electronic commerce

Electronic commercial transactions, such as the purchasing of goods and services by consumers, has been increasing significantly over time. Figure 5 provides evidence regarding the growth of e-commerce as a percentage of total retail commerce not only in the industrialized world but also in developing countries.

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47 Katz-Samuels, Cora. (2014). Native advertising: Beyond the Buzz. New York: Neo@Ogilvy viewpoints.

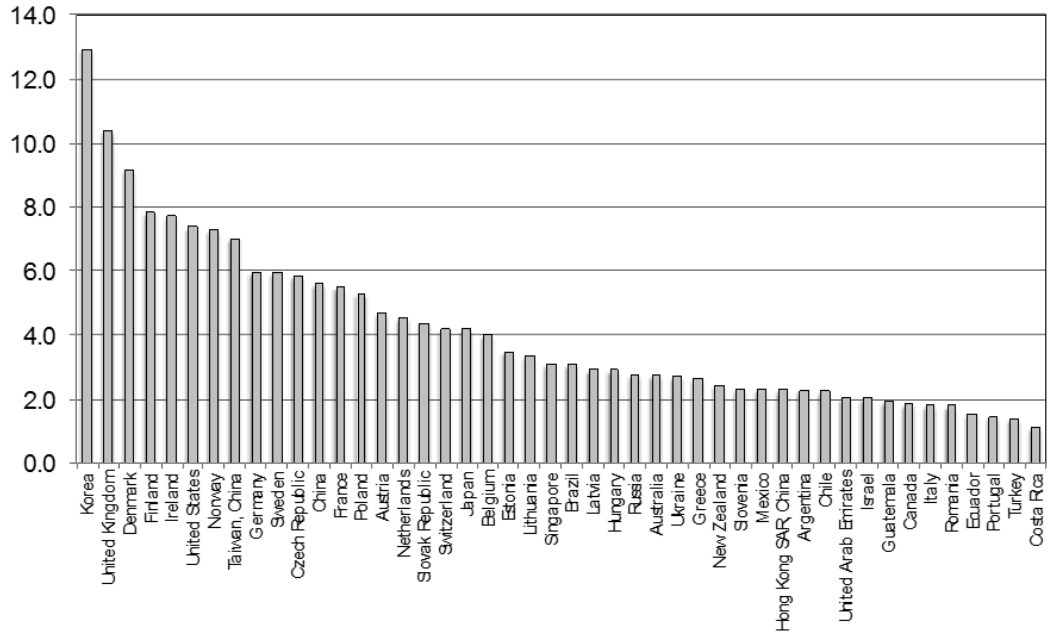
48 A review of digital advertising see Charlesworth, A. (2007). *Key Concepts in e-Commerce 3*. Palgrave Key Concepts.

49 Prussak, A. (2013). *The income of the 21st century: Online advertising as a case study for the implications of technology for source-based taxation*. Retrieved at http://ssrn.com/abstract=2206745 Electronic copy available at: http://ssrn.com/abstract=22067

50 Avi-Yonah, R. (1997). *International Taxation of Electronic Commerce*, 52 TAX L. REV. 507

51 Prussak, A. op. cit.

Figure 5: Internet retail as a percentage of total retail (2013)



Source: Euromonitor

While e-commerce is still a small percentage of total retail trade in relative terms (the Republic of Korea, the highest country, is around 12%), business to consumer e-commerce sales were estimated to exceed USD 1 trillion worldwide in 2012 (eMarketer, 2012).

The increasing rate of international e-commerce transactions has brought to the forefront the policy discussion of whether to collect taxes over online sales. The first warning was issued by the U.S. Treasury department in 1996 when a discussion paper raised the issue that e-commerce developments would result in revenue losses or other detrimental outcomes such as an increased use of tax havens for tax avoidance purpose[52]. First and foremost, as Internet sales reach sizable portions of total retail trade, governments fear losing large amounts of tax revenues. Secondly, when products are shipped internationally, inconsistent Internet tax policies can encourage the deployment by online retailers in tax havens to avoid tax liabilities[53]. As a consequence, taxation of e-commerce has both domestic and cross-border dimensions.

At the domestic level, some countries have, despite the growing share of online transactions, exempted e-commerce transactions from sales taxes. For example, in a recently re-enacted bill (Internet Tax Freedom Act), the United States has imposed a moratorium on discriminatory taxes on e-commerce. A "discriminatory tax" is defined as a levy that is not generally imposed through other means. For example, if sales taxes of a good are not collected through a mail order catalogue system, they cannot be collected from online purchases. In specific terms, consumers do not pay taxes on goods purchased online if the seller resides in a state with no sales tax. Additionally, the Act prohibits the collection of multiple taxes through double taxation.

In terms of cross-border trade, the issues are more complex when they result from purchasing a good online from a foreign location. The first issue relates to the definition of what constitutes "permanent establishment" of an online retailer in a given country. If that is the case and the e-commerce player has a location (such as a warehouse or a data centre) in a given country, the retailer is liable for

[52] Office of Tax Policy, U.S. Dept. of The Treasury (1996). *Selected Tax Policy Implications Of Global Electronic Commerce.* Washington, DC.

[53] imkin, M.; Bartlett, G., and Shim, J. (2003). "Pros and cons of E-Commerce Taxation", *International Business and Economics Research Journal*, vol. 1, 2, pp. 61-71.

payment of sales taxes in that country. Along these lines, the OECD considers that if the retailer has a server that displays information, takes orders and assigns distribution schedules in a given country for a "sufficient period of time", that should be considered "permanent establishment". On the other hand, if the server is located in an offshore location, e-commerce retailers pay sales taxes (usually at a low rate, if any) from the latter location, and only are subject to taxation when they repatriate profits to the home country at the appropriate rate[54].

The arguments for and against e-commerce taxation are multifold. The most argued point for taxation is that an exemption would create an unfair advantage vis-a-vis conventional retailers, especially small outlets that lack the capability to deploy a technological platform. The second point is that, given the growing trend of e-commerce transactions, an exemption would be excluding governments from an important source of revenues. Estimates for the United States show that only 20 per cent of all e-commerce transactions are taxed (of a revenue base of USD 226 billion)[55]. The third point argues that, since e-commerce is, at least initially, prevalent among higher income purchasers, an exemption would benefit those that can actually afford the sales tax, penalizing the low income segments of the population.

The arguments against e-commerce taxation are also numerous. First, it is argued that, given the diversity in rates, exemptions, and locations, enforcing an Internet sales tax is impractical. Following this, creating supervision and enforcement capability would be extremely cumbersome, cancelling out some of the revenues to be collected. Some analysts even argue that, due to the informational needs required to collect Internet sales taxes, taxing Internet sales would constitute an infringement of privacy. As location of consumption is difficult to determine, tax authorities would have to request credit card companies to provide information on consumers and their purchasing activity.

Interestingly enough, Amazon, the largest world e-commerce player supports the Internet sales tax (at least in the United States). The company considers that same-day shipping is an advantage favoured by customers. However, in order to provide this capability, the retailer has to establish warehouses in many states, thereby fulfilling the "permanent establishment" rule making it liable for collection of sales taxes. According to Amazon, a fulfilment competitive advantage greatly exceeds the imposition of a sales tax (and consequently, higher prices to consumers).

In order to decide whether this should become a key issue, policy makers should consider whether the rise of the Internet has impacted or will in the near future affect sales tax collections. While Internet usage has reached increasingly high levels across the world, it does not necessarily result in a proportional increase in online sales. These are dependent not only on Internet access but also on the existence of reliable payment, security and fulfilment systems. Until those emerge in a given country, one should expect e-commerce to remain a marginal percentage of total retail transactions. In this case, it might be advisable to governments not to engage in addressing this issue for the time being. In fact, a survey of initiatives taken by national governments in response to the challenges posed by cross-border electronic commerce shows limited move on their part[56]. This situation appears to have changed with the recent European Commission proposal for a "Digital Single Market Strategy for Europe"[57].

2.5 Applications providers

Software applications are typically imposed a sales tax to final users, but they are exempted if purchased by business users. However, taxation treatment can change whether software is purchased in the form of tangible property, like a disk, or if it is downloaded directly into a computer. This difference is

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54 OECD (2014). *Addressing the Tax Challenges of the Digital Economy*. OECD/g20 Base Erosion and Profit Shifting Project, OECD Publishing, p. 184.

55 Zeiler, D. (2013). "Internet Sales Tax Sticks it to the Nation's little guys" *Morning Money*, April 23.

56 Source: Cockfield,A. "The Rise of the OECD as Informal; World Tax Organization; Through National Responses to E-commerce Tax Challenges", *Taxblog. January 23, 2014.*

57 See European Commission. A Digital Single Market Strategy for Europe- Analysis and Evidence.

critical in terms of the tax regime to be followed by the application provider sites, such as the Apple app store. In general terms, application provider sites charge taxes only in jurisdictions where digital goods are taxable (see section 2.4.1). The tax rate is based on the purchaser's address and the sales tax rate in effect at the time the product is downloaded.

The taxation complexity in the case of apps arises at numerous stages of the transaction. For example, if the sale of the app is conducted by a US-based software developer for a nominal fee to a user outside the United States, premium features can be sold to users for a monthly fee and revenue could also be generated through the placement of ads within the app[58]. This transaction is, in essence a cloud-based sale, which gives rise to VAT and income tax liabilities in some countries. For example, while taxation of cloud commerce is not addressed under Chinese legislation, this transaction could be characterized as a software license in China, which would make the provider liable of income taxes from a royalty.

On the other hand, in Europe, the tax liability would require the software company to charge an EU Member State VAT to the consumer. However, due to the lack of harmonization, applicable rates might change by Member State. As shown, taxation regimes of application providers can vary greatly across countries.

3 A typology of taxation regimes in the digital sector

3.1 Taxation trends and fiscal policy in the digital economy

Reflecting the growing shift to digital platforms in commerce, advertising, and content distribution, taxation is becoming an increasingly important topic. Two opposing trends can be detected in terms of fiscal policy in the digital economy: one is to maximize collections based on growing digital flows; the second one is to recognize that lowering taxation benefits consumers and businesses.

According to the first trend, some governments recognize growing digital flows to become critical in their generation of revenues and are putting in place more mechanisms to maximize collection in these domains of economic activity. For example, in the United States wireless tax burdens have increased since 2006. The combined federal, state, and local burden on wireless consumers increased from 15.27 per cent to 17.05 percent, or nearly 2 percentage points. Underlying the discriminatory trend, overall tax burdens on wireless consumers grew about three times faster than general sales taxes on other taxable goods and services[59].

On the other hand, some countries consider that lowering taxes on the digital sector of the economy triggers spillovers that are larger than the foregone taxes. For example, until 2008, mobile subscribers in Ecuador were subject to a 15 per cent excise tax applied to mobile usage and subscriptions, over and above the 12 per cent VAT. In that year, the government abolished what was considered to be a luxury tax, and cellphone usage (as measured by minutes of use) increased 40 per cent. Similarly, in Uruguay, the mobile usage tax was abolished in 2007, resulting in an increase of over 60 per cent in penetration (from 65 per cent to 141 per cent)[60]. Along the same lines, Brazil recently reduced taxes on M2M communications. In the same vein, Pakistan reduced the SIM card sales tax from PKR 2 000 to PKR 250 in five years (2005 to 2009). During that period, SIM card penetration increased from 5 per cent to 55 per cent, reaching 70 per cent in 2014[61].

Some governments also reduce corporate taxes to telecommunication operators. For example, while the Panama Government had been reducing its corporate tax rate on profits from 30 per cent to 25

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58 Faraq, R. (2013). Practitoners from three continents discuss international tax implications of mobile app sales.
59 Mackey, S. and Henchman, J. (2014). *Wireless Taxation in the United States 2014*. Tax Foundation Fiscal.
60 Source: GSMA (2015). *Digital inclusion and mobile sector taxation in Pakistan*, p. 44.
61 Source: Pakistan Telecommunications Authority.

per cent in 2011[62], ICT/telecommunications continued to pay corporate taxes at 30 per cent rate. This distortive rate expired in 2014[63].

To illustrate the difference in country approaches, the next section will analyse different taxation regimes of wireless services.

3.2 Regional and country differences

Countries do not follow a uniform approach to mobile services taxation. While virtually all countries tax both services and handsets, the type of taxes selected and their amount vary significantly, with the consequential varying impact on total cost of ownership and use of a mobile device. Handset taxes increase the acquisition cost and service taxes the recurring expenses.

In 2010 the author, as part of a research team, performed a cluster analysis of wireless telecommunication taxation approaches across 80 countries, attempting to isolate mobile telecommunication tax policy differences[64]. The study begun by clustering the taxation approaches based on types of levies and rates and concluded that mobile service tax policies could be categorized around four approaches:

- **Universalization of service**: reduce taxes as much as possible to stimulate wireless adoption.
- **Direct taxation without sector discrimination**: establish a high uniform VAT to all sales without adding sector specific taxes in recognition of their distortion effect.
- **Direct taxation and sector specific taxes**: combine VAT with a sector specific levy.
- **Service tax revenue maximization**: leverage mobile communications as a source of direct taxation, by combining high VAT, high sector specific taxes and/or a fixed levy.

The study then proceeded to isolate handset taxation approaches, concluding that four taxation approaches could be identified as well, partly driven by the existence or not of import duties:

- **Sector discrimination based on the absence or moderate import duty**: VAT combined with low duty.
- **Sector discrimination based on high import duty but no telecom tax**: high import duty and VAT but no sector specific taxes on handsets.
- **Sector discrimination based on high VAT and import duty but low handset specific tax**: combine high VAT with a sector specific levy.
- **Handset tax revenue maximization**: leverage mobile communications as a source of direct taxation, by combining high VAT, high customs duty and a high sector specific levy or low import duty and high sector specific tax.

Following the methodology of the 2010 study, the clustering analysis was replicated by this author, relying this time on 2014 data compiled from the ITU ICTEye Tariff Policies Survey, the GSMA, and *Import Duty Calculator*. The study began by replicating the analysis of mobile service taxation, confirming the existence of distinct approaches.

Confirming the findings of the 2010 study, the analysis of service taxation for 2014 indicated that, while most developed and some developing countries reduce service taxes to promote universalization of service, the pattern is not consistent across countries. For example, the Africa and Asia-Pacific regions comprise some nations with taxation approaches aimed at universalizing mobile services, while this approach is significantly less prevalent in Latin America (see Table 3).

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62 KPMG (2015). *Corporate tax rate tables.*

63 Law 8 of 15 March 2010. The distortive rate included banking, power generation, cement manufacturing, insurance, casino and gambling activities.

64 Katz, R., Flores-Roux, E. and Mariscal, J. (2010*). The impact of taxation on the development of the mobile broadband sector*. London: GSMA, pp. 11-16.

Table 3: Service taxation approaches by country (2014)

Region	Universalization of service	Direct taxation without sector discrimination	Direct taxation and sector specific taxes	Service tax revenue maximization
Africa	Angola, Lesotho, Namibia, Rwanda	Botswana, Cameroon, Chad, Cote d'Ivoire, Ethiopia, Gabon, Guinea, Guinea-Bissau, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Seychelles, South Africa, Tanzania, Togo	Burkina Faso, Congo, Gambia, Ghana, Malawi, Nigeria, Zimbabwe	Democratic Republic of Congo, Kenya, Madagascar, Senegal, Sierra Leone, Uganda, Zambia
Americas	Paraguay	Bolivia, Chile, Colombia, Guatemala, Nicaragua, Peru, Trinidad and Tobago	Brazil, Mexico	Argentina, Dominican Republic, Ecuador, Venezuela
Arab States	Syria, Yemen	Egypt, Mauritania, Morocco	Jordan, Tunisia	Turkey
Asia-Pacific	Indonesia, Lao, Malaysia, Myanmar, Papua New Guinea, Thailand, Viet Nam	India, Philippines, Samoa	Cambodia, China, Iran, Sri Lanka	Bangladesh, China, Nepal, Pakistan
CIS		Azerbaijan, Kazakhstan, Russia, Uzbekistan		Albania, Georgia, Ukraine
Europe	Austria, Bulgaria, Cyprus, Czech republic, Denmark, Estonia, France, Finland, Germany, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Switzerland, United Kingdom	Norway		Greece

Source: 2014 data from ITU ICTEye Tariff Policies Survey, GSMA, and Import Duty Calculator

The same analysis was then replicated with 2014 data for handset taxation. Again, different country approaches for taxing handset were identified. The approach to handset taxation is anything but consistent. One model combines high VAT with no customs duty (South Africa), while another model includes high VAT and customs duty rate, complemented with high sector specific taxes (Brazil).

When clustering the rest of countries in the sample, it was confirmed that the most prevalent handset taxation model around the world is based on VAT combined, in some cases, with low sector discrimination through moderate import duty. Still, some countries were noticeably approaching handset taxation with the purpose of raising revenues through high import duties (for example, Argentina, Botswana, Ukraine). In some cases, the stated purpose of this policy was to protect local manufacturing or assembly operations (Argentina, Brazil, and China) (see Table 4).

Following the methodology originally used, service and handset taxation approaches were combined yielding four approaches to the taxation of wireless consumption:

- **Universalization and protectionism:** this approach aims at reducing levies with the purpose of decreasing as much as possible the total cost of ownership and stimulating wireless adoption; it can include a handset import duty and a sector specific handset tax (which is relatively low and therefore has minimum distortion potential).

Table 4: Handset taxation approaches by country (2014)

Continent	Sector discrimination based on no or moderate import duty	Sector discrimination based on high import duty	Sector discrimination based on high VAT and import duty but low handset specific tax	Handset revenue maximization
Africa	Angola, Ethiopia, Gabon, Guinea-Bissau, Kenya, Mauritius, Rwanda, South Africa, Tanzania, Uganda, Zambia, Zimbabwe	Cameroon, Chad, Democratic Republic of Congo, Gambia, Guinea, Malawi, Mali, Namibia, Niger, Seychelles, Sierra Leone, Swaziland, Togo	Botswana, Burkina Faso, Cote d'Ivoire, Ghana, Madagascar, Mozambique, Nigeria, Senegal	Lesotho
Americas	Bolivia, Chile, Dominican Republic, Guatemala, Mexico, Nicaragua, Paraguay, Peru	Argentina, Brazil, Ecuador, Trinidad and Tobago, Venezuela	Colombia	
Arab States	Egypt, Jordan, Mauritania, Morocco		Syria, Turkey, Yemen, Tunisia	
Asia-Pacific	Indonesia, Iran, Lao, Malaysia, Papua New Guinea, Philippines, Thailand, Viet Nam	Bhutan, Cambodia, China, Myanmar, Samoa	India, Nepal, Pakistan, Sri Lanka	Bangladesh
CIS	Albania, Azerbaijan, Kazakhstan, Russia, Uzbekistan	Georgia, Ukraine		
Europe	Austria, Bulgaria, Czech Republic, Denmark, France, Finland, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Switzerland, United Kingdom	Estonia, Greece	Cyprus, Slovakia	

Source: 2014 data from the ITU ICTEye Tariff Policies Survey, GSMA, and Import Duty Calculator

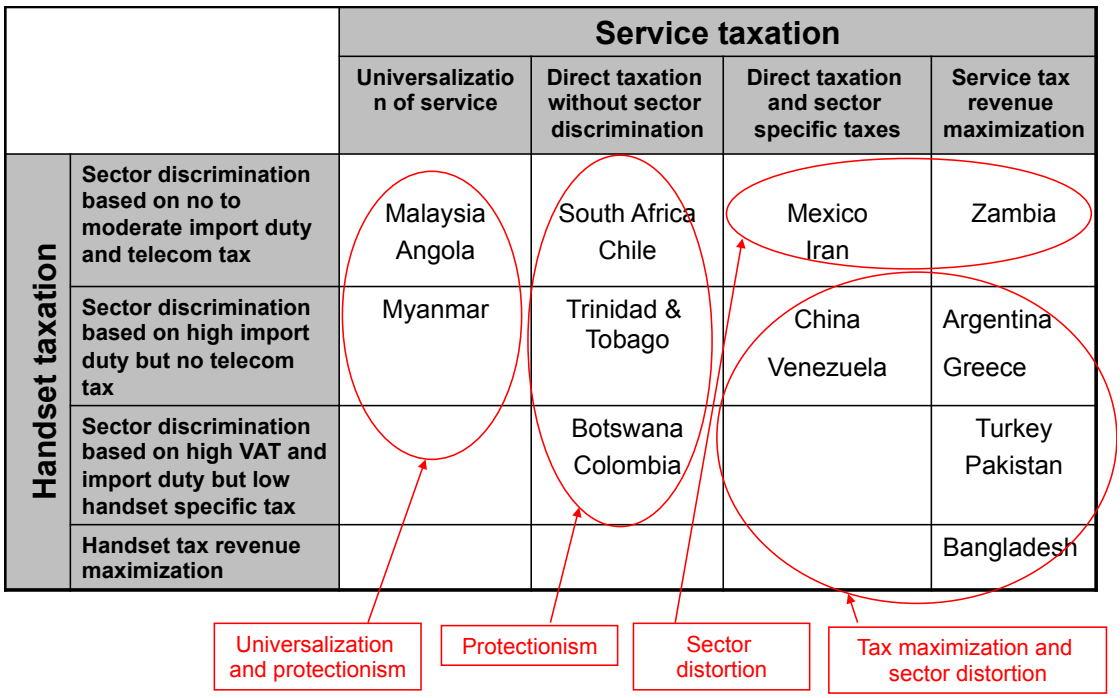
- **Protectionism:** this approach is similar to the one above, except that high value-added taxes on service increase substantially the total cost of ownership.
- **Sector distortion:** this approach introduces sector specific service taxes with the objective of increasing government revenues but, in doing so, plays an economically distortive role by emphasizing taxes on the telecommunication sector.
- **Tax maximization and sector distortion:** sector specific taxes are introduced not only on mobile services but also on devices with the purpose of maximizing government revenues, with the consequent high distortion impact.

Examples of countries following each of these four approaches based on 2014 data can be visualized in Figure 6.

As pointed out before, prevalent taxation models tend to differ by region. As expected, most developed countries have adopted universalization and protectionism tax approaches given that they do not need to rely on the telecommunication industry to increase revenues for the treasury. In addition, there are a number of countries with emerging market economies that have chosen a universalization and protectionism approach in order to stimulate telecommunication service adoption. Notable examples in this category are Angola, Indonesia, and Malaysia.

In the next category of taxation approach-protectionism- countries with emerging market economies that have adopted pro-active ICT development strategies can also be identified (for example,

Figure 6: Combined taxation approaches (2014)



Source: 2014 data from the ITU ICT-Eye Tariff Policies Survey, GSMA, and Import Duty Calculator

Colombia, India, and South Africa). In other words, the first two taxation categories are associated with technology development objectives.

At the other end of the spectrum there are also some significantly large countries with emerging market economies where the taxation approach runs counter to maximizing telecommunication adoption. Table 5 provides the position of all countries of the study dataset.

Table 5: Overarching taxation approach by country (2014)

	Universalization and protectionism	Protectionism	Sector distortion	Tax maximization and sector distortion
Africa	Angola, Lesotho, Rwanda, Swaziland	Botswana, Cameroon, Chad, Congo, Cote d'Ivoire, Ethiopia, Gabon, Guinea, Guinea-Bissau, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Seychelles, South Africa, Tanzania, Togo	Kenya, Uganda, Zambia, Zimbabwe	Burkina Faso, Democratic Republic Congo, Gambia, Ghana, Madagascar, Nigeria, Senegal, Sierra Leone
Americas	Paraguay	Bolivia, Chile, Colombia, Guatemala, Nicaragua, Peru, Trinidad & Tobago	Dominican Republic, Mexico	Argentina, Brazil, Ecuador, Venezuela
Arab States	Syria, Yemen	Mauritania, Morocco, Egypt	Jordan	Turkey, Tunisia
Asia-Pacific	Indonesia, Lao, Malaysia, Myanmar, Papua New Guinea, Thailand, Viet Nam	India, Philippines, Samoa	Iran	Bangladesh, Cambodia, China, Nepal, Pakistan, Sri Lanka
CIS		Azerbaijan, Kazakhstan, Russia, Uzbekistan	Albania	Georgia, Ukraine

Table 5: Overarching taxation approach by country (2014) (continued)

	Universalization and protectionism	Protectionism	Sector distortion	Tax maximization and sector distortion
Europe	Austria, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, France, Finland, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom			Greece

Source: 2014 data from the ITU ICTEye Tariff Policies Survey, GSMA, and Import Duty Calculator

A comparison between the results of the 2010 study and the analysis presented above indicates a remarkable consistency. Most countries have continued to implement similar approaches to wireless taxation. In fact, some countries have moved to implementing more stringent approaches. Most of these belong in emerging market economies (e.g. Botswana, Democratic Republic of Congo, Ecuador, Georgia, Sierra Leone, and Ukraine).

3.3 The impact of taxation on wireless adoption

In general terms, since high taxation increases the total cost of ownership of wireless services, it is correct to consider that higher wireless consumption taxes will raise the affordability barrier and reduce adoption. A correlational analysis indicates that technology adoption proceeds at a slower pace in countries with high tax burden on mobile. This is clearly the case in the European context (see Figure 7).

Figure 7 depicts two different correlations between tax burden on wireless service price and the growth in 3G penetration: one for western Europe, and the other one central and eastern Europe. In both cases, an increase in tax burden reduces the rate at which 3G penetration grows.

In the case of emerging countries, the relationship between taxation and rate of diffusion of mobile broadband can also be visualized, although continents would appear to follow different patterns and coefficients (see figure 8).

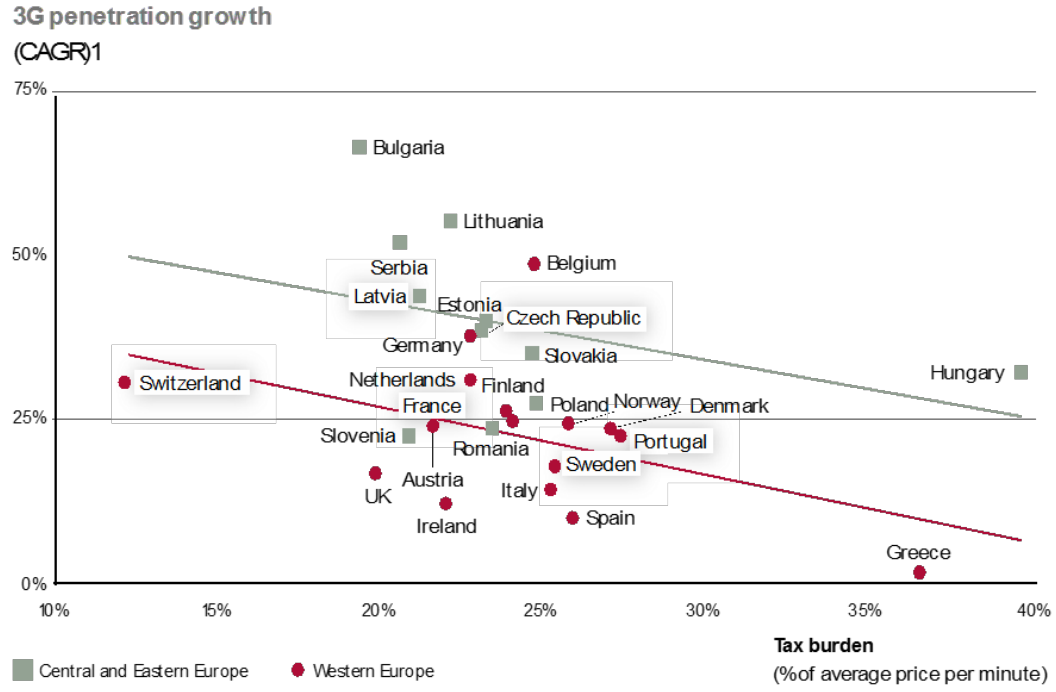
In the case of countries with emerging market economies, while the indirect relationship between tax burden and 3G penetration growth still holds, the correlation patterns between both variables appear to differ between Latin America (black regression line) and the Asia-Pacific region (orange regression line).

In this context, taxation could have a detrimental effect on the public policy strategy aimed at deploying mobile broadband. Examples of positive and negative effects are depicted in Table 6. With the exception of Malaysia, which has implemented a benign system based on extremely low value-added tax, the other countries have introduced taxes that could negatively affect service diffusion (see Table 6).

The impact of these different taxation approaches on total cost of ownership of mobile service varies widely. For example, in Mexico the impact of taxes on total cost of ownership is 15.18 per cent[65], in South Africa it is 15.2 per cent, in Brazil it reaches 29.8 per cent, while in Bangladesh it is 54.8 per cent. On the other hand, in Malaysia, the effect of taxes on mobile cost of ownership amounts to only 6.1 per cent.

[65] This estimate assumes a total cost of ownership (w/o taxes) of USD 1,311.51 based on a monthly ARPU of USD 8.76, and a terminal replacement rate of 24 months.

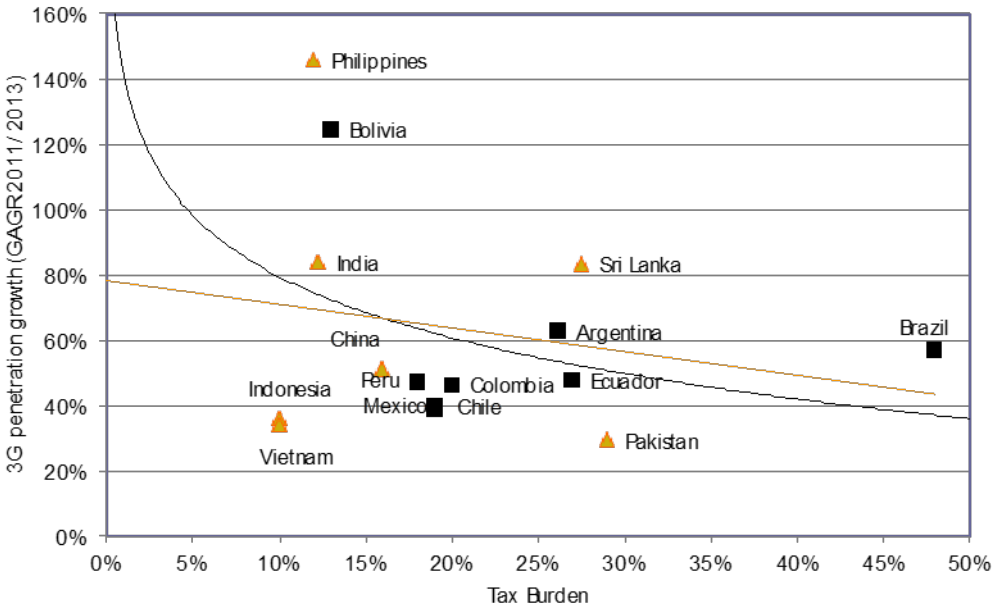
Figure 7: Tax burden and 3G penetration in selected European countries (2013)



[1]3G penetration growth as a percent of population when comparing the fourth quarters of 2009 and 2012

Source: A.T. Kearney (2013)

Figure 8: Tax burden and 3G penetration in selected Latin America and Asia-Pacific countries (2013)



Sources: ITU; Telecom Advisory Services analysis

If taxes limit adoption of wireless broadband, it is relevant to ask what the ultimate impact of reduced penetration might have on economic growth. Hypothetically, it is safe to assume that a reduction in adoption as a result of incremental taxation could yield a negative impact on GDP growth.

Table 6: Mobile taxation approaches in five countries with emerging market economies (2014)

Country	Services			Handset				Taxation Approach
	VAT	Other Taxes	Fixed Taxes	VAT	Customs Duty	Other Taxes	Fixed Taxes	
Malaysia	6 %	0 %	0 %	0 %	0 %	---	---	Universalization and protectionism
South Africa	14 %	0 %	0 %	14 %	0 %	---	---	Protectionism
Mexico	16 %	3 %	0 %	16 %	0.10 %	---	---	Sector distortion
Brazil	27 %	3 %	0 %	25 %	19 %	---	---	Tax maximization and sector distortion
Bangladesh	15 %	35 %	USD 11.76	15 %	25 %	---	USD 11.63	

Source: 2014 data from the ITU ICTEye Tariff Policies Survey, GSMA, and Import Duty Calculator

4 Distortive taxation regimes in the digital economy

In principle, taxation should attempt to be neutral and equitable across all sectors of the economy. A distortion occurs when a change in the price of a good resulting from taxation triggers different changes in supply and demand from what would occur in the absence of taxes. The deviation in supply/demand equilibrium is defined as the deadweight loss (cost of taxation over and above the taxes paid to the government). In this sense, taxation regimes should seek to minimize discrimination for any particular choice.

4.1 Dimensions of distortion

As mentioned above, taxes generate distortions when they affect conditions guiding social efficiency. Taxes can create distortions if they affect the choices made by market agents, which in the digital space could be as follows:

- Consumers, particularly those that are price sensitive, limit the adoption of technology. This was discussed in section 3.3.
- Telecommunications operators reduce their rate of investment in infrastructure. This topic will be approached in section 6.1.
- Global digital technology providers adapt their deployment footprint according to a minimization of tax burden.
- Different tax regimes within the digital eco-system create asymmetries. This will be discussed in chapter 7.

The design of an efficient tax structure in the digital space needs to consider several somewhat contradicting requirements:

- Ensure proper collection of taxes for income generated at source.
- Avoid over taxation of digital activities when compared to other industries.
- Selectively provide exemptions to facilitate investment in infrastructure and promote adoption by end-users.

4.1.1 Sector discrimination through specific taxes

In general terms, economic theory has formalized the basic conditions under which sector specific taxes need to be considered:

- If the goal is to fund a programme (say broadband in schools) with as little loss as possible in economic surplus, sector specific taxes should focus on goods whose demand or supply is inelastic.
- Alternatively, if the goal is to change consumer or supplier behaviour, sector specific taxes should focus on goods whose supply and demand is elastic.

Discrimination in taxes in the digital space could emerge if:

- The rates at which taxes are collected are higher than in other sectors.
- The sector is affected by a large number of specific taxes with the potential of greatly affecting agent behaviour.

4.1.2 Taxation asymmetry

Three dimensions of taxation asymmetry exist when looking at tax burdens incurred by companies in the digital space. The first one refers to the disparity in tax burdens imposed on telecommunication operators when compared to Internet players of the digital eco-system (digital advertisers, social networks, etc.). The following analysis compares the effective tax rates (ETR)[66] of wireless operators, convergent telecommunication operators (fixed and mobile and Internet firms). The ETR captures the taxes actually paid by companies as presented in their annual reports. The analysis was conducted at six levels: a global comparison, China, Europe, India, the United States, and emerging markets (see Table 7).

Table 7: Effective tax rates for telecommunication and Internet players (2014)

	Wireless telecommunications	Telecommunication services	Internet
Global	29.75 %	27.70 %	32.81 %
China	22.91%	22.71%	17.89%
Emerging markets	26.41%	19.64%	19.74%
Europe	13.48%	27.05%	22.57%
India	49.37 %	9.19 %	35.95 %
United States	21.78%	31.14%	35.06%

Note: Values correspond to the ratio of taxes to taxable income as reported in annual reports

Source: Damodaran Online, retrieved at http://people.stern.nyu.edu/adamodar/New_Home_Page/home.htm

Table 7 presents data for wireless operators "pure plays" (such as Bharti Airtel, MTN, or Millicom) in the first column, for fixed and mobile telecommunication services companies (such as Verizon, Telefonica and Deutsche Telekom) in the second column, and for Internet companies (social networks, search platforms) in the third column. On a global scale, the asymmetry would seem to work in reverse: Internet companies pay more taxes than telecommunication operators. But once the comparisons are made at the country or regional level, the evidence points to the existence of asymmetry affecting the telecommunication operators. In Europe, Internet firms have a 5-point lower ETR than telecommunication service companies. In the case of countries with emerging market economies, Internet companies have a 7-point lower ETR than wireless operators. The fact that the difference does not show up in the case of telecommunication services firms could relate to the continued existence of

[66] For a detailed methodological discussion on effective tax rates, see section 7.1.

state-owned operators that are taxed on a more favourable basis than private enterprises. That would be confirmed with the data for India: it would appear that wireless telecommunication operators bear a burden that is 14 points higher than Internet firms. Finally, the difference would also appear to exist in China, where both wireless and full service telecommunication companies are taxed at a rate that is 5 points higher than Internet players. In sum, the analysis of taxes actually paid by firms in the three sectors would appear to confirm an asymmetry within the digital sector.

A second dimension of taxation asymmetry within the digital sector exists when one looks at global players. In general, the provision of telecommunication services in a given country requires the deployment of local infrastructure in the form of points of presence, interconnection points, switches and distribution networks. From a tax standpoint, this constitutes a "permanent establishment" and renders the service provider liable for payment of taxes, contributions, and telecommunication specific fees within that country. On the other hand, a global digital player that relies on the telecommunication operator infrastructure to access the end customer does not necessarily require having an in-country presence. This is directly related to the business model and operating processes of the global digital player, which is "asset-light" and benefits from having a centralized R&D and processing infrastructure (in the form of data centres located in the home country[67]). The derived value of this configuration is that, contrary to what happens with telecommunication service providers, global digital players (such as Facebook, Google, and Twitter) are liable for a much reduced tax burden in countries beyond that of their home office. Some digital players like the OTT operators do not even have a physical presence, all transactions are booked out of the country, and therefore, while they generate revenues and profits, they do not pay taxes. Other players, like the major digital advertising platforms (e.g. Google, Facebook) set up sales offices and therefore become liable for a small tax burden, derived from social charges for local employees, VAT for some goods purchased in-country, and, in some cases, some country-specific taxes[68]. This situation is not consistent across countries. In Chile, for example, advertisers purchasing services from Google are expected to subtract a 35 per cent tax on gross amounts invoiced by the operator.

For example, a recent study[69] estimated the taxes paid by global digital players in Latin America and compared them with those paid by telecommunication service providers, and equipment manufacturers. According to these estimates, total taxes paid by Facebook, Google, Twitter, Skype, LinkedIn and Netflix in Latin America would amount to approximately USD 1.09 billion for a revenue base of USD 9.24 billion, which would represent an ETR of 11.78 per cent. On the other hand, telecommunication service providers[70] pay an estimated USD 50.9 billion for revenues of USD 153 billion (equivalent to an ETR of 33 per cent), and telecommunication equipment manufacturers[71] pay approximately 3.7 billion (from a revenue base of USD 25 billion, which results in an ETR of 14 per cent).

The third dimension of taxation asymmetry refers to in-country comparison of tax burden of the telecommunication sector, compared to the rest providers of other goods and services. For example, a 2014 study compared the tax burden of the mobile industry with the general sales and use tax in the United States (see Box 2).

Different tax burdens are related to the number of sector-specific taxes that are imposed on the telecommunication industry. In section 7.1, a cross-sector analysis, comparing tax burden of telecommunication operators with the tourism and media industries provides additional evidence in this regard.

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67 One should recognize that, in order to reduce transport costs, global Internet players also tend to deploy data centers around the world.

68 See detailed analysis in section 4.3.

69 Katz, R. (2015). *El eco-sistema digital y el desarrollo industrial de America Latina*, Madrid: Ariel.

70 Including Claro, Entel Chile, Millicom, Oi Brasil, Personal (Argentina), Telefonica, TIM Brasil, and others.

71 This includes Alcatel-Lucent, Cisco, Ericsson, and Huawei.

Box 2. Tax burden on wireless industry in the United States

Mackey and Henchman (2014) conducted a study on the difference between the local, state, and federal wireless tax rate in the United States and the general sales and use taxes. According to their study, sixteen states in the US have a wireless tax burden over 5 percentage points higher than the general sales tax rate.

Disparity between wireless tax and fee rate and sales tax rate (July 2014)

Rank	State	Sales tax rate	Wireless tax rate	Wireless over/ under sales tax rate
1	Nebraska	7.00 %	18.48%	11.48%
2	Washington	9.15%	18.60%	9.45%
3	Florida	7.25%	16.55%	9.30%
4	New York	8.44%	17.74%	9.30%
5	Alaska	2.50%	11.77%	9.27%
6	New Hampshire	0.00%	8.17%	8.17%
7	Rhode Island	7.00%	14.58%	7.58%
8	Pennsylvania	7.00%	14.05%	7.05%
9	South Dakota	6.00%	13.02%	7.02%
10	Illinois	8.88%	15.81%	6.94%
11	Missouri	8.08%	14.58%	6.50%
12	Maryland	6.00%	12.37%	6.37%
13	Delaware	0.00%	6.23%	6.23%
14	Montana	0.00%	6.00%	6.00%
15	District of Columbia	5.75%	11.56%	5.81%
16	Utah	6.80%	12.53%	5.73%

According to this research, Nebraska is the only state that has a disparity of greater than 10 percentage points between its wireless rate and the general sales tax rate. Other states with large disparities include Washington State, Florida, New York, and Alaska. On the other hand, New Hampshire ranks 6th in the disparity between wireless taxes and sales taxes, despite having a relatively low rate on wireless service. This is because this state does not have a sales tax, while it imposes a 7 per cent communications tax and a USD 0.57 monthly 911 fee on wireless service. Two other states that impose taxes on wireless service but do not have sales taxes – Delaware and Montana – also rank relatively high on the scale.

4.2 Double taxation for international telecommunication services

Double taxation is defined as the collection of comparable taxes by two states on the same entity for the same income, asset, or transaction. As expected, double taxation has a negative effect on international trade and cross-border movement of factors of production. International agreements have the objective of minimizing the noxious effects of double taxation.

This section focuses on two double taxation distortionary cases in international communications: international mobile roaming, and international long distance calling. These two cases are considered as "juridical double taxation", which occurs when one person or company is subject to tax on the same income, asset, or transaction by more than one tax authority[72].

4.2.1 International Mobile Roaming

Double taxation in mobile roaming increases the price of calls, thereby reducing demand. A mobile user traveling outside the country of residence where he or she has the service subscription will make calls home by relying on international roaming agreements signed up by operators in both countries. The subscriber pays a retail price based on the call volume to his home operator for the roaming service but does not pay a fee in the visiting country. In turn, the operator in the home country pays the operator in the visiting country wholesale charges based on roaming call volumes.

Double taxation emerges in setting up the price for the roaming mobile call. When the subscriber pays for roaming calls it includes in the payment the retail price of the home operator plus VAT. However, when the home operator sets up the price for international roaming calls, it includes, in addition to its own costs, the cost of the international transport service, and the price set up by the operator in the visiting country, which also includes a VAT (plus, potentially, other taxes such as withholding taxes, and local and provincial taxes). Thus, the subscriber ends up paying VAT in the home country and in the visiting country. Since VAT can range from 7 per cent to 27 per cent, retail prices increase substantially, further dampening demand. Double taxation in international mobile roaming could result in up to 40 per cent increase in the final retail price. Double taxation in international roaming is quite pervasive. For example, it is estimated that 72 per cent of roaming routes in Latin America are subject to double taxation[73].

Double taxation of mobile roaming services has triggered three reactions. First, a number of regional bodies are intent in dealing with this issue in order to lower international roaming prices. For example, as part of the European Union programme to create a single market for telecommunications, the institution adopted a new law that foresees the end of roaming charges within the EU by June 2017[74]. Similarly, the Gulf Cooperation Council (GCC) Ministerial Committee for Post, Telecommunications and Information Technology approved in 2015 new roaming price caps which will gradually reduce roaming charges at the wholesale and retail level for voice, SMS and mobile data within GCC Member States starting in April 2016[75]. The purpose of double taxation agreements is to protect against the risk of double imposition, and protect each government taxing rights, while providing a framework for enforcement and dispute resolution[76].

Secondly, in addition to regional frameworks, many countries have moved to negotiate bilateral roaming agreements. As example, Malaysia, Australia, New Zealand and Singapore have been working at reducing mobile roaming rates for voice, data and video calls.

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72 The other type of double taxation occurs when two persons are subject to tax on the same income or capital.

73 GSMA Latin America (2012). *International roaming explained*, p. 7

74 http://ec.Europa.eu/digitalagenda/en/news/one-single-telecom-market—europe ; http://ec.europa.eu/digital-agenda/en/news/new-rules-roaming-charges-and-open-internet

75 See: https://www.tra.gov.om/news-5/1361-reduced-gcc-mobile-roaming-rates-starting-from-april-2016

76 See DePasquale, P. and Varley, A. (2011). *Telecommunications and methods for avoiding double taxation*. Presentation at ITU Workshop on "Taxation of Telecommunication Services and Related Products "Geneva, September 2 (www.itu.int/ITU-T/worksem/taxation/201109/index.html). See ITU/BDT Publication on "A Practical Guide on Benchmarking Telecommunications Prices". Available at www.itu.int/en/ITU-D/Regulatory-Market/Pages/Studies.aspx

The third approach is less focused on signing agreements and embodies strategic moves on the part of mobile operators. In industrial organization terms, double taxation in mobile roaming is the equivalent of uncoordinated "double marginalization" where the final retail price is a function of different firms in the same industry that have their respective market powers but at different vertical levels in the supply chain, applying their own markups in prices. Due to these markups, a deadweight loss is induced, thus making it worse off for the whole market. One way of avoiding the losses due to double marginalization is to merge the two firms, thus reducing at least one of the dead weight losses. This can be done through acquisition of one of the firms by the other firm in the supply chain. Obviously, this is not the primary driver for conducting a horizontal merger of two wireless operators; the main reasons remain achieving operational synergies, leveraging skills and product scope, and gaining market access. However, when a wireless carrier has a position in two countries with intense roaming traffic, they might eliminate roaming charges for their own customers in order to build competitive differentiation. The Celtel launch of "One Network" in East Africa, enabling its subscribers to roam seamlessly across 15 African countries at local rates is such an example. India's Bharti Airtel has also introduced the "one network" framework integrating India, Bangladesh, and Sri Lanka[77], and America Movil has eliminated its roaming charges for postpaid customers calling among its Central American mobile networks[78]. In sum, this third approach demonstrates that if governments do not find a solution to deal with a portion of the distortion by agreeing to reduce double taxation in international mobile roaming, this natural economic inefficiency is being dealt with through cross-border horizontal integration of operators.

4.2.2 International long-distance calling

Double taxation can also occur in the case of international long-distance calling. The cost components of an international call include originating rates (charged by the operator in the country where the call originates) and terminating charges (imposed by the operator where the call is directed to). These are added to a margin so the originating operator can determine its retail price.

Double taxation in this case works in the following way. The operator in the terminating country includes in the termination price the tax it pays on the call to the authorities of the country where it provides the service. The terminating rate, including the operating costs and margin plus the tax, is passed in full to the originating operator. The originating operator in turn includes the termination price (which includes the tax) in the retail price that the consumer pays for the outgoing international call. In sum, taxes are paid at originating and terminating point increasing the price of the service to the point that it reduces demand. At a lower demand level, tax revenue diminishes. This situation has been reported to be the case in several countries[79].

The International Telecommunication Union has been putting forward initiatives to deal with this distortion. The "Melbourne Agreement" adopted in 1988 with the World Administrative Telegraph and Telephone Conference proposed that taxes should only be collected "in respect of international services billed to customers" in the country of origination. More recently, this was addressed in the ITU International Telecommunication Regulations (ITR) that was reviewed during the World Conference on International Telecommunications (WCIT) held in Dubai, United Arab Emirates from 3-14 December 2012. The ITRs serve as the binding global treaty designed to facilitate international interconnection and interoperability of information and communication services as well as to ensure their efficiency and widespread public usefulness and availability. The ITRs state in Article 8.3 that "*Where, in accordance with the national law of a country, a fiscal tax is levied on collection charges for international telecommunication services, this tax shall normally be collected only in respect of international services billed to customers in that country, unless other arrangements are made to meet special circumstances*"[80].,

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77 Telegeography (2012). Airtel links Africa and South Asia with One Network.

78 Economía y Negocios (2014). Claro elimina cobro por roaming y llamadas a Centroamérica. April, 21, 2015.

79 Cave, M. (2013) *Taxing telecommunication/ICT services: an overview.* Geneva: ITU, p. 24

80 WCIT, ITR review, at: www.itu.int/en/wcit-12/Pages/default.aspx

This effect, which is also akin to a double margin[81] process, is not only detrimental to international call demand and, consequently, tax revenues. It has set the stage for the emergence of VoIP carriers, such as Skype. By eliminating the originating operator (since the call is originated by a device connected to a broadband network), a Skype-to-phone call avoids the originating cost, including only as an input the terminating price. Furthermore, since the purchasing of service is conducted outside the boundaries of the originating country, the consumer originating the call does not pay local taxes on the call. This allows Skype to price an international call at an average of USD 0.02 per minute, well below the rate implied by the terminating costs and the double taxation regime. The distortion implied by double taxation of international calls can only be dealt with if the governments in the territories where the call originates and terminates agree to eliminate the tax on one of the "sides" of the international call, this is treated in the ITRs Article 8 on charging and accounting[82].

4.3 Taxation regimes of global players with no local presence

The discussion above of tax rules for players operating in the digital space (see section 2.4) becomes quite complex for global players. The following section presents a series of case studies of specific global digital companies, assessing how they deal with taxation issues and what the net impact of these arrangements are in terms of tax collections for host country governments.

4.3.1 Netflix

The US-based company Netflix has a total 53 million worldwide subscribers (3Q2014), of which 66 per cent are located outside the United States. Netflix offers video streaming service in Europe (Austria, Belgium, France, Germany, Luxembourg, Netherlands, Scandinavia, Switzerland, United Kingdom), Latin America and the Caribbean (Argentina, Brazil, Paraguay, Uruguay, Bolivia, Chile, Colombia, Ecuador, Peru, Venezuela, Mexico, and Ecuador), and Asia (Australia). The larger concentrations of subscribers by country are presented in Table 8.

The company objective is to generate 80 per cent of revenues from international subscribers, which compels it to aggressively expand in all continents. In its ongoing international expansion, the company is facing some taxation challenges, based on complaints of unfair competition on the part of local streaming providers and cable operators.

For example, the city of Buenos Aires imposed a 3 per cent gross income tax on all foreign online subscription services, including video, music and games. The tax, known as the "Netflix tax", is targeted directly at streaming services and relies on credit card companies acting as tax withholding agents. Rather than taxing consumers, the objective is to collect taxes from digital content distributors that do not pay any corporate taxes in Argentina[83]. Beyond Netflix, the measure also affects services such as Amazon Instant Video, Spotify, and iTunes. The argument in support of the ruling is to protect local streaming services that do pay income taxes in Argentina. The law also stipulates that the tax cannot be passed through to consumers[84].

In Europe, Netflix chose to headquarter in the Netherlands not to deal with the culture tax levied on French TV and media enterprises. As mentioned above, this prompted opposition from local cable TV providers arguing that this situation creates unfair advantage for the US-based company, since French video streaming providers pay 19.6 per cent VAT. In response, the France Government introduced a 2 per cent tax on foreign video on demand operators. Starting in January 2015, international online video streaming services were liable for payment. The measure was prompted by the French film

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81 Cave, M. (2013) ITU paper on *Taxing telecommunication/ICT services: an overview.* Geneva: ITU, p. 35.

82 See Article 8 on charging and accounting of ITRs agreed upon at WCIT in Dubai, United Arab Emirates, 3-14 December 2012.

83 Mango, A. (2014). "Buenos Aires Issues 'Netflix Tax' on Streaming Media Subscriptions". Retrieved in www.hollywoodreporter.com/news/buenos-aires-issues-netflix-tax-729994

84 Ferdeline, A. (2014). Argentina's "Netflix tax" isn't surprising. Blogs. London School of Economics.

Table 8: Netflix: Paying subscriber base ('000) (2Q2014)

Country	Subscribers
United States	35 085
United Kingdom	4 452
Canada	3 000
Sweden	940
Mexico	640
Netherlands	600
Brazil	560
Denmark	440
Norway	390
Finland	370
Colombia	310
Argentina	310
Ireland	260
Chile	155

Source: Netflix

producers association and local video streaming services motivated by the lack of local tax payments by foreign providers, but also fears that Netflix would affect French "cultural exception"[85].

In Canada, large telecommunication operators, such as Bell Canada and Rogers, are also calling for a similar tax to be levied on all streaming services. The argument in this case is that since Netflix does not follow Canadian local content laws, it puts local companies at a disadvantage[86].

4.3.2 Facebook

The OECD has extensively studied the issue of corporate taxation of Internet advertisers[87]. The following section will review a typical tax planning structure of digital advertisers and use Facebook as an example of their impact on countries with emerging market economies.

Facebook provides social network functionality, access to applications, and messaging capability to consumers free of charge. However, by virtue of two-sided market dynamics, the supplier collects advertising revenues driven by its enhanced capability to target consumers based on their preferences and demographic characteristics. As of 2014, Facebook global revenues would have reached USD 8.7 billion with a 25.9 per cent margin (see Table 9).

85 Chazan, D. (2014). Netflix Is Getting A Frosty Reception In France. *The Telegraph*, September, 15; Nigmatulina, K. "France introduces new tax on VoD operators based abroad". *HIS Technology.*

86 "Canada And Buenos Aires Move To Tax Netflix". *The Hollywood Reporter.*

87 OECD (2014). *Addressing the Tax Challenges of the Digital Economy*. OECD/g20 Base Erosion and Profit Shifting Project, OECD Publishing.

Table 9: Facebook: Revenues and margin from advertising and transactions

Year	Monthly active users (million)	Revenues (in billion USD)	Profitability (in billion USD)	Margin
2006	12	4.33	---	---
2007	50	3.00	-2.70	---
2008	150	1.81	-0.37	---
2009	360	2.15	0.70	32.6 %
2010	608	3.29	1.01	30.7 %
2011	845	4.39	1.18	26.9 %
2012	1 056	4.81	0.05	0.1 %
2013	1 228	6.41	1.22	19.0 %
2014 (*)	1 320	8.70	2.26	25.9 %

(*) Nine months annualized

Sources: Carlson (2011); Tsotis (2011); Wikipedia (2011); Annual Report; analysis by the author

These financial results are generated on the basis of leveraging 1 320 million monthly active users, which result in average revenues of USD 6.59 per subscriber. That said, revenues per subscriber are much higher in North America than in the rest of the world because this geography is much more digital advertising intensive than the rest of the world (see Table 10).

Table 10: Facebook: Monthly users and revenues per user

Year	North America		Rest of World (*)	
	Monthly active users (million)	Revenues per user (in USD)	Monthly active users (million)	Revenues per user (in USD)
2009	112	4.62	69	---
2010	154	---	133	---
2011	179	3.16	225	0.39
2012	193	4.04	304	0.54
2013	201	6.00	376	0.82
2014 (e)	206	6.45	---	0.86

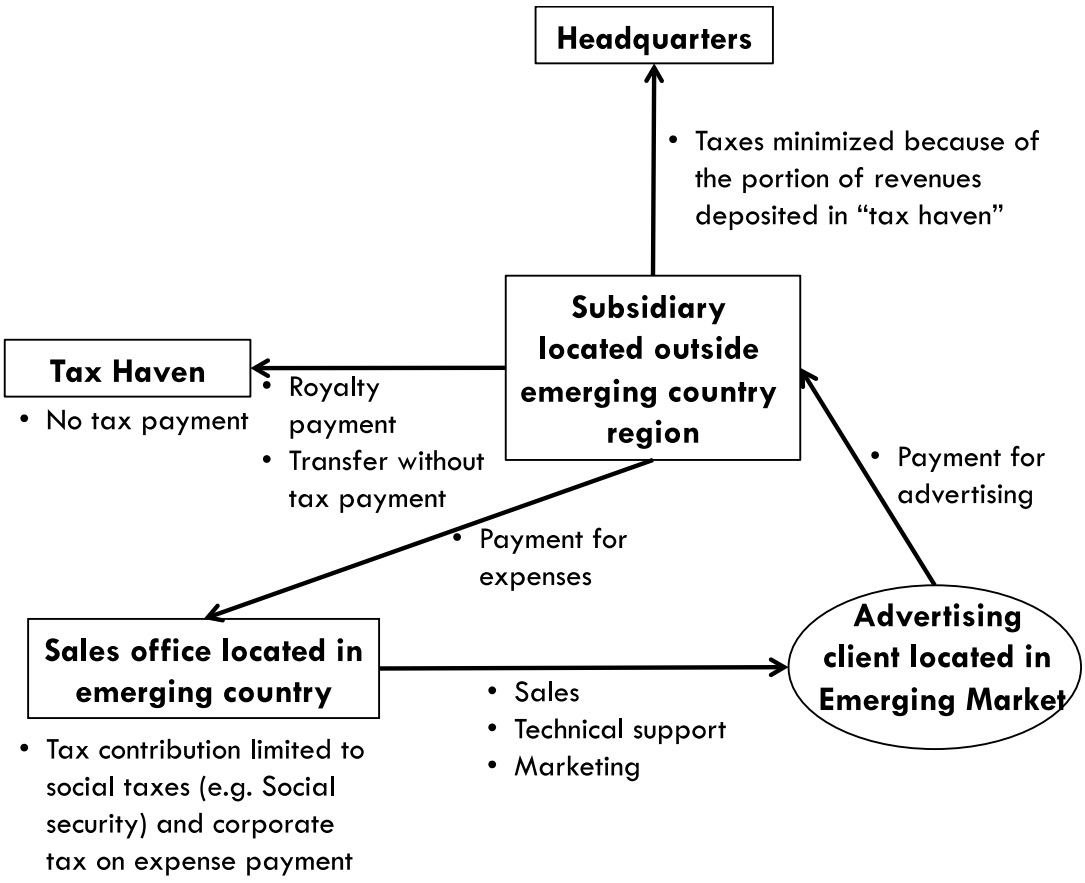
(*) Includes Africa, Latin America and Arab States

Sources: Facebook S-1; Facebook Annual reports; Statista

The company is headquartered in the United States, where it has all research and development staff focused on enhancing the power of consumer targeting and advertising efficacy, and an important local business, for which it pays corresponding corporate taxes. The physical presence in a typical country with an emerging market economy is relatively small, primarily focused on selling advertising, and potentially training local advertisers to use the platform. However, contracts with local advertisers from the emerging market are concluded electronically through remotely located websites on the basis of standard agreements. Payments for advertising contracts are not logged in the local subsidiary but in remote locations, either headquarters or another subsidiary. Thus, most revenues resulting

from sales of advertising to local firms in countries with emerging market economies are treated as revenues in headquarters or the remotely located subsidiary. On the other hand, countries with emerging market economies do not tax the profits of the local subsidiary because the latter does not have income that is attributable locally[88]. The only taxes paid locally comprise social security for local employees and a corporate tax on the payment received for services rendered to headquarters (see Figure 9).

Figure 9: Facebook: Flow of funds and tax implications



Source: Adapted from OECD (2014). Addressing the Tax Challenges of the Digital Economy. Paris, pp. 186-191.

Based on this approach and according to reports in the press, despite earning an estimated GBP 223 million in the United Kingdom in 2012, the company paid no taxes[89]. The situation in a country with an emerging market economy is fairly similar. For example, a pro forma financial statement of a small local Facebook operation could be extremely profitable (see Table 11).

This country with emerging market economy has a total of 24 million monthly active users, from which advertising revenues are collected at a ratio of USD 0.86 per user. The operating expenses of this subsidiary comprise the salaries of 40 professionals with an assumed fully loaded salary of USD 70 000 each. The location has no debt or corporate tax obligations (except for expenses payment booked as income). The only additional taxation incurred by the local subsidiary is related to social charges resulting from payment of the local staff, and a corporation tax for payment received for services performed to headquarters. This situation yields an extremely profitable pro-forma operation (net margin: 80%). The situation could be different in some emerging market countries like Chile

88 OECD (2014). *Addressing the Tax Challenges of the Digital Economy*. Paris, pp. 186-191.

89 Garside, J. (2013) "Facebook caught in controversy over earnings exported to Cayman Islands". *The Guardian*, December 5. Additional data in OECD (2014). *Addressing the Tax Challenges of the Digital Economy*. Paris, pp. 186-191.

Table 11: Facebook pro forma income statement (typical emerging market) (2014)

Metric		Source
REVENUES		
• Monthly active users	24 000 000	
• Revenues per MAU (ROW adjusted)	USD 0.86	Estimate based on Annual Report
• Total	USD 20 640 000	
OPERATING EXPENSES		
• Staff (marketing, sales, administration)	40	Estimated based on staffing of a typical office
• Average yearly salary (fully loaded)	USD 70 000	Fully loaded salaries
• Total	USD 2 800 000	
GROSS INCOME	USD 17 840 000	
• Interest	USD 0	Annual Report
• Corporate taxes	USD 535 000	Corporate tax on gross profits
• Social contributions	USD 896 000	32% rate
NET INCOME	USD 16 400 000	
• Net margin	80%	

Source: Analysis based on typical MAUs and staff in a small country with emerging market economy

where digital advertisers are withheld a 35 per cent tax by advertisers at the time an invoice is paid to the operator.

4.3.3 Google

The approach followed by Google in most countries when it comes to tax strategy is similar to that of Facebook. In addition to a fairly centralized processing operation, the search and advertising firm deploys offices around the world with staff in charge of selling advertising and providing technical consulting to its customers. Given its highly centralized operating model, the staff deployed overseas represents a small portion of the operator personnel. For example, in 2013, Google had 47 756 employees worldwide. Of this amount, it is estimated that, for example, the Latin America headcount did not exceed 400 staff[90].

The staff in local offices is responsible for selling advertising to local customers. However, the sales are not logged locally but remotely in subsidiaries such as Google Ireland. Following the "permanent establishment" rule, the operator does not pay taxes in the local country where the acquisition of digital ads is conducted. The rationale is that the sale actually occurs in the remote subsidiary where the purchasing is logged. Furthermore, since the purchasing is handled through auction pricing, it is not the local staff that actually performs the sale but the customer himself[91].

[90] In France, the company employs approximately 500 staff. See Schechner, S. "Google's Tax setup Faces French Challenge", *Wall Street Journal* (October 8, 2014).

[91] See OECD (2014). Addressing the Tax Challenges of the Digital Economy. Paris, pp. 188-191.

The remote subsidiary, such as Google Ireland does not necessarily pay taxes at the local 12.5 per cent rate, since the revenues received from customers located in each country are transferred to a subsidiary in the Netherlands in the form of royalty fees for intellectual property, which in turn transfers it to an Irish unit registered in Bermuda, a location with no corporate income tax. The resulting arrangement minimizes the income tax to be paid by the local office. As an example, in 2012, Google revenues from France, Germany, and the United Kingdom were estimated at approximately USD 9 billion generated by digital advertising sold to local customers. Of this amount, the three country subsidiaries reported USD 1.28 billion in revenues and USD 33 million in income tax. In some Google subsidiaries, the revenues result from programming contracts arranged with Google headquarters. For example, the France subsidiary performs programming work for the Chrome browser for Apple Inc.'s iOS. Additionally, the subsidiary is paid by the Ireland subsidiary for marketing promotion services for the selling of digital advertising[92].

At an aggregate level, the report submitted by Google in 2012 to the Securities and Exchange Commission of the United States reported that, from gross revenues of USD 7 600 million generated outside the home country, the company paid foreign taxes of USD 248 million, an effective tax rate of 3.26 per cent. This is not the case in the United States, where the tax rate amounts to 49.81 per cent (this amount could be somewhat distorted from payments of deferred taxes). Given the high rate incurred in the home country, Google's incentive is to keep as long as possible foreign earnings from being transferred to the United States. Thus, the report informed that Google kept approximately USDD 21.2 billion in cash balances outside the home country[93].

In Latin America, it is estimated that Google revenues approximated USD 3.1 billion[94]. According to public communications, its Brazil subsidiary, which is Google's largest in the region, paid approximately USD 310 million in taxes in 2013. If we add the rest of Latin America, for which the local subsidiaries are paid a service fee, and that each employee is compensated at USD 70 000 per year, local taxes to be paid would comprise social security contributions (averaged at 31.80 per cent rate) and a 3 per cent tax for gross revenues, total taxes would reach USD 541 million. This would amount to an effective tax rate of 18 per cent[95].

4.3.4 Amazon

Originally a book distributor, Amazon has been progressively expanding into content development, devices, and hosting services (see Table 12).

Amazon's original competitive advantage relied on no-fixed costs as a result of not owning a store network, the variety (long tail) of goods offered derived from low inventory costs, and lower prices, which meant higher margins. The extension from books into music and merchandise represented a horizontal scope expansion, remaining close to the core business. The launch of Amazon marketplaces, positioned the company as a two-sided platform, which enhanced the supplier product scope without holding inventory (other retailers could offer their products through the Amazon channel). At 6-15 per cent margin in its *Marketplaces* platform, Amazon captures higher profits than with its own products, while providing real time data on high potential products. In fact, Amazon Marketplace represents an entry into an adjacent value chain (two sided platforms), leveraging original capabilities. In its next diversification move, Amazon entered into web services by offering a broad set of global compute, storage, database, analytics, application and deployment services. In doing so, Amazon Web Services resells the platform originally developed for the company's own offering, achieving higher returns to scale by incorporating additional volume. However, while connected to the original scope, the diversification is further away

92 Schechner, S. "How Google's French Tax structure works", *Wall Street Journal* (October 8, 2014).

93 Jiménez, M. (2012). "Google, Apple y Microsoft pagan impuestos mínimos fuera de EE.UU." *El País*, 30 de enero.

94 Google worldwide revenues in 2014 reached USD 66 billion, of which USD 31.38 billion originate in what the company considers to be "rest of the world', which means global revenues minus the United States and the United Kingdom. On the other hand, PWC estimates that search revenues in Latin America for the top seven countries are USD 1,805 million. By grossing up to include the remaining countries, and adjusting for other Google businesses, total revenues are estimated to reach USD 3 050 million.

95 Katz, R. (2015). Op.cit., p. 195.

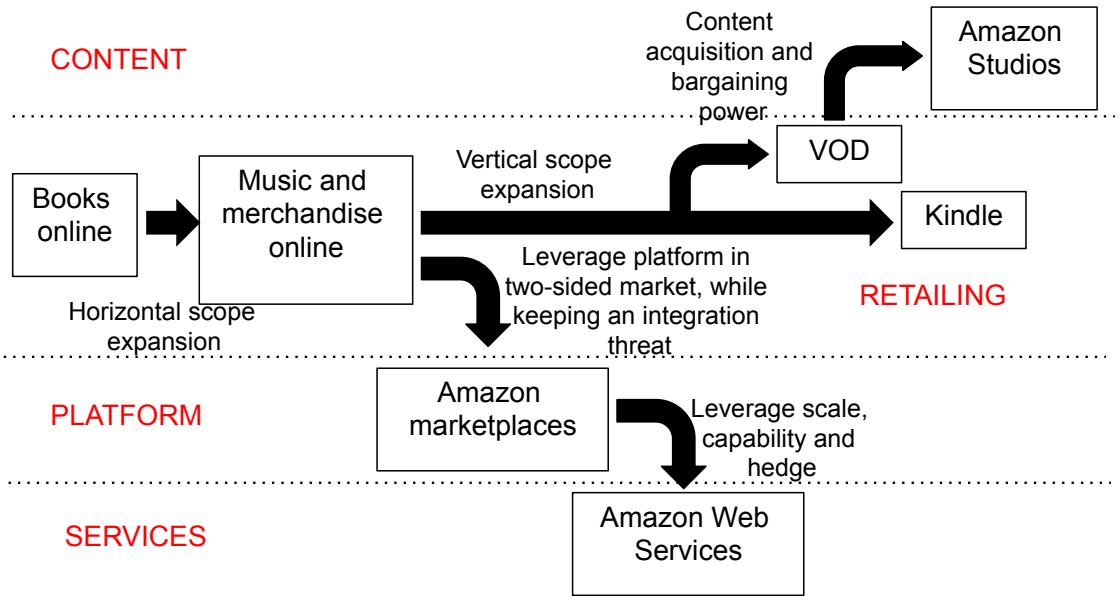
Table 12: Amazon: Diversification schedule

Year	Initiative	Description
1995	Book distribution	Selling books online
1999	Expansion into music, electronics, etc.	Selling other merchandise online
2000	Amazon marketplaces	Third party merchant platform
2002	Amazon Web Services	Cloud computing services
2006	Video-on-demand	Video streaming
2007	Kindle	Shop and download books and movies
2011	Amazon Studios	Production of original video content
2011	AdNetwork search	Targeted advertising to Amazon customers
2012	UpNext	3D mapping company

Source: ITU

The diversification strategy indicates a progressive move away from the core books online business (see Figure 10).

Figure 10: Amazon: Diversification strategy



Source: ITU

from the core. The entry into the device business, by offering the Kindle e-reader is motivated by the need to solidify the relationship with buyers (e.g. Kindle owners report buying in seven or more Amazon departments, while non-device owners shop at 5.5 departments). Nevertheless, the Kindle strategy appeared to be a defensive move to reinforce the core business. As a next diversification step, Amazon entered into video-streaming and content production. This move appears to be a logical extension from selling DVDs once the physical format began to be superseded by downloads. Further, the entry into production was primarily motivated by the need to acquire an independent content source and increase its bargaining power with the studios (a move similar to Netflix).

As the diversification strategy indicates, Amazon is positioned in multiple different businesses, ranging from e-commerce to video streaming, with a strong international presence (see Table 13).

Table 13: Amazon revenues (USD millions) (4Q2013)

	North America	International	Total
Electronic and General Merchandise	10 648	6 478	17 216
AWS, Advertising and co-branded credit cards	1 170	64	1 234
Media (books, music, movies, videogames, software, and digital downloads)	3 513	3 714	7 227
Total	15 331	10 256	25 587

Source: Annual report

As Table 13 indicates, 40 per cent of total sales are generated internationally. However, each line of business has different tax implications. In the case of e-commerce, Amazon's tax planning structure has similarities with Facebook. As a starting point, the central organization in the United States is focused, in addition to managing the US business, on developing the IT platforms for data management and fulfilment, coordinating procurement to achieve scale, and maintaining consistency. These coordination services are sold to overseas regional operating subsidiaries for a management fee. In addition, all the rights for the intellectual capital underlying the delivery of services are held by the central organization. Overseas subsidiaries share in the development costs by providing a payment for the rights.

Purchases from overseas customers are handled by the regional subsidiaries, which have similar platforms for processing orders and payments. Fulfilment is handled by the country unit where the customer has made the purchase. However, since this unit provides only routine services, they are allocated minimal taxable income. In fact, all revenues derived from the sale in a country are booked at the regional subsidiary level, which means that the country where the sale took place does not tax the profits originated at that transaction. Furthermore, the regional subsidiary where the sale is booked tends to be located in countries that have preferential treatment for income derived from certain intangibles, which results in a lower tax rate. Finally, all payments that the regional subsidiary makes to central headquarters are not taxed because they are subject to double tax treatment. All in all, Amazon implemented a tax structure that minimizes its tax contribution overseas[96].

4.3.5 Spotify

In 2013, Spotify, the music streaming site, reported revenues of USD 931 million (91 per cent of which came from premium users and 9 per cent from advertising). The company has 12.5 million paying subscribers (of a 50 million total base)[97]. About 70 per cent of its revenues are paid to rights holders. The company is essentially a multi-sided platform collecting revenues from advertisers and premium subscribers (over a "freemium model"). In that sense, its taxation exposure is a function of two businesses: digital advertising and distribution of digital goods (similar to Netflix).

As the company expands globally, it appears to be shifting its tax strategy to minimize taxes. For example, financial results in 2012 for its United Kingdom subsidiary indicated a loss after taxation of GBP 10.1 million (over revenues of GBP 87.9 million). In the middle of that year, the company shifted

96 OECD (2014). *Addressing the Tax Challenges of the Digital Economy*. Paris, pp. 182-186.

97 The site is available in 58 markets around the world – Andorra, Argentina, Austria, Australia, Belgium, Bolivia, Brazil, Bulgaria, Canada, Chile, Colombia, Costa Rica, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, El Salvador, Estonia, Finland, France, Germany, Greece, Guatemala, Honduras, Hong Kong (China), Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malaysia, Malta, Mexico, Monaco, New Zealand, Netherlands, Nicaragua, Norway, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Singapore, Slovakia, Spain, Sweden, Switzerland, Turkey, United Kingdom, Uruguay and USA.

the revenue recognition of all of its global premium subscriptions outside the UK (4 million in 2012) from the United Kingdom subsidiary to other local subsidiaries. The move appears to be driven by an attempt to minimize the tax burden otherwise imposed in the United Kingdom[98].

Spotify adds national, state and local taxes to its consumer bill when its entry in certain geography implies investing in marketing and promotional activities and use of local sales agents and consultants. In an approach similar to Netflix, Spotify is facing a number of cases where governments are attempting to tax its income. In addition to the governments of the city of Buenos Aires and France, the state of New York is considering imposing a tax on digital goods, which could affect Spotify, as well as Pandora and other streaming services. The rationale behind the proposal is that digital music should be considered tangible personal property.

4.4 Tax optimization approaches

The common approach observed in the prior case studies indicates that, in order to reduce tax liabilities, global players tend to segregate taxable income from the activities that generate it. Three approaches to reduce taxation have been identified:

1. Avoid a taxable presence in certain markets by shifting gross profits from the market where the good is being offered to subsidiaries located in tax havens or low tax environments.
2. Keep withholding tax low or nil at the source, by shifting profits in the form of royalties or interest to a lower tax jurisdiction.
3. Avoid taxation of low-tax profits at the level of the parent by searching for preferential domestic tax regimes.

In addition, global digital players tend to minimize the amount of VAT by optimizing its global deployment in search for low rates.

In all fairness, these approaches have been implemented by multinational corporations for a long period of time. Perhaps, the aggravating factor is that digitization enables more flexible arrangements with regards to tax optimization than manufacturing and distribution of physical goods.

In dealing with this situation, governments need to consider three trade-offs. The first issue when assessing this approach is how to assess from a cost/benefit standpoint the fact that the resulting low taxation enhances adoption of digital goods and services (with its corresponding spillovers) against the fact that by shifting liabilities away from income producing locations, other taxpayers need to bear the burden. The second issue to deal with is unfair competition. Local digital players paying the corresponding taxes based on their location have to compete with global players offering the service at an economic advantage (the prominent argument in the Netflix case). The third issue to consider is taxation asymmetry with regards to other firms of the digital eco-system[99].

5 Issues regarding tax collection in the digital sector

The issue of cost of tax collection has been studied and even considered in the telecommunication sector for a number of years[100]. Among the cost of collecting taxes in telecommunications, several concerns have been raised. For example, levying telecommunication taxes in non-monetary economies, such as those prevalent in rural areas of emerging market countries, presents obvious

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98 Dredge, S. (2014). "Spotify revenues grew sharply in 2013, but operating losses also rose". *The Guardian*, November 25, 2014.

99 See section 4.1.2.

100 Cave, M. *Taxing telecommunication/ICT services: an overview www.itu.int/pub/D-PREF-EF/en*

difficulties. More complex effects could arise when taxes act as an incentive to avoid payment and push companies to operate in an informal economy. These concerns still exist and become part of a larger set of problems in the case of the digital economy. The purpose of this chapter is to present some of the problems confronted by policy makers in developing an effective tax system to tackle the current digital sector.

5.1 Obstacles to effective tax collection

In general terms, an effective tax system requires good information from taxpayers to determine who has to pay and how much. The limited availability of information on who has consumed a specific digital good or service becomes an obstacle to collect taxes in an effective manner. Globalization exacerbates this problem insofar that it is difficult to locate information of who are the consumers that have purchased a good stored in a server beyond the frontiers of a given country. A classic example of this situation has been the problems encountered in implementing the "Netflix tax" in Buenos Aires, Argentina. As mentioned above, the objective of the city government was to collect taxes on subscriptions or payments for the purchasing of digital goods such as a movie, a song, or other digital content (except for software) from operators such as Netflix, Apple TV, or Spotify[101]. Since none of these players have an operation in Argentina with servers capturing information on subscribers, the government was confronted with the difficulty of collecting information for administering the tax collection activities. The solution devised was to rely on credit card issuers. Considering that the purchasing of subscriptions for these services are paid through credit cards, the government decided to make these companies the key point of information gathering. This remained a critical issue since, considering that the tax was only applicable to residents of the city of Buenos Aires, the government needed to gain access to records stating the subscriber address.

While this option solved the information-gathering hurdle, it did not address the tax collection obstacle. In the purchase of a physical good, collecting sales taxes becomes the responsibility of the place at which the good is acquired. In this case, again, the provider of the service is located beyond the frontiers of Argentina. This meant that a system dependent on Netflix and other providers collecting taxes and then remitting the levy to the Buenos Aires was not cost effective. In this situation, the city government opted to rely again on credit card issuers. In this case, when a consumer pays for a subscription on his or her credit card, the digital operator collects the tax and then proceeds to deliver the amount collected to the city government. This approach addressed the collection barrier. However, it raised another problem related to consumer privacy. Some consumer advocates argued that collecting, storing and delivering information of private citizens' purchases of a digital good became an infringement of their privacy[102].

To deal with digital good VAT collection according to the location where the good is purchased, the EU set up a mini one-stop-shop portal where taxes are filed and paid at this single European point from where authorities of member states redistribute the amounts to the right country. In order to identify the country of residence, companies can rely on either the IP address and the location of the consumer's computer, or the address of the credit card used to purchase the subscription[103].

Notwithstanding the problems raised by relying on credit card issuers for tax collection of digital goods, the cases reviewed above are emblematic of the potential contribution that financial services players could make to address the issue of tax collection.

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101 "Desde febrero aplicaran el Nuevo "impuesto Netflix", *Clarín* (December 19, 2014).
102 Clarín (2014). Desde febrero aplicaran el nuevo "impuesto netflix".
103 Nigmatulina, K. (2014). "France introduces new tax on VoD operators based abroad". *HIS Market Insight*.

5.2 The case of evasion and fraud

Tax evasion and avoidance is directly related to the ease or difficulty with which taxes can be collected. While taxes collected from telecommunication operators are relatively easy to collect, that is not the case for users of digital goods and services.

Tax evasion in the digital sector has multiple dimensions. On the supply side, a number of digital start-ups tend to operate in an informal context, thus avoiding payment of taxes. On the consumer side, digital piracy results in significant tax revenue losses. By illegally downloading digital content, consumers do not pay sales taxes[104]. On the other hand, it is argued that it is precisely taxation of digital goods that indirectly promotes the illegal acquisition or piracy of those items. The increased price of digital goods, which would result from the new tax, encourages consumers to look for lower-priced or untaxed items offered by digital pirates.

This last issue raises a fundamental point in the design of tax policy: what is an optimal tax structure in an economy where evasion exists? Richter and Broadway (2001) argue that efficient tax design needs to consider the ease with which taxes can be evaded[105]. Along these lines, the authors argue that efficient taxation must take into account the incremental effects each type of tax has on the cost of distortions and the cost of risk taking on the part of consumers. In the case of taxes associated to the consumption of digital goods, when evasion is fairly easy and risk is low, the design of an efficient tax system could be challenging. This was recognized by the Australia Government in its assessment of online copyright infringement[106].

Smuggling of digital devices is another classical way of avoiding payment of import duties and potentially, sales taxes.

5.3 Informal digital economy and grey markets

Going back to the cost of taxation, the least expensive and most efficient way to collect taxes is to focus on imposing levies on large corporations, such as telecommunication operators. These firms have developed billing systems and therefore, state-of-the art capability for tracking information and collecting taxes. Furthermore, no large corporation wants to be exposed to a reputational conflict over tax avoidance, which means that they would be very willing to carefully follow all government directives regarding payments.

In a digital economy, however, the emergence of a multiplicity of small and medium firms offering Internet-based services (electronic commerce, social networking, matching platforms, etc.) leads to the emergence of an informal economy where the government faces more difficulties in collecting taxes.

It is unclear how startups that proceed to escalate and grow in size would easily convert to complying with all tax requirements[107]. If the informal sector of the economy represents around 50 per cent of the GDP[108], as is the case in many countries in the world of emerging market economies, tax revenues coming from small digital operators tends to be limited.

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104 It is estimated that the global software piracy rate is 42%, and range from 86% in Indonesia to 19% in the United States (source: Business Software Alliance (2012). *Shadow Market*. Washington (May).

105 Richter, W. and Broadway, R. *Trading off tax distortion and tax evasion*. CESifo Working paper No. 505. June 2001.

106 Australian Government (2014). *Online copyright infringement*. Discussion Paper.

107 See Farrell, D. "Tackling the Informal Economy". *Business Week*.

108 t is estimated that the informal sector in Latin America ranges from 32% of GDP in Chile to 71% in Bolivia. See Tokman, V. (2009). "The informal economy, Insecurity and Social Cohesion in Latin America", *International Labor Review*, 146, pp. 81-107.

6 Economic impact of taxation on the performance of the digital economy

So far, the analysis has focused on different approaches to taxation followed by countries around the world, as well as strategies followed by some global players to minimize their tax burden. As mentioned above, taxes on service providers and consumers of digital services could have an economic impact by reducing the amount of capital to be invested in the deployment of infrastructure or increasing the total cost of ownership of digital devices for consumers. This section will present research that assesses the potential impact that taxation can have in these two domains. It will provide also a perspective on the issue of whether a potential elimination of specific taxes could have an economic impact that outweighs the cost of foregoing the levy.

6.1 Impact of taxation on telecommunication capital investment

As mentioned in chapter 1, the research literature to date provides evidence that taxes tend to raise the required pre-tax rate of return of capital invested. In general terms, leaving aside the positive effects taxes play in terms of their contribution to the delivery of public services, they tend to also affect the incentives of a company to make investments and reduce the supply of funds available to finance them. In industries such as telecommunications that provide broadband services, a critical platform to deliver information, public services, and ensure economic growth, taxation tends to reduce the level of capital investment.

In a study on the impact of state and local taxes on the purchasing of broadband investment by telecommunication service providers and cable TV operators in the United States[109], an econometric model tested the impact of sales taxes on telecommunication and cable TV investment (see Annex A). Considering that the telecommunication and cable TV industries enjoy different tax exemptions by state in the US, and that changes in the tax regime affect each industry differently, the model was specified for the telecommunication and cable TV industries separately.

As the models indicate, the investment in telecommunications is sensitive to sales taxes; every decrease of 1 per cent in the average sales tax rate results in an increase in the total cable TV per capita investment of 0.0408 per cent and 0.0332 per cent in wireline and wireless per capita investment[110]. Furthermore, considering that 30 states impose a sales tax on wireless and wireline equipment purchasing, while 31 states (plus the District of Columbia) do so on cable TV equipment, it is reasonable to consider a scenario under which these states were to join those that have enacted policies aimed at promoting network deployment by totally eliminating this tax. This scenario would result in a baseline estimate of increase in investment of USD 1.48 billion, although an optimistic scenario projects the increase to reach USD 1.72 billion (an increase of 4.08 per cent).

Research indicates that the economic benefits associated with investments in communications networks are broadly distributed across the many businesses, governments, and non-profit organizations that use information technology and communication services, as well as consumers. Those benefits comprise short-term effects resulting from network construction, and long-term effects driven by the positive externalities of communications networks, particularly broadband. By relying on input-output matrices to quantify the construction effect and econometric analysis to estimate the positive externalities, the following benefits have been estimated at a national scale. Baseline estimates indicate that an increase in investment of USD 1.48 billion, derived from an elimination of the sales tax on equipment purchasing, would:

- generate USD 7.24 billion in additional annual GDP in the first year after the increase in investment and USD 33.13 billion of output over three years;

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[109] Katz, R., Flores-Roux, E., Callorda, F. (2012). *Assessment of the economic impact of taxation on communications investment in the United States*. New York: Telecom Advisory Services LLC.

[110] The elasticity coefficients in relationship with taxable investment, 66% of total investment, are 0.0619 and 0.0504.

- create 53 000 new jobs in the first year after the increase in investment and 243 000 over three years;
- increase broadband deployment by 634 000 new connections in the short term.

The sum total of the baseline economic effects is presented in Table 14.

Table 14: Economic effects of eliminating the sales tax on network equipment

Horizon	Incremental Investment (USD '000'000)	Direct Effects		Direct and Indirect Effects	
		Incremental Output (USD '000'000)	Jobs (000)	Incremental Output (USD '000'000)	Jobs (000)
Short-Term (1 year)	1.48	2.96	32	7.24	53
Long-Term (3 years)	6.77	13.54	147	33.13	243

Source: TAS analysis

Furthermore, the new economic activity would generate substantial offsetting revenues for state and local governments as new employment and economic activity generates income, sales, property, and other tax revenue for governments.

A similar analysis was conducted in 2013 by this author evaluating the impact of repealing a sales and use tax exemption on telecommunication equipment in the state of Minnesota[111]. The study indicated that the telecommunication industry, stimulated in part by a sales tax exemption on the purchase of equipment, had invested USD 5.167 billion between 2006 and 2012, which by virtue of the direct multipliers and spillover effects had contributed to the support of 112 239 jobs/year and generated USD 10.38 billion in output. Based on econometric modelling and the results of survey research, it was estimated that repealing the sales tax exemption would trigger a decrease in capital investment of USD 153 million over two years, and USD 722 million over the long run. Based on this analysis, the state legislature decided to extend the repeal for the foreseeable future.

6.2 Impact on ICT adoption and overall digitization

The prior case provided evidence on how taxation can affect the level of capital investment of suppliers of broadband services. The study will now turn to the impact consumption taxes could have on broadband adoption.

6.2.1 The case of broadband services

The economic structural factors driving broadband purchasing need to be assessed in terms of the total cost of ownership, a concept that allows factoring in the purchasing cost of devices, initial activation costs, as well as the recurring costs resulting from monthly service charges. Total cost of ownership is the sum of the cost of usage (service) plus part of the cost of the access device, which is assumed to be amortized throughout its lifetime, usually between two and four years, depending on the device[112].

As a general principle, telecommunication services have negative elasticities: higher prices imply lower demand. However, pricing needs to be decomposed among its different elements because they affect initial adoption and usage in different manners. Initial adoption is constrained by device

[111] Katz, R. and Callorda, F. *Assessment of the economic impact of the repeal of the tax exemption on telecommunication investment in Minnesota*. New York: Telecom Advisory Services, December 2013.

[112] The average replacement cycle of a PC is 3.5 years, while the cycle for a mobile handset is 18 months.

acquisition, its corresponding tax burden, service activation cost, and expected recurring costs derived from subscription retail fees and its taxes.

Device retail prices and their corresponding taxes vary between fixed and mobile broadband. Fixed broadband requires the acquisition of a personal computer, while mobile broadband could be supported through either a personal computer or a smartphone. Retail acquisition prices of this type of equipment are driven by supply and demand conditions, in particular manufacturing economies of scale and component costs. While device retail pricing is typically outside the realm of policy control, taxation is not. Final price of devices is affected by a set of different taxes, which vary by country and year. As will be shown below, taxes can, in some cases, add a significant burden to the retail price.

The importance of expected recurring costs on initial adoption varies by type of device. For example, in general, service subscription for a wireless modem is generally stable, representing a monthly rate for an expected type of service plan. As a result, subscribers can easily factor in the monthly subscription cost on the total cost of ownership and make an informed decision regarding adoption. In the case of smartphone access to mobile broadband service, prepaid subscription allows subscribers to purchase service while limiting total cost of ownership to a minimal amount. In this case, taxes play a more limited role than in the case of service activation and postpaid usage rates.

There are several studies that shed a light on the potential price elasticity of broadband services[113]. Considering the level of service adoption at the time each of these studies was completed allows estimating the relationship between fixed broadband penetration and elasticity (see figure 11).

Figure 11 plots fixed broadband household penetration and calculated elasticity at the time each of the seven studies was conducted. The data allows displaying the relationship between both indicators, showing that higher penetration is associated with lower price elasticity. Why is this? At the beginning of a broadband diffusion process, prices are typically high, broadband is not a key technology for most users and non-adopters are very price sensitive. With increasing penetration, prices tend to fall, broadband becomes a key resource for a larger portion of the population, and consequently, elasticity declines. By relying on the data in Figure 11, a logarithmic function is specified with the purpose of estimating the coefficient that links penetration (in the X axis) with elasticity (in the Y axis). While the elasticity data in Figure 11 is presented in absolute values, the price elasticity coefficient is always negative indicating the indirect relationship between price and demand. The equation displayed in the figure indicates what the elasticity would be at each broadband penetration level.

The formula underlying the model and derived from the data in Figure 11 is the following:

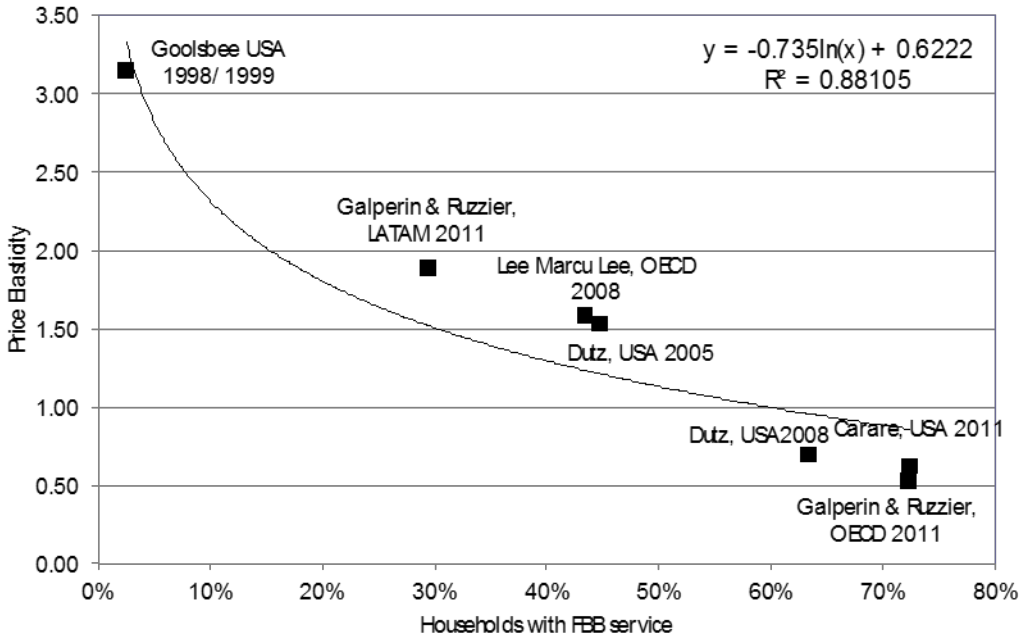
$$\text{Expected penetration} = (1 + ((0.735 * \text{Log}(\text{current penetration}/100) + 0.622)/100) * \%\ \text{price change}) * \text{current penetration}$$

Where,

Expected penetration: broadband penetration resulting from a price reduction

[113] For example, by relying on data from a survey of approximately 100 000 US households, Goolsbee (2006) found fixed broadband service demand between 1998 and 1999 to be fairly elastic. According to the author, for levels of penetration between 2% and 3%, price elasticity was between-2.8 and-3.5. In another study, Galperin and Ruzzier (2012) utilized data for the OECD and Latin America to estimate the elasticity of fixed broadband service in 2011. Their main finding is that the elasticity of both regions varies. In the case of Latin America, where penetration averaged 7.66% in 2011, broadband price elasticity was-1.88. In the case of the OECD, with an average broadband penetration of 27.48%, price elasticity was-0.53. This result begins to point out that, as expected, mature markets tend to be more price inelastic. Coincidentally, Lee, Marcu and Lee (2011) found that for OECD countries between 2003 and 2008, elasticity was-1.58 (lower than for Latin America). Confirming the inverse relation between penetration and elasticity, Dutz, Orszag and Willig (2009) analyzed the elasticity of broadband service in the US between 2005 and 2008. They found that in 2005 the elasticity was of-1.53 but declined to-0.69 in 2008, confirming the declining elasticity trend at higher penetration levels.

Figure 11: Correlation between fixed broadband penetration and price elasticity



Note: The t-value for the variable of interest is -.755

Source: Katz and Berry (2014)

0.735: Price elasticity coefficient resulting from a decline in pricing of 1 per cent, according to the equation in Figure 11

Current penetration: penetration of broadband at time of test of price reduction

0.622: constant

Price change: determination of expected price reduction

By relying on this model, the effect of a price reduction between 5 per cent and 25 per cent was estimated for different regions of the world (see Table 15).

Table 15: Impact on weighted average penetration level of fixed broadband of a price reduction (2013)

Region	2013 Household Penetration	5% Price Reduction	10% Price Reduction	15% Price Reduction	20% Price Reduction	25% Price Reduction
Africa	3.12%	3.62%	4.11%	4.61%	5.10%	5.60%
Americas	54.87%	57.79%	60.70%	63.62%	66.54%	69.45%
Arab States	27.93%	30.10%	32.28%	34.46%	36.64%	38.82%
Asia-Pa-cific	31.05%	33.35%	35.65%	37.95%	40.25%	42.55%
Europe	72.02%	75.13%	78.24%	81.35%	84.46%	87.57%
CIS	36.94%	39.44%	41.94%	44.45%	46.95%	49.45%

Source: ITU

Since the price elasticity is dependent on broadband penetration, the estimates have to begin by calculating the prorated fixed broadband penetration by geography (the second column presents the prorated household penetration). The next five columns calculate what the household fixed broadband penetration would be if prices would decrease according to five scenarios. For example, if broadband prices were to decline by 5 per cent in Central and South America, fixed broadband penetration would increase from 54.87 per cent to 57.79 per cent. As shown in Table 16, the price elasticity is higher for the regions with lower levels of penetration (as is shown in the data that is compiled in Figure 11) because early adopters are less price sensitive. For example, in regions like sub-Sahara Africa, a 25 per cent price decline could yield an approximate doubling of current penetration levels. The increase in fixed broadband penetration is also substantial in other countries with emerging market economies (see Table 16).

Table 16: Penetration growth (per household) of fixed broadband as a consequence of a price reduction

Region	5% Price Reduction	10% Price Reduction	15% Price Reduction	20% Price Reduction	25% Price Reduction
Africa	15.85%	31.70%	47.55%	63.40%	79.25%
Americas	5.32%	10.63%	15.95%	21.27%	26.58%
Arab States	7.80%	15.60%	23.40%	31.20%	38.99%
Asia-Pacific	7.41%	14.82%	22.23%	29.64%	37.05%
Europe	4.32%	8.63%	12.95%	17.27%	21.59%
CIS	6.77%	13.54%	20.31%	27.08%	33.85%

Note: For each tariff reduction scenario, the growth on broadband penetration was estimated based on the formula of Figure 11.

Source: Katz and Berry (2014)

Table 16 presents data in terms of the increase in penetration resulting from broadband price reductions. As a result, a 10 per cent price reduction yields an increase in penetration of 31.70 per cent in Africa, 15.60 per cent in the Arab States, 10.63 per cent in South and Central America, and so forth.

In this context, taxation could have a detrimental effect on the public policy strategy aimed at deploying broadband. The impact of these different taxation approaches on total cost of ownership of broadband service varies widely. As mentioned before, in Mexico the impact of taxes on total cost of ownership of mobile broadband is 18.4 per cent, in South Africa it is 15.2 per cent, in Brazil it reaches 29.8 per cent, while in Bangladesh it is 54.8 per cent. On the other hand, in Malaysia, the effect of taxes on mobile broadband cost of ownership amounts to only 6.1 per cent.

At a correlational level, taxation appears to have an impact on the deployment of mobile broadband. For example, *ceteris paribus*, there may be some association between the very high level of taxes in Brazil and its very low penetration level of 3G handsets. On the other hand, Malaysia shows a low level of taxes and a high 3G penetration rate. Similarly, an inverse relationship appears to exist between tax burden and adoption of data services when measured by wireless data as per cent of service revenues. If taxes limit adoption of wireless broadband, it is relevant to ask what the ultimate impact of reduced penetration might have on economic growth.

Some countries have reached the conclusion that while foregoing tax collections in the short run, a tax reduction strategy can result in additional adoption of devices and broadband usage, and consequently enhanced economic benefits in the long run. In 1998, the Sweden Government enacted its tax rebate programme, which encouraged employers to purchase home computers for their employees. The price of the computer was deducted from employees' salaries as monthly repayments over a three-

year period and employers received a tax credit for the purchase. The programme was credited in part with the country's rise in computer penetration, which reached 93 per cent of individuals by 2012[114]. In January 2010, the Government of Malaysia offered an incentive to consumers, who received tax relief on the broadband subscription fee up to USD 165. The country's Inland Revenue Board announced in 2011 that these tax benefits extended to smartphone broadband use as well. While the actual devices did not qualify for the additional personal computer tax incentive, tablets such as the iPad did. The Malaysia Income Tax Act 1967 states that the cost of a personal computer – up to USD 1 000 – is deductible. As of 2014, while the deductibility for personal computers was maintained, it could only be made once every three years. On the other hand, the tax relief for broadband expired[115].

In a similar case, the Zimbabwe Revenue Authority exempted all ICT equipment of any import duty. This includes computers, cellphones, and other selected equipment. With the stated purpose of promoting the development of the ICT sector, the only tax attached to this equipment is VAT[116].

6.2.2 The case of personal computers and tablets

The international market for personal computers and tablets, considered as the devices used to access the Internet is considerably developed. Worldwide shipments of personal computers (both desktop and laptops) in 2013 reached 315.1 million, while tablets shipments amounted to 227.3 million[117]. Of these volumes, 58 per cent of PCs and 25 per cent of tablets are shipped to emerging markets[118]. In light of these volumes, import duties and sales taxes remain an important factor in driving purchasing prices up. Retail prices before import duties and sales tax range by manufacturer and product type. Import duties and sales taxes are added to the retail price. The global average import duty rate for a personal computer is 2.1 per cent ranging between 0 per cent to a maximum of 35 per cent; in addition, sales taxes to be added to the purchase price could range from zero per cent to 27 per cent[119]. Countries with the highest cumulative taxes on PCs include Iran, Argentina, Cambodia, Croatia, and Venezuela, while countries with the lowest taxes include India, Panama, Saudi Arabia, and Singapore (see full table in Annex B.1).

In the case of tablets, the global average import duty rate is 1.2 per cent, with a minimum of zero per cent to a maximum of 16 per cent. Countries with the highest cumulative taxes on tablets include Algeria, Bulgaria, Chile, Ecuador, Lithuania, and Morocco, while countries with the lowest burden comprise Bangladesh, Egypt, Panama, and Sri Lanka (see full table in Annex B.2).

Data indicate that, when considering import duties and sales taxes, European countries appear to be on the high end of the tax rate distribution for PCs and tablets. The Arab States tend to appear in the low end of the distribution, while Latin America, Africa and the Asia-Pacific regions display a moderate tax burden on device imports.

However, in addition, some countries add on top of customs duty and sales tax, a product specific tax, which tends to affect the end-price of PCs and tablets (see Table 17).

The cumulative impact of customs duties, sales taxes and, in some cases, additional levies have, in some cases almost a 50 per cent impact in the price of data access devices. This increase has an impact on the affordability of devices by large portions of the population in countries with emerging market economies. For example, an earlier tax impact study[120] concluded that the VAT exemption enacted

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114 Source: Katz, R., Berry, T. (2014). *Driving demand for broadband networks and services*. London: Springer.

115 Weina, Ang "Top 10 tips on filling your tax returns", The Star (April 6, 2014); retrieved from: www.thestar.com.my/News/Nation/2014/04/06/Top-10-tips-on-filing-your-tax-returns/

116 Zimbabwe Revenue Authority (2014). *You can import ICT equipment duty-free.*

117 IDC. *Smart connected device market by product category, unit shipments 2013 and 2017.*

118 IDC. *PC Shipments by Region and form factor 2013-2018.* Juniper Research. *Tablet shipments split by eight key regions. 2015.*

119 Source: Import Duty Calculator, retrieved from http://www.dutycalculator.com/popular-import-items/import-duty-and-taxes-for-personal-computer/

120 Villate, C. and Granados, R. *Estudio Sobre la Exclusión del IVA a los PCs y su Impacto Económico, Competitivo y Fiscal,* Desarrollado para la Cámara Colombiana de Informática y Telecomunicaciones 2009, DC-Colombia.

Table 17: Specific additional duties and taxes on import of PCs and tablets

	Personal Computers	Tablets
Australia	• Import Processing Tax (AUD 48.85)	
Bangladesh	• Advance Trade VAT (4%) • Advance Income Tax (5%)	
Brazil	• Airport fee (50% (Storage fee + Handling fee)) • Storage fee (1% CIFD) • Handling fee (BRL0.015 per KG) • Declaration fee (BRL30.00) • IPI (15% CIFD) • COFINS tax ((9.25% (CIF * (1 + ICMS%) * (Duty% + IPI% * (1 + Duty%)))) / (0.9075 * (1 ICMS%)))	
Burundi	• Administrative Licence Fee (0.5% CIF) • Security Tax (1.15% CIF)	
Chile	• Classification Charge (1% CIF)	
Costa Rica	• (Tourism development tax) (18% CIFD)	
Ecuador	• FodInfa (Children development fund) (0.5% CIF) • ICE (Consumption Tax) (0% CIFD)	
India	• Landing charges (1% CIF) • Countervailing duty (10% (CIFD + Landing charges)) • CESS (3% (Duty + CEX (Education & Higher Education CESS) + Countervailing duty)) • Additional Countervailing Duty (4% (CIFD + Landing charges + Countervailing duty + CESS + CEX (Education & Higher Education CESS))) • CEX (Education & Higher Education CESS) (3% Countervailing duty)	
Indonesia		• Income tax (7.5% CIFD)
Israel	• Import port fee (USD 50.31 Import port fee if weight more 50 kg per shipment)	
Morocco	• Parafiscal tax (0.25% CIF)	
Panama	• ISC (Consumption tax) (5% CIFD)	

Source: Duty Calculator

in Colombia in 2007 and 2008 generated more economic benefits and tax revenues than the losses incurred by the temporary enactment of the measure. If the Colombia Government had not exempted low priced PCs from VAT, its revenues would have been USD 243 million. On the other hand, the VAT collected by the acceleration of demand of software, services, and broadband subscription triggered by the accelerated diffusion of PCs was USD 201 million, while the fiscal revenues collected by spillover effects on the rest of the economy reached USD 244 million. The net effect of the measure was an incremental revenue effect to the Colombia Treasury. Other governments followed the Colombia example. For example, in September 2012, the Brazil Government enacted a law suspending certain taxes on PCs, as well as on software for educational use, and other ICT-related services[121].

[121] INTEL (2012). *The merits of reducing taxes on personal computers*.

7 Comparison of digital sector taxation with other sectors

The evidence provided so far points to a number of tax asymmetric issues regarding taxation within the digital sector. As such, it includes either ICT/telecommunication operators or digital platform providers, such as digital advertising and content distribution firms. A question that is also being raised is to what extent is the digital sector taxed at an unfair rate compared to other sectors of the economy. This raises a number of theoretical issues regarding fiscal policy.

First, while the ICT/telecommunication sector is recognized as an engine of economic growth and social development, the burden of taxation borne by the sector is larger than that of other industries. This point is being argued from two angles. The first one raises the issue of whether the effective tax rate for the telecommunication sector, defined as the ratio between the total tax payments in the annual accounts (which includes corporate income taxes and personal income contributions by employers) and gross revenues, is higher than for other sectors of the economy. If the evidence proves this point, then the question would be one of fairness (why do telecommunication firms pay more tax than companies in other sectors of the economy?) as well as economic policy (if the telecommunication sector represents a large multiplier, shouldn't their tax rate be lower than other sectors in order to maximize its adoption and usage?).

The second issue of cross-sector taxation fairness is broader[122]. If, as a matter of public policy, governments chose to subsidize certain goods, such as fuel and electricity, it falls to other industries, such as telecommunications, to fill the gap left by the subsidies. In other words, the implied cost of the subsidy is the lost revenue that could offset taxes. If subsidies are onerous (as fuel or electricity subsidies generally are), the telecommunication (or/and other sector) sector has to fill the revenue gap through a larger tax burden.

In addition, to the cross-sector argument, taxation fairness is being raised as an issue within the digital eco-system. As pointed above, not all firms within the digital sector are being taxed in the same way: generally speaking, OTT and digital platforms (such as digital advertising and search firms) face a much more benign taxation framework. As mentioned above, the European Union has been focusing on this issue when proposing changes in VAT rules across Europe. This matter is important since it is generally assumed that taxation within industrial sectors should be considered in the context of substitutable goods. A case in point is how taxation of over the top VoIP players is tackled when compared to traditional telecommunication operators.

The following section focuses primarily on the first issue: a comparison of taxation burdens between different sectors of the economy.

7.1 Overview of taxation in other sectors of the economy

A comparative analysis of taxation burden across sectors presents several methodological issues. First, the appropriate metric to measure the taxation burden needs to be defined. There is a general consensus that the effective tax rate (ETR) would be the appropriate metric[123]. However, data gathering to construct comparative panels across sectors is rather difficult. The usual approach is to divide the taxes paid by the taxable income as reported by public companies in their reports to the stockholders. This presents in turn two problems. From a theoretical standpoint, a more appropriate measure would be marginal tax rates paid by those firms. However, data for this metric is not available. Second, and on a related point, data on taxes paid contained in annual reports does not reflect the real burden of taxation since it implies differences in tax rates, tax exemptions, or even tax strategies followed by said firms.

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122 This point is raised in GSMA. *Mobile taxes and fees: a toolkit of principles and evidence*. London, February 2014.

123 The Effective Tax Rate (ETR) for a company is the average rate at which pre-tax profits are taxed. Contrary to the statutory rate, which is legally imposed, the ETR measures the total tax paid as a per cent of the company's accounting income.

The second methodological issue raised in conducting these cross-sector comparisons relates to country differences. Sector tax burdens change by country, which means that cross-border averages have little sense. Along these lines, a multinational corporation is bearing different levels of taxation burden. Their annual reports generally tend to blend the total taxes paid, which limits the ability to conduct a cross-country comparison. Obviously, this issue does not apply for companies operating in a single country, a fact that is quite uncommon particularly in the digital sector.

With these limitations in mind, the following analysis relies on Prof. Aswath Damodaran's data sets[124]. The sources for the dataset are Bloomberg, Morningstar, Capital IQ and Compustat. The data used has been last updated in January 2015. The data on effective tax rates represents an average rate for all firms in each sector, and reports data for 94 sectors.

The cross-sector comparison of effective tax rates was conducted at a regional, and country level. Three sectors, each of which comprises two or more sub-sectors, were chosen for comparison: the digital sector, tourism, and media. Each analysis includes the number of firms comprising the sample, and the aggregate effective tax rate (which is calculated on the ratio of aggregate taxes to the total sector corporate income). Recognizing that cross-border, cross-sector analysis could be misleading, the comparisons were conducted for some regions or countries separately: Europe, United States, and emerging markets[125].

7.1.1 Cross-sector comparisons within the United States

When conducting the comparison for the United States, the effective tax rate (ETR) for the three sectors under consideration varies substantially. The variance in effective tax rates within sectors is also prevalent. For example, within the digital sector, the highest tax rates are found in software (Internet), telecommunication services, and office equipment and services, while the sectors with the lowest rates are software (entertainment), telecommunication equipment, and computer services (see Table 18).

Table 18: Digital sector: US effective tax rate (2014)

Sub-sector	Number of firms	Aggregate effective tax rate
Computer services	119	20.89 %
Computers/peripherals	64	25.48 %
Electronics (consumer and office)	28	26.93 %
Information services	67	30.41 %
Office equipment and services	25	31.99 %
Retail (online)	46	24.75 %
Software (entertainment)	20	13.79 %
Software (Internet)	327	39.20 %
Software (systems and applications)	259	23.94 %

[124] Aswath Damodaran is a professor of Finance at the Stern School of Business at New York University, where he teaches corporate finance and equity valuation. He has been compiling data since the 1990s to support his research and teaching in firm valuations. In that sense, data was compiled to value companies rather than support a public policy debate. With that caveat in mind, directional findings regarding the state of affairs could be a useful tool for policy makers.

[125] These are the tables included in Prof. Damodaran's database.

Table 18: Digital sector: US effective tax rate (2014) (continued)

Sub-sector	Number of firms	Aggregate effective tax rate
Telecom equipment	126	20.09 %
Telecom services	77	31.69 %

Source: Damodaran Online at: http://people.stern.nyu.edu/adamodar/New_Home_Page/home.htm

When examining the tourism sector, the hotel/gaming industry, one of the sub-sectors comprising this industry is benefitting from a surprisingly low ETR (10.77%) (see Table 19).

Table 19: Tourism sector: US effective tax rate (2014)

Sub-sector	Number of firms	Aggregate effective tax rate
Hotel/gaming	80	10.77 %
Restaurant/dinning	79	32.59 %

Source: Damodaran Online at: http://people.stern.nyu.edu/adamodar/New_Home_Page/home.htm

The comparison with the media sector would indicate that all sub-sectors are taxed at lower ETR than software (internet) (see Table 20).

Table 20: Media sector: US effective tax rate (2014)

Sub-sector	Number of firms	Aggregate effective tax rate
Broadcasting	28	35.59 %
Cable TV	18	34.21 %
Entertainment	84	28.63 %
Publishing and Newspapers	43	17.30 %

Source: Damodaran Online at: http://people.stern.nyu.edu/adamodar/New_Home_Page/home.htm

In the case of the United States, the tourism sector appears to be most benefitted by a lower ETR. Furthermore, telecommunication services firms also appear to be affected by a relatively low ETR, when compared to software and media companies.

7.1.2 Cross-sector comparison in Europe

The cross-sector comparison for Europe also depicts a wide variance in ETR. Within the digital sector, the highest tax rates are found in retail (online), and telecommunication services, while the sectors with the lowest rates are computer equipment, and software (entertainment) (see Table 21).

Table 21: Digital sector: Europe effective tax rate (2014)

Sub-sector	Number of firms	Aggregate effective tax rate
Computer services	217	28.86 %
Computers/peripherals	37	7.19 %
Information services	23	26.16 %

Table 21: Digital sector: Europe effective tax rate (2014) (continued)

Sub-sector	Number of firms	Aggregate effective tax rate
Office equipment and services	37	31.13 %
Retail (online)	34	34.26 %
Software (entertainment)	25	17.82 %
Software (Internet)	137	23.85 %
Software (systems and applications)	229	26.08 %
Telecom (wireless)	16	N.A.
Telecom equipment	53	N.A.
Telecom services	87	31.43 %

Source: Damodaran Online at: http://people.stern.nyu.edu/adamodar/New_Home_Page/home.htm

On the other hand, contrary to what occurs in the United States, the European tourism sector does not appear to be paying at a much lower ETR than the digital sector (see Table 22).

Table 22: Tourism Sector: Europe effective tax rate (2014)

Sub-sector	Number of firms	Aggregate Effective Tax Rate
Hotel/gaming	126	31.86 %
Restaurant/dinning	40	25.90 %

Source: Damodaran Online at: http://people.stern.nyu.edu/adamodar/New_Home_Page/home.htm

Finally, the comparison with the ETR of media companies would indicate that all these sub-sectors, except publishing, are taxed at a similar rate or higher than telecommunication services and software firms (see Table 23).

Table 23: Media sector: Europe effective tax rate (2014)

Sub-sector	Number of firms	Aggregate Effective Tax Rate
Broadcasting	31	46.69 %
Cable TV	11	29.59 %
Entertainment	83	31.63 %
Publishing and Newspapers	110	21.98 %

Source: Damodaran Online at: http://people.stern.nyu.edu/adamodar/New_Home_Page/home.htm

Interestingly enough, the comparison of ETR across the same industries for the European continent indicates a reversal. Telecommunications services firms exhibit the second highest ETR, while media companies incur the lowest. E-commerce firms pay taxes at 5 percentage points more than media firms as well.

7.1.3 Cross-sector comparison in countries with emerging market economies

The cross-sector comparison of effective tax rates for countries with emerging market economies also depicts a wide variance in ETR. Within the digital sector, the highest tax rates are found in office

equipment, and software (entertainment), while the sectors with the lowest rates are computer equipment, telecom services and software systems (see Table 24).

Table 24: Digital sector: countries with emerging market economies effective tax rate (2014)

Sub-sector	Number of firms	Aggregate effective tax rate
Computer services	418	24.53 %
Computers/peripherals	194	20.63 %
Electronics (consumer and office)	86	28.19 %
Information services	51	28.22 %
Office equipment and services	58	39.43 %
Retail (online)	11	N.A.
Software (entertainment)	52	31.77 %
Software (Internet)	142	21.93 %
Software (systems and applications)	297	20.79 %
Telecom (wireless)	67	29.46 %
Telecom equipment	256	21.30 %
Telecom services	110	19.50 %

Source: Damodaran Online at: http://people.stern.nyu.edu/adamodar/New_Home_Page/home.htm

Table 25: Tourism sector: Countries with emerging market economies effective tax rate (2014)

Sub-sector	Number of firms	Aggregate effective tax rate
Hotel/gaming	407	12.96 %
Restaurant/dinning	78	25.58 %

Source: Damodaran Online, at: http://people.stern.nyu.edu/adamodar/New_Home_Page/home.htm

Table 26: Media sector: Countries with emerging market economies effective tax rate (2014)

Sub-sector	Number of firms	Aggregate effective tax rate
Broadcasting	57	31.18 %
Cable TV	27	17.92 %
Entertainment	143	66.42 %
Publishing and Newspapers	154	15.35 %

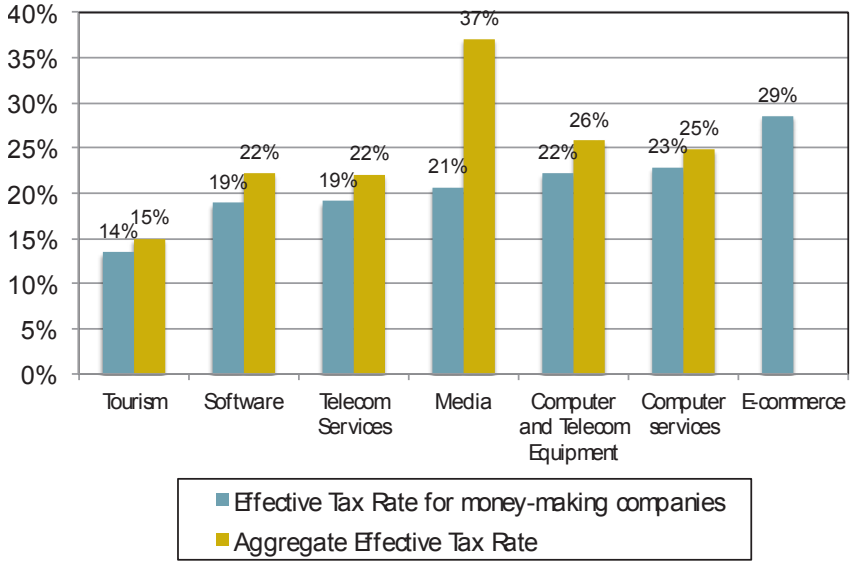
Source: Damodaran Online at: http://people.stern.nyu.edu/adamodar/New_Home_Page/home.htm

However, the tourism sector in countries with emerging market economies appears to be, on a prorated basis, paying taxes at a much lower effective rate than the digital sector. The aggregate effective tax rate of tourism firms in countries with emerging market economies is five percentage points lower than telecommunication services and software firms, and between eight and fifteen

percentage points lower than computer and telecommunication equipment, computer services and e-commerce companies.

In sum, in countries with emerging market economies, the tourism sector ETR is significantly lower than media and all ICT related sectors (see Figure 12).

Figure 12: Emerging countries: Effective tax rate by industry (2014)



Sources: Damodaran Online at: http://people.stern.nyu.edu/adamodar/New_Home_Page/home.htm

7.2 Conclusions of the comparison of digital sector taxation with other sectors

The comparison of effective tax rates (ETR) across sectors by region indicates significant differences:

- United States: the range of aggregate ETR across technology intensive sectors is seven percentage points, which might raise a potential distortion within the digital eco-system.
- Europe: the ETR for companies in the telecommunication and computer services is between five and seven percentage points higher than that of the media sector. It is worth examining this potential asymmetry to determine whether this is a source of distortion.
- Countries with emerging market economies: the aggregate effective tax rate of the tourism sector is five percentage points lower than telecommunication services and software sectors, and between eight and fifteen percentage points lower than computer and telecommunication equipment, computer services and e-commerce. The lower tax rate of the tourism sector is frequently associated with policies aimed at promoting competitively priced destinations, in addition to the fact that a significant number of small businesses in the tourism sector fall underneath a compulsory tax bracket[126]. Considering the importance of the technology sectors as economic multipliers, it would be relevant from a development policy standpoint to reexamine this asymmetry.

It is important to mention, however, that these conclusions can only be considered tentative given the paucity of data, and the fact that these estimates are based on annual reports, that provide data on taxes being paid on a specific year, implying differences in rates, tax exemptions, or even tax strategies implemented by each firm. It is, therefore, important that governments conduct detailed assessments of the tax situation of digital firms operating in their country to define appropriate fair

[126] Foreign Investment Advisory Service (2006). *Sector study of the effective tax burden: South Africa*. World Bank. P. 51.

and unbiased approaches that allow them to collect revenues, while ensuring that digital operators continue contributing to economic growth.

8 Lessons learned, best practices and fiscal policy recommendations

In the introduction to this report, several questions were raised and reviewed to demonstrate the ongoing debate regarding taxation in the digital economy. Recognizing that answers to these questions should be developed based on country-specific policy trade-offs between revenue generation and the potential negative impact on the development of the digital sector as well as the telecommunication/ ICT market environment, the evidence provided in this report should help understand the implications of these decisions:

- What is the appropriate level of taxation on capital equipment purchased by telecommunication operators? Taxation of equipment purchased by ICT operators, such as import duties and sales taxes, has a negative impact on capital investment. Governments should carefully consider the enactment of tax exemptions similar to those considered for development of critical industries.
- How should Internet sales be taxed? No easy answers in this area. Taxation of goods sold over the Internet should be considered in light of the benefits to consumers implied in a tax-free environment. For example, consumer welfare in this domain has been identified in areas such as lower purchase price[127]. On the other hand, no taxes for goods purchased over the Internet have a potential distortion vis-à-vis physical distribution channels. The European Union is moving to a single, unified VAT regime to ensure a fair collection, while stimulating development of smaller start-ups selling online[128].
- How should consumption of digital goods be taxed? Again, this is an evolving policy domain. However, if the objective is to protect national digital industries, no taxation of global players offering digital goods has a potential distortionary effect.
- Should the consumer purchasing wireless devices and personal computers be taxed? If the objective is to maximize adoption of digital access devices, the evidence points out that tax minimization fosters increased adoption, which in turn results in large economic gains, which compensate for the foregone tax revenues.
- Should the providers of digital platforms, such as Google and Facebook, be taxed at the country where revenues are generated, or should they benefit from international rules that allow them to take corporate tax exemptions? This question is at the core of an ongoing debate, which is critical for countries with emerging market economies. Global platforms have been the preeminent drivers of Internet adoption throughout the world. Furthermore, their indirect contributions to the development of the digital economy have been significant. While the current tax regime might be a source of asymmetry within the digital sector (particularly vis-à-vis telecommunication operators), governments in countries with emerging market economies need to carefully assess the convenience of moving into this domain, which might entail a risk in hampering growth of local demand and usage.
- Should Internet service providers pay taxes the same way as telecommunication carriers? Again, this is an evolving concept with little evidence so far. However, some analysis point out that taxing Internet service providers in a way similar to telecommunication operators, while distortive, has the potential for increasing the cost of broadband access.

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127 A lower "price penalty" has been identified in several categories of goods (housing, personal care, toys, electronics) purchased through e-commerce (see Buchanan, L. and Parlapiano, A. (2014). "Costs for Americans reflects an increase in quality over the past 10 years". *New York Times*. April 30, 2014.

128 See European Commission. A Digital Single Market for Europe; Commission sets out 16 initiatives to make it happen. Brussels, May 6, 2015.

Beyond these preliminary conclusions, two additional generic points for tax policy making are worth reviewing, on tax imbalances and how to maximize the impact on digitization.

8.1 Addressing tax imbalances

Throughout this study, the distortive effect of taxes in the digital eco-system has been identified at several levels:

- The first one refers to the disparity in tax burdens imposed on telecommunication operators when compared to other operators of the digital eco-system (digital advertisers, social networks). In Europe, Internet firms have a five-point lower effective tax rate than telecommunication service companies. In the case of countries with emerging market economies, Internet companies have a seven-point lower ETR than wireless operators. In India, wireless telecommunication operators bear a burden that is 14 points higher than Internet firms. Finally, the difference would also appear to exist in China, where both wireless and full service telecommunication companies are taxed with a rate that is five points higher than Internet players.
- A second dimension of taxation asymmetry within the digital sector exists when one looks at global players. In general, the provision of telecommunication services in a given country requires the deployment of local infrastructure in the form of points of presence, interconnection points, switches and distribution networks. From a tax standpoint, this constitutes a "permanent establishment" and renders the service provider liable for payment of taxes, contributions, and telecommunication specific fees within that country. On the other hand, a global digital player that relies on the telecommunication operator infrastructure to access the end customer does not necessarily require an in-country presence. This is directly related to the business model and operating processes of the global digital player, which is "asset-light" and benefits from having a centralized R&D and processing infrastructure (in the form of data centres located in the home country). The derived value of this configuration is that, contrary to what happens with telecommunication service providers, global digital players are liable for a much reduced tax burden in countries beyond that of his home office. Some digital players like the OTT operators do not even have a physical presence, all transactions are booked out of the country, and therefore, while they generate revenues and profits, their ETR is substantially low. Other players, like the major digital advertising platforms set up sales offices and therefore become liable for a small tax burden, derived from social charges for local employees, VAT for some goods purchased in-country, and, in some cases, some country-specific taxes.
- The third dimension of taxation asymmetry refers to in-country comparison of tax burden of the telecommunication sector, compared to the other providers of goods and services. In Europe, the effective tax rate for companies in the telecommunication and computer services sub-sectors is between five and seven percentage points higher than that of the media sector. In countries with emerging market economies, the aggregate effective tax rate of the tourism sector is five percentage points lower than telecommunication services and software sectors, and between eight and fifteen percentage points lower than computer and telecommunication equipment, computer services and e-commerce.

Governments should examine these asymmetries to determine whether they are source of distortion in particular, considering the importance of the technology sectors as economic multipliers, it would be important for governments of countries with emerging market economies to examine these imbalances and assess their potential negative impacts.

8.2 Maximizing impact on digitization

There is extensive evidence supporting the fact that digitization has significant impact on economic growth[129]. In this context, taxation of digital goods and services might have a detrimental impact on the rate of development of digitization. For example:

- Taxes on consumption of digital goods and services (for example, downloading a movie, or purchasing a good through an e-commerce site) impose an excess burden if demand is elastic, and consumers replace the digital good or service for a substitute (for example rent a DVD or purchase a good in a physical store). This has an overall negative impact on the efficiency of the economy.
- High taxes on production inputs, such as network equipment have a negative impact on business development[130]. This can operate by reducing the capital investment rate of rate. It can also affect investment if the provider of service opts to absorb a portion of taxes to be paid by the consumer. This could again have a negative impact on investment.
- In some cases, operators may increase their pre-tax price (a behaviour known as over-shifting) when a tax is imposed. This can have a negative impact on adoption.

Because digital technologies have an impact on the economy, increasing efficiency of production processes, facilitating the circulation of goods, and creating new businesses, the taxation of digital goods and services should be approached with care, preventing any erosion of their spill-over contribution to GDP growth. Furthermore, because of the economic impact, it has been shown that excessive taxing digital goods and services could limit adoption, restricting the positive contribution to GDP. Thus, the tax collected is outweighed by tax foregone on "lost" GDP.

In developing fiscal policies, governments need to consider the trade-offs between revenue generation and the potential negative impact of the development of the digital sector. ICT/telecommunication operators already contribute significant tax revenue. These contributions include the value-added tax (VAT), social security tax, corporate tax, regulatory fees, and telecom sector-specific taxes.

In crafting policy, recognizing that part of the taxation burden is to be borne by consumers, governments should systematically consider the impact taxes have on the total cost of ownership of device (e.g. smartphone, PC or tablet) and its related subscription cost. This metric, which includes not only the acquisition price but also all related taxes to be paid decreases service affordability and therefore determines whether an excessive burden creates a barrier to adoption by lower income users. Furthermore, while the telecommunication sector of the digital eco-system should pay appropriate taxation and regulatory fees, a balance is needed between short-term revenue schemes and long-term strategies to support industry innovation and growth.

Considering the premises raised above, fiscal authorities have to carefully assess the trade-offs regarding the imposition of taxes and tariffs. The impact of levies on the total cost of ownership of devices and service access will have a negative impact on technology affordability. Arguments such as the imposition of a "luxury tax" on smartphones will not have any redistributive impact. Furthermore, in many cases import duties have no clear impact in the protection of domestic industries. Finally, the imposition of "sector specific taxes" runs counter to classical principles of tax policy.

The evidence regarding the economic impact of digital industries continues to grow, ranging from fixed broadband to computing, the Internet, and mobile broadband. From that perspective, the argument to reduce potential distortions emerging from over-taxation of the sector is gaining ground. As others

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[129] See Sabbag, K., Friedrich, R., El-Darwiche, B., Singh, M., Ganediwalla, S. and Katz, R. (2012), ''Maximizing the impact of digitization'', in Dutta, S. and Bilbao-Osorio, B. (Eds), *The Global Information Technology Report 2012*, World Economic Forum and INSEAD, Geneva; Katz, R. y Koutroumpis, P. "Measuring digitization: A growth and welfare multiplier", *Technovation*, July 2013. Katz, R., Koutroumpis, P. and Callorda, F. "Using a Digitization index to measure economic and social impact of digital agendas", *Info,* January 2014.

[130] Cave, R. "Telecommunications service taxation: understanding the process". ITU, 2011: www.itu.int/ITU-T/worksem/taxation/201109/index.html

have argued, though, the reduction in digital sector taxes needs to be weighed in terms of the potential reduction in revenues. Having said that, establishing a balanced view of tax policy across sectors in order to eliminate distortions is a tall order.

Annex A: Models estimating the impact of taxation on telecommunication capital investment

In general, the model estimates the impact of different tax rates among states and years, controlling for state fixed effects, such as wealth of the economy, demographic profile, and urban/rural population, variables considered to be proxies for fixed effects. In addition, the model includes a control variable lagged one year to account for the effect of budgeting inertia in investment decisions[1]. The model for assessing the impact of sales taxes on investment was structured as follows:

$$\text{Taxable Investment PC}_{it} = \alpha_1 (\text{Equipment State Sales Tax}_{it}) + \alpha_2 (\text{Median Income}_{it}) + \alpha_3 (\text{Population}_{it}) + \alpha_4 (\text{Human Capital}_{it}) + \alpha_5 (\text{Rural Population}_{it}) + \alpha_6 (\text{Investment PC}_{it-1}) + \alpha_7 (\text{Population 60 years or more}_{it}) + \alpha_8 (\text{Population between 20/34 years}_{it}) + \alpha_9 (\text{Population between 5/19 years}_{it}) + e_{it}$$

Table A1: Variables of sales taxes effect on investment

Variable	Explanation	Rationale	Source
State communications investment per capita	Sum of taxable state investment by operators per capita in 2010 dollars (66 per cent of the total investment)	Total state communications investment normalized by population size	Broadband Tax Institute
State sales tax rate on initial equipment	Effective sales tax rate on cable or telecom	Independent variable	Mackey (2011)
Median Income	State Median Income	Control variable given that the level of income impact on investment	US Bureau of Economic Analysis
Population	Population at state level	Control variable	US Bureau of Economic Analysis
Human Capital	Share of economically active population with at least High School education	Control variable given that more educated population drives demand	National Broadband Plan Database (FCC)
Rural Population	Share of rural households at the state level	Control variable given that rural population should be inversely related with broadband deployment	US Census Bureau
State communications investment per capita lagged	Sum of state investment by cable TV or telecom operators per capita one year before (in 2010 dollars)	Control for investment inertia	Broadband Tax Institute
Population 60 years or more	Share of population with 60 years or more	Control for age of the population	National Broadband Plan Database (FCC)
Population between 20/34 years	Share of population between 20 and 34 years	Control for age of the population	National Broadband Plan Database (FCC)
Population between 5/19 years	Share of population between 5 and 19 years	Control for age of the population	National Broadband Plan Database (FCC)

Source: Katz et al. (2012)

[1] In other words, it accounts for the importance of the prior year in predicting investment in the current year, an effect observed above in the review of the research literature on capital planning.

Model results for the telecom and cable TV industries are presented in Table A2.

Table A2: Model of impact of sales tax rate on investment – OLS Model of impact of sales tax rate on investment with autoregressive factor (2006-2010)

Dependent Variable	Cable Investment		Wireless & Wire-line Investment	
Sales Tax Rate	-0.3085	*	-0.8529	*
	(0.1586)		(0.5142)	
Median Income (2010 Dollars)	-0.1655		0.5817	*
	(0.1239)		(0.3524)	
Population	0.2508	**	-0.3662	
	(0.0984)		(0.2690)	
Human Capital	0.2382		0.2689	
	(0.1893)		(0.5602)	
Rural Population	-0.0936	**	-0.0620	
	(0.0441)		(0.1461)	
Investment the last year	0.5019	***	0.4375	***
	(0.0465)		(0.0408)	
60 years or more	-0.3200		-8.7256	
	(0.8200)		(6.3690)	
Between 20/34 years	-0.5230		-3.8209	
	(1.2667)		(6.7247)	
Between 5/19 years	-0.8622		-6.9562	*
	(0.6340)		(3.5852)	
Constant	28.6410		434.7922	
	(47.9686)		(301.4056)	
R^2	0.7984		0.4808	
F (9,190)	50.99		37.61	
Prob > F	0.0000		0.0000	
Number of Observations	200		200	

Independent Variables: *Sales Tax Rate, Median Income, Population, Human Capital, Rural Population, Investment lagged, Age of Population.*

Note: ***, **, * significance at 1%, 5%, and 10% level

Note: The median income coefficient is estimated over USD 1 000 multiple

Source: Katz et al. (2012)

The coefficient for the sales tax rate variable indicates that a decrease of 1 percentage point in this rate (for example, from 4.45 per cent to 3.45 per cent in cable TV and from 4.02 per cent to 3.02 per cent in wireless and wireline equipment) would increase cable TV investment by USD 0.31 per capita and wireline and wireless investment by USD 0.85 per capita across all states. These results are statistically significant at the 6 per cent level for cable TV investment and 10 per cent for wireless and wireline. Furthermore, the coefficients imply an elasticity of investment per capita due to a change in sales tax rate, which is calculated as follows:

$$Elasticity\ of\ inv.\ p.c. = \frac{(-0.3085 * Old\ average\ sales\ tax)}{Average\ investment\ per\ capita}$$

Or,

$$0.0408 = \frac{(-0.3085 * 4.45)}{Average\ investment\ per\ capita}$$

Annex B: Taxes on PCs and tablets

Table B.1: Cumulative customs duty and sales taxes on personal computers (2014)

Cumulative taxes	Africa	Americas	Arab States	Asia-Pacific	CIS	Europe
0 %- 5 %			Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates	India, Sri Lanka, Bangladesh		
5 %- 10 %	Nigeria	Panama	Egypt	Australia, Indonesia, Japan, Malaysia Singapore, Thailand		Switzerland, Slovakia
10 %- 15 %	Botswana, Lesotho, Namibia, South Africa, Swaziland,	Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua		Philippines, New Zealand		
15 %- 20 %	Kenya, Burundi, Rwanda, Tanzania, Uganda	Colombia, Dominican Republic,Mexico, Peru, Bolivia	Jordan	China, Pakistan, Republic of Korea	Russia, Bulgaria	Austria, Cyprus, Estonia, France, Germany, Israel, Malta, Turkey, United Kingdom
20 %-25 %		Ecuador	Algeria, Morocco			Belgium, Czech Republic, Finland, Greece, Iceland, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Slovenia, Spain,
25 %- 30 %		Chile, Paraguay, Venezuela		Cambodia		Croatia, Denmark, Norway, Sweden
30 %- 56 %		Uruguay, Argentina		Iran		

Source: Duty Calculator; analysis by the author

Table B.2: Cumulative customs duty and sales tax on tablets (2014)

Cumulative Taxes	Africa	Americas	Arab States	Asia Pacific	CIS	Europe
0 %- 5 %			Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates	Bangladesh, India, Sri Lanka		
5 %- 10 %	Nigeria	Panama	Egypt	Australia, Indonesia, Japan, Malaysia, Singapore, Thailand, Viet Nam		Switzerland
10 %- 15 %	Botswana, Lesotho, Namibia, South Africa, Swaziland	Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua		Iran, New Zealand, Philippines		
15 %- 20 %	Burundi, Kenya, Rwanda, Tanzania, Uganda	Bolivia, Colombia, Dominican Republic, Mexico,Peru, Venezuela,	Jordan	China, Pakistan, Republic of Korea	Russia	Austria, Cyprus, Estonia, France, Germany, Israel, Malta, Slovakia, Turkey, United Kingdom
20 %-25 %		Ecuador, Chile	Algeria, Morocco	Cambodia		Belgium Bulgaria Croatia Czech Republic Denmark Finland Greece Iceland Ireland Italy Latvia Lithuania Netherlands Poland Portugal Romania Slovenia Spain
25 %- 30 %		Paraguay				Hungary
30 %- 56 %		Argentina, Uruguay				

Source: Duty Calculator; analysis by the author

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