Historically in Mexico, as in many other countries, the development of the telecommunications sector has been characterised by the presence of a single operator owned by the State, followed by a privatisation process. However, in the years that followed, a number of obstacles to competition and the development of telecommunications were identified. As a result, a constitutional reform was implemented in 2013. It consisted of a series of measures that have contributed to shape the sector as it is nowadays, with favourable outcomes that have begun to be tangible. This article recounts the evolution and current state of the Mexican telecommunications ecosystem, briefly describing new challenges and opportunities posed by the digital economy.

Introduction: overview of the current situation

In recent years the telecommunications sector in Mexico has been characterised by a transition toward conditions of effective competition, mainly due to recent measures taken by the authorities. That is, as a result of the acknowledgement of the importance of this sector, efforts had been made for more than a decade in order to foster competition, infrastructure development and favourable outcomes for consumers. Examples included number portability rules which were implemented in 2008, although back then they did not include key aspects such as the obligation to carry out the process within a 24 hour time frame (IFT, 2015 [7]); and the requirement to use open network architecture design to promote competition through interconnection and interoperability (Cámara de Diputados del H. Congreso de la Unión, 2014 [8]).

However, these efforts proved insufficient in an environment where América Móvil (traditionally known as Telmex in the fixed market and Telcel in the mobile market), stood out for its market power and the difficulty faced by other companies to compete with it in fixed and mobile services. (It is worth mentioning here that the broadcasting sector has also been characterised by the dominance of Televisa, a broadcaster and media content company that has sustained a high market share for many years). For this reason, a constitutional reform in telecommunications and broadcasting took place in 2013. This reform was based on the identification of a number of factors hampering the development of the sector, as well as the analysis of international best practices as a solution to those problems.

Abstract

Historically in Mexico, as in many other countries, the development of the telecommunications sector has been characterised by the presence of a single operator owned by the State, followed by a privatisation process. However, in the years that followed, a number of obstacles to competition and the development of telecommunications were identified. As a result, a constitutional reform was implemented in 2013. It consisted of a series of measures that have contributed to shape the sector as it is nowadays, with favourable outcomes that have begun to be tangible. This article recounts the evolution and current state of the Mexican telecommunications ecosystem, briefly describing new challenges and opportunities posed by the digital economy.
This assessment was contained in a document by the Organization of Economic Cooperation and Development (OECD), whose citation will be based on the organisation’s acronym in Spanish: OCDE (2012 [9]). Following the assessment, the President sent a proposal to the Legislative Power to reform a series of constitutional articles on telecommunications. The proposal encompassed the following objectives from the ?Pact for Mexico?, an agreement between the country’s Executive Power and the main political parties: establishing broadband access as a human right, reinforcing the autonomy of the regulatory agency, developing both a backbone and a wireless wholesale network, developing a digital strategy and creating specialised courts on economic competition and telecommunications (Hernández & Navarro, 2016 [10]).

Along with the reforms to the Constitution, the Federal Telecommunications and Broadcasting Law Ley Federal de Telecomunicaciones y Radiodifusión, in July 2014, henceforth LFTR) and other related laws, the autonomy of the regulatory agency for the telecommunications and broadcasting sectors was reinforced. In this case, the word "reinforced" refers to the fact that although there was already a separate governmental agency responsible for supervising the development of the referred sectors, its operating budget and its major regulatory decisions depended on the central government and/or the Ministry of Communications and Transport (Secretaría de Comunicaciones y Transportes). This was part of a problem that is commonly referred to as "double window? (Hernández & Navarro, 2016 [10]). With this in mind, and as part of the key problems facing the sector, it was considered that the regulator needed autonomy as well as a series of specific powers and responsibilities.

Therefore, ever since the constitutional reform of 2013 was implemented, the relevant regulatory framework has established that the Federal Telecommunications Institute (Instituto Federal de Telecomunicaciones, IFT) is the independent and autonomous regulator for the telecommunications and broadcasting sectors (Table 1 presents a relation of the main companies of the telecommunications sector that are subject to IFT’s authority, and the markets in which they operate). It has its own operating budget and constitutional warrants to avoid any external (private or governmental) influence on its decisions. Its charter consists of regulating and promoting competition and the efficient development of both telecommunications and broadcasting. For this purpose it is in charge of regulating, promoting and supervising the efficient use of radio spectrum, orbital resources, satellite services, public telecommunication networks and access to passive and active infrastructure and to other essential inputs.

### Table 1 Main telecommunications operators in Mexico.

<table>
<thead>
<tr>
<th>Market</th>
<th>Operator</th>
<th>Network Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile (Voice &amp; Broadband)</td>
<td>AT&amp;T and Unefon</td>
<td>GSM/IDEN (2G)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CDM 1xEV-DO!</td>
</tr>
<tr>
<td></td>
<td>Telefonica (Movistar)</td>
<td>W-CDMA(3G)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LTE (4G)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GSM (2G)</td>
</tr>
<tr>
<td></td>
<td>Am?rica M?vil (Telcel)</td>
<td>W-CDMA(3G)</td>
</tr>
<tr>
<td></td>
<td>Virgin Mobile</td>
<td>LTE (4G)</td>
</tr>
<tr>
<td></td>
<td>Qbo Cel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maz Tiempo</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weex</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maxcom</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cierto</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Axtel-Avantel-Alestra</td>
<td>Fixed Wireless</td>
</tr>
<tr>
<td>Fixed (Voice)</td>
<td>Megacable-MCM</td>
<td>VoIP</td>
</tr>
<tr>
<td></td>
<td>Maxcom</td>
<td>Fixed Wireless</td>
</tr>
<tr>
<td></td>
<td>GTM</td>
<td>Fixed Wireless</td>
</tr>
<tr>
<td></td>
<td>Televisa</td>
<td>VoIP</td>
</tr>
<tr>
<td></td>
<td>Total Play</td>
<td>VoIP</td>
</tr>
<tr>
<td>Fixed (Broadband)</td>
<td>Am?rica M?vil (Telmex)</td>
<td>PSTN</td>
</tr>
<tr>
<td></td>
<td>Megacable-MCM</td>
<td>Cable Modem</td>
</tr>
<tr>
<td></td>
<td>Maxcom</td>
<td>xDSL</td>
</tr>
<tr>
<td></td>
<td>Axtel-Avantel-Alestra</td>
<td>FTTx/WiMAX</td>
</tr>
<tr>
<td></td>
<td>Televisa</td>
<td>Cable Modem/FTTx</td>
</tr>
<tr>
<td></td>
<td>Total Play</td>
<td>Cable Modem/FTTx</td>
</tr>
<tr>
<td></td>
<td>Am?rica M?vil (Telmex)</td>
<td>xDSL/FTTx</td>
</tr>
</tbody>
</table>

Source: Own elaboration with data from IFT (2016a [11]) and Ovum TMT Intelligence Informa (2017 [12]).

* These are the MVNOs for which the IFT is currently reporting data on number of subscribers, although the list is not limited to them. A more exhaustive list should include other MVNOs, such as Teligentia, Quickly Phone, Pepephone, Flashmobile, Tuenti, etc.

The IFT is also the competition and antitrust authority in the sectors it regulates, exerting exclusive powers in the terms established by the corresponding legal framework (Article 7, LFTR) and being able to establish specific regulation and sanctions with full autonomy. These powers and responsibilities consist of guaranteeing free competition, by investigating and implementing measures to deal with market power, monopolistic practices, mergers and other situations that may work against the achievement of efficient market outcomes. It is important to note that these powers were vested on the IFT after the 2013 constitutional reform, for traditionally they had been exercised by the Federal Competition Commission (Comisión Federal de Competencia). The latter continues to oversee the development of competition for the other sectors of the economy, functioning as an independent regulator as well.
Among the aspects that are deemed essential for the development of the telecommunications and broadcasting sectors is consumer protection. A list of consumer rights, and mechanisms to ensure their protection, is included in the 191st article of the LFTR. Besides these and other specific aspects related to consumer protection that can be found in this legislation, provisions for consumer protection are based mainly on the Federal Consumer Protection Law (Ley Federal de Protección al Consumidor, LFPC). This means that there is convergence in the subject, both in terms of legal instruments and regulatory institutions. Specifically, within the scope of the LFPC, the IFT protects consumers’ rights and so does Procuraduría Federal del Consumidor (PROFECO), which is an independent governmental agency. For example, the rights contained in the 191st article of the LFTR are to be enforced by PROFECO which, according to the 21st transitional article of the LFTR, has to create a specialised department in charge of these functions. Moreover, PROFECO is designated to be in charge of addressing complaints by the users. It is also noteworthy that for the broadcasting sector, operators are obliged to have an advocate for their audiences, which has to address complaints and suggestions by the audiences, on contents and programs.

The constant evolution of the sector and the transition to a digital economy has brought about a debate regarding the regulation of an increasing number of technological scenarios, business models and new markets, especially transversal (i.e. multi-market) possibilities. In this sense, the Mexican case is not different from other regions where the same debate is currently happening. Even though the 2013 constitutional reform devoted significant efforts to implementing ex-ante regulation that was considered necessary, the Mexican regulator is still faced with the challenge of continuing to define its scope in market application and to devote significant efforts to find a regulatory balance for the aforementioned new possibilities. In other words, the Mexican regulator is aware of the difficulties entails by the definition of new markets subject to specific regulation, as well as the transversal nature of such markets (i.e. that involve more than one market, regulatory instruments and/or competent authorities), and the possibility of relaxing certain regulatory provisions for ?traditional operators? in order to allow for a level playing field.

An example of the challenges posed by the emergence of new services is the obligation for over-the-top, video-on-demand services to include minimum amounts of local content (currently over-the-top services are not regulated by the IFT). An example of transversal possibilities is privacy and personal data protection (in Mexico there are provisions on this subject in either the LFTR or the Federal Law on Protection of Personal Data Held by Private Parties, Ley Federal de Protección de Datos Personales en Posesión de los Particulares). As for the relaxation of rules for traditional operators, an example is the possibility of allowing traditional broadcasters more flexibility in the ways in which they present advertisements.

An important concept that is already contemplated in the LFTR is net neutrality (article 145); however, this is still subject to the publication of specific guidelines, for aspects such as quality of service and infrastructure development. For other potential scenarios, the current legislation has left room for self-regulatory schemes, mainly for popular applications/content providers. For example, regardless of specific provisions that are or could be found in national regulatory frameworks, various popular applications/content providers already adhere to international standard rules regarding the use of personal data. In Mexico, this situation will likely change, within an environment of constant innovation that will also keep raising concerns in terms of investment incentives for Internet service providers (Bollek, 2009[13]; Courcoubetis et al, 2014[14]; Cheng et al, 2011[15]; Choi & Kim, 2008[16]; Kr?mer & Wieliorra, 2009[17]; Njorge et al, 2010[18]).

Historical evolution of the telecommunications market in Mexico

An overview of the telecommunications market through the last 40 years starts with fixed services, which were provided by Telmex, a monopoly that was owned by the government since 1972. By the end of that decade the number of fixed lines had trebled. In spite of this, during the 80s the development of the company and the telecommunications market was affected by a macroeconomic and external debt crisis and a devastating earthquake, and the growth in the number of lines dropped to 7%. The economic and financial situation also affected the quality and reliability of telephone services. Given that the government considered Telmex as a cash cow of revenue for other sectors of the economy, and for serving Mexico’s external debt obligations, Telmex was not able to make its necessary network investments, and started to operate with obsolete technologies (Del-Villar-Alrich, 2006[19]).

In 1990 Telmex was sold to the private sector. As part of this privatization, the government granted it a licence that is set to expire in 2026. This licence enables the company to provide voice, data, text, audio and video transmission services. Telmex was also granted a monopoly of domestic and international long-distance call service until 1997. The company was required to increase the number of basic service lines at a minimum average annual rate of 12% in the period from 1990 to 1994. In addition, the licence included provisions in terms of the accounting separation of local and long-distance calls (international and national) in fixed networks; the prohibition of monopolistic practices; the obligation to reduce waiting times for repairs and installations; the improvement of the quality of service and the extension of coverage in rural areas (with a target of at least one telephone service in each village of 500 inhabitants or more, by 1994); automatic switching services for all communities with more than 5,000 inhabitants; and 2 public telephones per 1,000 people (increasing to 5 per 1,000 people by 1998) (Robles-Rovalo et al, 2006[20]). Telmex was also obliged to provide its regulators with four-year work plans, and was subject to specific price regulation based on a cap-price system applied to the weighted average of a basket of regulated services. 1990 was also the year in which the mobile phone service started in Mexico. This market was the main driver of the later development of the telecommunications industry, growing at a composite rate of 40% in the period 1996-2009. Since in 1996 Mexico lagged behind other OECD countries in the development of the mobile telephony market, its high growth reflected a process of recovery from a low penetration rate (Kuhlinmann et al, 2010[21]). Nevertheless, Telmex was also present in this market with its subsidiary Telcel, founded in 1989, and has been the largest company in this sector in Mexico (nowadays both Telcel and Telmex are part of América Móvil), sustaining a market share of more than 50% for several years (OCDE, 2012[9]). This concentration level had been accompanied by prices that were high in comparison to other countries (Del-Villar-Alrich, 2006[19]), even though they have been decreasing in recent years (INEGI, 2017[22]).

Another key aspect in terms of competition was interconnection. In regard to the long-distance telephone service, interconnection rates had reduced between 1997 and 2006. However, the country had been lagging in terms of the obligation of Telmex to provide interconnection in all the facilities with routing capacity, which was technically feasible since the year 2000 (Del-Villar-Alrich, 2006[19]). In fact, access to the incumbent’s infrastructure was clearly identified as an obstacle to competition, both in mobile and fixed markets. In this sense, the OECD identified a series of areas of opportunity such as wholesale services, in which it recommended that companies with market power should make service level agreements available to new entrants, with appropriate indicators of access to leased lines and other network elements.

The OECD also suggested that there was room for improvement in terms of overcoming existing barriers to obtaining rights of way. It sustained that the regulator needed to be competent to declare bottlenecks and essential infrastructures, enabling access to these under non-discriminatory conditions, including unbundling the incumbent’s local loop and co-location with cost-oriented prices (OCDE, 2012[9]). These issues represented obstacles to the development of greater competition in broadband access. In addition, cable TV operators were not allowed to provide broadband services until 2003 (Del-Villar-Alrich, 2006[19]). Moreover, it was not until 2006 that there was a convergence agreement whereby telecommunications operators were allowed to offer pay TV services and broadcasters were allowed to offer telecommunications services (SCT, 2006[23]). Nevertheless, the concessions system involved costly requirements, which served as barriers to entry, prevented operators from accessing other markets in the sector and limited the use of new technologies (e.g. voice over IP), which translated into consumer losses (Mariscal & Rivera, 2007[24]).
Regarding mobile-to-mobile interconnection rates, their evolution since the calling-party-pay scheme was implemented in 1999 had been slow, as they started at 0.19 Mexican pesos and were still 0.14 Mexican pesos in 2006. Also in the mobile market, one of the main issues was related to radio spectrum and its availability (Mariscal & Rivera, 2007 [24]). Allocations of this essential resource were concentrated among very few players (Robles?Rovalo, 2016 [25]) and a concern was that operators who held spectrum rights could hoard them and prevent third parties from obtaining them to offer their services (Robles?Rovalo, 2016 [25]). Another area of opportunity, related to infrastructure access, was the entrance into the market of MVNOs. In addition to these issues, the existence of restrictions to foreign direct investment was identified as an obstacle in the development of the sector (OCDE, 2012 [9]).

Current situation of the market

Competition and consumer benefits

In describing the current status of the market, it is important to start by pointing out that at the core of the LFTR (Article 2) is the objective of establishing conditions of effective competition in the provision of telecommunications and broadcasting services. Competition is seen as a desirable goal because of the benefits it can bring to a market and its users, deriving from the pressure competition places on firms to be efficient, innovative and customer focused in order to thrive and survive. These benefits include lower prices, higher productivity, more service choices, and greater connectivity (The World Bank, InfoDev and the International Telecommunication Union, 2011 [26]).

As noted in the previous section, price levels for voice services were one of the concerns behind the reform, and with the various measures aimed at enhancing competition prices have continued to decrease. This can be seen on Figure 1 (a and b), which shows the evolution of Consumer Price Indexes (CPIs) for fixed and mobile services, and how they decreased, whereas the CPI for the entire economy exhibited the opposite behaviour. Even so, prices had already been decreasing but a key concern was that they were higher than in other countries. Figure 2 (a and b) shows how this situation has changed, now that Mexico is in the upper third on the list of OECD countries in terms of lowest mobile voice prices.

*The definition of mobile telecommunication services is based on the North American Industrial Classification System (NAICS).

?All sectors? comprises primary, secondary and tertiary activities, according to NAICS.

Source: INEGI (2016 [28]).

Figure 1a Evolution in fixed telecommunications CPIs in Mexico. 2011-2016.
Figure 1b: Evolution in mobile telecommunications CPIs in Mexico, 2011-2016.

Source: INEGI (2016).
Source: Own elaboration with data from Strategy Analytics (2016 [31]). The prices are for call baskets, as defined by the cited source.

Figure 2a Fixed voice prices for selected operators from OECD countries. 2016.
In addition, Mexico’s constitutional reform in telecommunications and broadcasting has resulted in achievements that have a direct, positive impact on consumers. Examples are the elimination of long distance fees for national fixed and mobile voice calls, the improvement of number portability rules and the requirements for all operators to provide consumers with information on the conditions and performance of the telecommunications and broadcasting services that they are hiring.

Asymmetric regulation

Interconnection pricing stood out as an item for reform because, even though under perfect competition interconnection rates should correspond to the cost structure of the operator offering access to its network, there is evidence that their fixing corresponds more to the strategic and competitive behaviour of firms. This usually happens because interconnection rates are an instrument that can be used by larger networks to generate club effects and attract more subscribers (Castro et al, 2013 [33]; Laffont et al, 1998 [34]; Harbord & Pagnozzi, 2010 [35]). In practice, the cost structures end up being affected by the levels of competition, and dominant operators may end up strengthening their position in the market. For these reasons, a number of research studies point to the importance of regulating interconnection rates as a mechanism to increase levels of competition in mobile telephony markets. For example, Laffont & Tirole (2000 [36]) maintain that a good interconnection policy is key to the development of competition in telecommunications markets (Castro et al, 2013 [33]).

Taking this into consideration, the LFTR (article 131) now includes specific provisions dealing with interconnection rates for “preponderant” economic agents. An economic agent is considered as “preponderant” in terms of its national participation in the provision of broadcasting or telecommunications services, if it has a market share greater than fifty per cent. In accordance with the Law this percentage can be measured by the number of users, subscribers, audience and traffic or capacity in their networks, depending of the adequacy of the metric to reflect the competition in the corresponding market. For such agents, the regulator can impose ex-ante measures including a prohibition for operators to charge for interconnection as long as they meet the criteria to qualify as preponderant economic agents. Figure 3 shows the evolution in Mobile Termination Rates (MTRs) and the asymmetry between them. In fact, Escobar-Briones (2016 [37]) provides evidence on how the implementation of asymmetrical MTRs has translated into lower prices, increased consumption and therefore more consumer welfare for Mexican consumers.
Infrastructure competition

In most OECD countries, open access policies for fixed networks in the form of mandated regulated access, such as local loop unbundling or other wholesale access products, have played a leading role in the development of competition, as these markets were liberalised (OECD, 2013). The relevant Mexican regulatory framework establishes the following. The LFTR, in its 138th article, mandates that each year the ?preponderant agents? must register (with the IFT) and publish their list of interconnection services in a disaggregated manner. They are required to provide the technical and functional specifications of the interconnection points and to publish reference interconnection offers, indicating the elements that are available for such purpose, in accordance with article 267 of the LFTR.

Article 3 establishes that the IFT is responsible for determining which inputs are to be considered essential, in accordance with the Federal Economic Competition Law (Ley Federal de Competencia Económica) (Article 94). Article 128 of the LFTR, on interconnection and obligations for the ?preponderant?, and article 267, on preponderance, specify obligations that such an agent faces in relation to the disaggregation of its network and the provision of services to other concessionaries. Article 138 states that the preponderant must share infrastructure, co-location sites and rights of way. In addition, article 139 establishes that the IFT will promote infrastructure sharing, the service of co-location between concessionaries and rights of way when they are limited by reasons of public interest, or legal or regulatory provisions. The issues addressed through these provisions were part of a more general problem that has already been notified: the then lack of development in the broadband sector.

Besides the competition legislation to improve broadband penetration (most notably the increase in mobile broadband penetration, from 46% to 56% between 2015 and 2016 (IFT, 2016b [41])), a fundamental initiative has been introduced by the Mexican authorities to maintain this positive trend. This is the development of a wholesale national broadband wireless network (red compartida), a new Public-Private-Partnership project whose contract has been awarded and is set for implementation starting in 2017. It is part of a broader digital inclusion strategy (Article 3, LFTR) and has the objective of increasing telecommunication services coverage, for which purpose it includes a minimum coverage requirement which was set at 85% of the national population (SCT, 2016 [42]).

This project also represents a further step in a series of coverage obligations that have been established in the country. As a consequence of the reform, specific actions in terms of social telecommunications coverage have resulted in a comprehensive national connectivity plan, called Programa de Conectividad Digital (SCT, 2017 [43]). It combines the goals of a series of projects, including a brand new system of Mexican next-generation satellites Sistema Satelital Mexicano Mexsat, a public sites-internet hotspots project México Conectado, access to government telecommunications facilities for private networks (proyectos de infraestructura pasiva del Estado) and a national high capacity network for scientific, technological and educational research Red NICTE.

Another milestone in the digital inclusion strategy comprises a number of articles in the LFTR (3, 74, 79 and 81), which establish that licences for the provision of telecommunications and broadcasting and for the use of radio spectrum will be granted preferably to those who incorporate specific factors. Examples include plans and commitments in terms of minimum coverage and their contribution to universal service goals. Regarding the licencing model for operators to provide their services, the new Law created a convergent telecommunications licence called Concesión única, authorising the provision of all facilities-based services (telephony, video, Internet, etc.) under one single licence (McCutchen, 2014 [44]). Potential benefits of this measure include, on the one hand, that competition between networks may become more effective and, on the other, that any individual network can provide access to a greater range of services than previously. This leads to potentially much stronger economies of scale and scope than before (ITU, 2013 [45]). Furthermore, the Concesión única seeks to reduce regulatory costs and to incentivise operators to maintain technological evolution of their network in order to be able to provide more diversified services (SCT, 2006 [23]).

In terms of infrastructure access provisions, the possibility of mobile network operators (MNOs) to host MVNOs as a means of improving competition was also among the suggestions made by OECD for Mexico. The OECD considers that the entry of MVNOs, either through voluntary agreements with MNOs or by some type of mandated regime, has improved the level of domestic competition in other countries (OECD, 2013 [40]). With this in mind, the IFT has issued guidelines that facilitate the licensing of MVNOs, defined as new providers of mobile services, which use the capacity and/or services provided by MNOs, to operate in certain frequency bands of the radio spectrum (IFT, 2016c [46]). The list of MVNOs that operate in the country is included in Table 1. Some examples are worth noting because they have emerged as part of the following synergies:

- **QBOCEL**? In August 2014, the company KUBO CEL S.A.P.I. de C.V. was granted permission from IFT to provide telephony and data transmission through the QBOCEL brand, owned by the national union for education workers (Sindicato Nacional de Trabajadores del Estado commonly referred to as SNTE).

- **Cierto**? In alliance with Ekofon, OXXO, a Mexican chain of convenience stores, has entered the mobile market through the MVNO Cierto. This operator is currently providing its services in the Mexican market, with authorisation from the regulator.

- **Weex**? This operator provides its services through Telefonica’s network (Movistar). It was launched as a start-up by students of the Instituto Tecnológico y de Estudios Superiores de Monterrey. The start-up was supported by the Coca-Cola Company.

In spite of low initial penetration levels, especially as compared to other economies, the number of subscribers to MVNOs? services has been increasing in Mexico (Figure 4). Further development of this type of operators is expected to be triggered by the deployment of the wholesale wireless network Red Compartida (IFT, 2016e [47]).
Radio spectrum

It is well known that radio spectrum is a fundamental input for telecommunications services, which is why concerns were raised concerning its availability. According to Hazlett & Muñoz (2009 [49]), greater spectrum availability can lead to diminishing prices and reduced market concentration. The unequal distribution of spectrum among the different operators has also been identified as a determinant of market concentration (Saenz-de-Miera-Berglind, 2015 [50]), whereas the differences in terms of frequency-bands has been associated to mobile services penetration (Robles-Rovalo, 2016 [25]).

With this in mind, increased spectrum allocation has taken place in Mexico over the last years. More specifically, an AWS spectrum auction was carried out in 2015 and the first digital dividend has been already completed, allowing for 90 MHz in the 700 MHz band to be committed to the operation of the new wholesale national network. Also, the IFT expects to auction the 2.5 GHz band during 2017 and clear the 600 MHz band by the end of 2018. Figure 4 shows the projected amount of spectrum that is expected to be assigned among the operators in the future, based on a scenario suggested by IFT. Under this scenario, Mexico could catch up with countries that are currently ahead of it, such as Brazil, Chile, Nicaragua, Panama, Argentina, Colombia, Puerto Rico and Venezuela.

Figure 5 Mobile Spectrum scenario in Mexico (2018). Source: Own elaboration with data from IFT (2016b [41]).
The distribution of spectrum among the operators was brought to the attention of the authorities as well. In 2012 the OCDE (2012 [9]) pointed out that the spectrum assignment processes should be designed carefully in order to avoid a situation in which one company dominates this market. For this reason, the first two AWS auctions (numbers 20 and 21) were carefully designed.

However, once the constitutional reform had taken place, the regulator sought to improve the design of the new AWS auction, with respect to the previous AWS auctions, which had taken place prior to the reform (Rodríguez, 2015a [52]). The regulator did this by implementing a combinatorial clock auction, in an effort to adhere to international best practices. Furthermore, the authorities recognised that the spectrum cap is one of the main design components that can influence stakeholders’ interests and the value of spectrum, which in turn has direct implications for the prices paid at auctions, the business prospects for new networks and the impact of broadband services on society (ITU, 2012 [53]). Therefore, auctions number 20 and 21 had already incorporated the use of caps and ?set-aside? mechanisms for new entrants. However, the caps and set-asides for these auctions were set by regions (in Mexico the use and exploitation of spectrum is divided according to nine geographic regions (IFT, 2016d[54])), whereas the AWS auction was designed with the use of caps that considered the prior distribution of spectrum among the operators.

The spectrum management measures that have been implemented since the constitutional reform also consider the possibility of a secondary spectrum market (SEGOB, 2017 [55]), as well as those of refarming and reallocation of different spectrum bands (AM, FM, 450 MHz, 600 MHz, 700 MHz, 800 MHz, AWS, 2500 MHz, 3500 MHz).

Investment

Infrastructure investment was identified as another area for policy improvement. It is well known that regulatory certainty and transparency are key determinants of investment levels. An area where regulation was considered by the OCDE (2012 [9]) to act as an obstacle to investment in Mexico was the limit imposed on the level of foreign direct investment in the country. For this reason the constitutional reform has resulted in foreign direct investment of up to 100% now being allowed in telecommunications and satellite communications. In fact, investment levels have increased in Mexico after the constitutional reform (IFT, 2016b[41]) and are expected to keep growing with the introduction of the wholesale broadband network, and with diverse upgrades and joint initiatives by the operators in the evolution to next-generation-networks (Forbes, 2016 [56]; Guerrero, 2015 [57]; Rodríguez, 2015b [58]).

A point worth mentioning in regard to network upgrades is gigabit technology. Even though there is no specific national governmental program to upgrade gigabit networks, nation-wide-operators are continually upgrading their backbone networks and offering gigabit connections to Small and Medium Enterprises. Additionally, there are projects by academic, entrepreneurial and private-operators networks that provide gigabit transmission capabilities and interconnect major cities (CUDI, 2016 [59]). Currently, there are specific efforts to accurately identify and assess the level of deployment and evolution of gigabit technologies in Mexico, such as the National Registry of Infrastructures (Registro Nacional de Infraestructuras), a database that will record the attributes of telecommunication networks in the country (IFT, 2017 [60]).

Digital economy

Finally, the national authorities have endeavoured to open up future opportunities with the development of the digital economy. For example, citizens? access to ICTs, telecommunications and broadcasting services, including broadband Internet access, is now a constitutional right. A National Digital Strategy has been defined, which is being implemented so technology and innovation can contribute to reaching the country?s development goals. Its objectives are the digital transformation of government processes and policies and the ways to interact with government; development of the digital economy; digital transformation of access to education and health systems; civic innovation and citizen participation. These types of initiatives are expected to enable the country to benefit from the digital economy, and to face the potential obstacles arising, especially from the regulatory standpoint.

Conclusions

The characteristics that had defined the traditional Mexican telecommunications market raised a series of concerns that resulted in the 2013 constitutional reform. This reform has laid the foundations for an improvement in competitiveness in the sector, to achieve the national benefits identified as essential objectives by the Mexican Government. With the measures implemented since the reform came into effect, it is evident that providing the telecommunications regulator with adequate powers has been crucial in creating effective competition. In fact, this has translated into favourable outcomes that have begun to be tangible. However, the Mexican authorities need to continue with their efforts, given that Mexico is no exception to the universal challenges posed by rapid technological change and the transition to a digital economy.

At the time of writing, the IFT has finished its first assessment of the measures imposed on the ?preponderant? economic agent (IFT, 2017b [61]). Based on economic analyses and public, technical and legal consultation processes, the assessment presents key issues that include the following: the growth in fixed broadband penetration has been lower than expected; broadband speeds are still below the OECD average; there is a low level of infrastructure based competition; and 12% of the population still does not have access to fixed services. These figures have been attributed to the fact that even after the implementation of the measures for the ?preponderant?., its competitors have had limited or slow access to its infrastructure and unbundling services, due to incentives to delay negotiations and increase transaction costs. Accordingly, the IFT has determined that to be able to continue pursuing the goals of the constitutional reform, it is necessary to impose functional separation measures. The objective is to ensure non-discriminatory conditions in the provision of wholesale services, for market participants to be able to compete under the same conditions. This measure poses new challenges that deserve future research and will play a key role in the future evolution of the sector.

Acknowledgements

The authors acknowledge and thank the valuable and enriching comments from Pascual Garc?a-Alba Idu?ate Centro de Estudios, IFT, who does not share any responsibility for any flaws in the article. The views and conclusions presented in this article are the exclusive responsibility of the authors and do not reflect those of the IFT.

References


