Northumbria Research Link

High-speed data provision via mobile networks in Latin America and the Caribbean

SCHOLARONE™
Manuscripts

High-speed data provision via mobile networks in Latin America and the Caribbean

Introduction

The increasingly wide adoption of mobile devices across the Latin American & Caribbean region – hereafter LA&C – has created opportunities for countries and communities to close the digital divide compared with rival locations (Carmody 2013) and for entrepreneurial activity to emerge (Jagun, Heeks and Whalley 2008; Wamuyu 2015). More broadly, mobile communications are seen as contributing positively to economic development (Chavula 2013; Lee, Levendis and Gutierrez 2011; Waverman, Meschi and Fuss 2005).

One reason why the mobile communications industry is having such a profound impact on LA&C is that mobile technology has not stood still. With each successive generation of mobile technologies, a broader array of services has become possible. Because LA&C has lagged behind other parts of the world when it comes to the adoption of mobile communications, the advantages that accrue from their use, including very high-speed access to the Internet, are not being shared by all. However, it is perfectly possible to update a mobile network at any point in time with the latest technology, if necessary even skipping an entire generation, so the current transition to so-called 4G – essentially a technology based upon Long-term Evolution (LTE) – should open up the socio-economic benefits of Internet access to LA&C inhabitants a lot faster and cheaper than building costly fixed-wire networks would do (GSMA 2016).

In a region as diverse as LA&C terms such as 'typical' or 'average' tend to be unhelpful when it comes to examining mobile communication markets due to the stark contrasts that exist in terms of area, population or any other metric. In contrast, such terms, may be more useful in relation to, say, Europe, which is more homogenous in terms of economic development and living standards. It accordingly follows that the latter region will be more homogenous in terms of the availability of mobile networks and mobile services, as indeed it is.

52 countries and islands are taken to form part of LA&C for the purposes of the discussion which follows. However, LA&C has few countries of any real size where population is concerned. The region is dominated by Brazil (210 million) and Mexico (130 million). A long distance behind can be found Colombia (49 million), Argentina (44 million), Peru (32 million) and Venezuela (31 million). There is then a further big gap to Chile (18 million), Ecuador (17 million), Guatemala (17 million), Cuba (11 million), Haiti (11 million), Bolivia (11 million) and the Dominican Republic (10 million). Honduras, Paraguay, El Salvador, Nicaragua, Costa Rica, Panama, Puerto Rico, Uruguay and Jamaica all have populations between 3 million and 8 million. These are treated as 'larger' for the purposes of Tables II and III while the other countries and islands all have populations below one million and are treated as 'smaller'. This, in turn, explains why they are served by a different set of operators, as discussed below.

This discussion analyses the development of high-speed mobile communications in LA&C, concentrating in particular on licensing and launches as this juxtaposition is never attempted in other sources. Indeed, one can go so far as to say that LA&C attracts very little attention compared to the USA, Europe and Asia. Nevertheless, it has enormous potential – Brazil is one of the so-called 'BRICs' (Brazil, Russia, India, China) and Mexico has far more in common with LA&C even if it trades predominantly with the USA.

A further purpose of this paper is to identify the holding companies that are responsible for much of the provision of mobile communications and to reflect upon the changing nature of competition in this sector. The introduction of high-speed data transmission has exerted very considerable pressure upon market structures, but has introduced conflicting forces. On the one hand, for example, it has introduced opportunities for disruptive new entrants which are not hamstrung by the need to maintain legacy networks, while on the other hand the scale of investment required to roll out nationwide networks is often beyond the means of new entrants unless backed by a well-resourced parent company. Hence, as demonstrated below, the threat to incumbents has yet to erode the entrenched position of incumbents other than in exceptional circumstances.

Overview

Latin America and the Caribbean islands are to be found in the same geographical region. The common usage of the terms tends to highlight a number of significant differences – for example, Latin America is customarily viewed exclusively as the countries that run southwards from the southern border of the USA and the Caribbean as an assortment of islands within and to the east of the Gulf of Mexico. However, the reality is rather more complex.

Wikipedia (2017a) states that Latin America is 'a group of countries and dependencies in the Americas where Romance languages are preponderant'. As such, 'it consists of 19 sovereign states and several territories and dependencies.' However, Wikipedia goes on to note what it calls 'contemporary definitions' which include the following:
- The territories in the Americas where the Spanish or Portuguese languages prevail. This encompasses Mexico, most of Central and South America and, in the Caribbean, Cuba, the Dominican Republic and Puerto Rico.
- More widely, all of the Americas south of the USA, thus including the Guianas, the Anglophone Caribbean (and Belize), the Francophone Caribbean and the Dutch-speaking Caribbean.

For the purposes of this paper, the wider definition is in use, and the region is , as noted above, referred to simply as LA&C for our purposes. It is accepted that this does not encompass a homogeneous group of countries/islands, but all can be described as relatively 'modern' when it comes to communications. A key driver of development is the provision of communications services that, in the context of a historical under-investment in fixed-wire networks, means mobile connectivity. This, in turn, is driven by technology which is advancing via a sequence of so-called 'generations' (2G, 3G, 4G and so forth. Long-term evolution (LTE), which is marketed as 4G (Wikipedia, 2017c and 2017d), has been licensed and launched as a technology capable of providing a downlink of several hundred megabits per second (Mbps), but its introduction into this region has so far been patchy with many countries and network operators preferring to concentrate on expanding networks that are

technically less-advanced – primarily using upgraded versions of high-speed packet access (HSPA+).

Long-term Evolution

No industry has ever evolved at the speed shown by the mobile communications industry during the past 15 years (Curwen 2002; Curwen and Whalley 2008, 2010, 2013, 2014). During this period the main driving force has been technological progress which, in turn, has been concerned primarily with increasing the speed at which data can be transferred between sender and receiver.

3G – otherwise known in most other parts of the world by the acronyms Wideband Code Division Multiple Access (W-CDMA) – was first launched in roughly 2000, since when it has reached all bar a couple of countries world-wide (GSMA 2014). Initially it operated very slowly by modern standards, but was steadily enhanced by technologies such as high-speed packet access (HSPA) to the point at which a user might – albeit only in favourable conditions – be able to access a downlink of 10 Mbps (megabits per second).

The arrival of Long-term Evolution (LTE) was a game changer in several respects. In the first place, it could be used across a wide variety of spectrum bands lying typically between 600 MHz and 2.6 GHz whereas 3G tended to be restricted to bands in the region of 2 GHz with 2G – effectively a technology used for voice communications – separately occupying lower bands. Because the spectrum being used for 2G and 3G was rapidly filling up, especially in countries where fixed-wire connectivity was rarely adequate other than in big cities, the fact that LTE is more spectrally efficient than 3G is also very important since it means that much more data can be transmitted via a given slice of spectrum.

LTE is often referred to as 4G. In fact, LTE does not meet the technical specifications for 4G laid down by bodies such as the Third Generation Partnership Project (3GPP) – see Wikipedia (2017e, 2017f) – which are compatible only with LTE-Advanced, a version of LTE that is multi-carrier – that is, it combines spectrum from (at least) two slices of spectrum within a band or, more commonly, in two separate bands in order to speed up data transmission rates. The most recent versions of LTE-A are designated as 4.5G – most commonly known as LTE-A Pro (Qualcomm, 2016) – and employ as many as five bands to create a (theoretical) maximum downlink approaching 1 Gbps (gigabits per second).

The licensing of LTE in LA&C

When it comes to the licensing and launch of mobile networks, LA&C has tended to lag other regions for understandable reasons by no means the least of which is the high cost of investment relative to the incomes of prospective customers. It is no longer playing catch-up with respect to 3G which is pervasive, but is engaged in addressing the need, sooner or later, to roll out 4G in the guise of LTE which is de facto the worldwide standard.

The first aspect for analysis is the state of play in the issuing of licences specifically for LTE. In practice this is a complicated matter because many licences originally issued for 2G or 3G were technologically neutral and hence permitted the introduction of LTE services without the need to amend the licences. In other cases, spectrum has to be re-farmed and a specific

regulatory authorisation is required. Finally, new spectrum bands are being opened up and these need to be allocated for the provision of LTE services either via an auction, a beauty contest or government dictat.

The rolling out of LTE is an expensive process which may strain the coffers of the smaller networks with limited access to external funds although it is less of an issue for the 'big two' – América Móvil and Telefónica – because they can achieve economies of scale across their various networks. But LTE is also a driver of competition – by and large, if your main competitors are launching then so must you.

Table I lists some but by no means all of the 52 countries/islands comprising LA&C for the purposes of this paper. Most of these used Global system for Mobile (GSM) technology for 2G and 3G but all intend to utilise LTE for 4G. However, for historical reasons, licences have been issued in various bands with those countries closely linked to the USA often adopting the bands in use there such as Advanced Wireless Services (AWS). AWS-1 varies according to region but normally includes spectrum in the 1700 MHz band paired with spectrum in the 2100 MHz (2.1 GHz) band.

The use of names for licensees can be confusing, most obviously because most operators use brand names to market their services. These brands are not necessarily the same in every country where a holding company such as América Móvil operates, perhaps because brands involved in a takeover have been retained. Wherever practicable, the holding company is listed in order to demonstrate its presence within the region, whereas media reports may use a variety of other names. It is worth noting that América Móvil is most often referred to as Claro, Telefónica as Móvistar and Millicom as Tigo. In contrast, although Cable & Wireless Communications (CWC) was bought by Liberty Global in May 2016, it is never referred to by its parent's name.

Table I appears to be complicated insofar that there are extensive footnotes. However, a major problem in dealing with spectrum licensing is comparing like with like. Other sources tend to brush the issue under the carpet, either by limiting themselves to a brief reference to the definitions used in compiling the data or simply by presenting the data as a fait accompli without qualification. This is extremely unsatisfactory, if only because some regulatory bodies and operators are surprisingly reticent about the details of auctions and, as noted, the names used for licensees are usually the marketing brands rather than the primary stakeholders.

Table I only goes back to 2011 because prior to that year the licences issued rarely referred to their possible use for LTE. More recently, including when existing licences are re-auctioned at the end of the licence term, explicit reference to usage for LTE services has become the norm. As can be seen, even where licences in more than one band are auctioned together, each band is specified independently as the winning bidders may differ from one band to another. As can also be readily determined, the licences are almost always issued to 2G/3G incumbents. Evidence from more developed parts off the world – see, in particular, Curwen and Whalley (2016) – demonstrate clearly that the optimum number of networks is normally three or four. However, LA&C contains a great many islands with no more than a few hundred thousand inhabitants, so it is surprising that they so often sustain more than two networks.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Operating profitably in such a small environment is not the province of the 'big two' (América Móvil and Telefónica) in the larger countries, but rather of more specialised operators such as Digicel – a private company which discloses the minimum amount of information required by law – and CWC (Wikipedia, 2017h). The small scale required to set up a network is potentially attractive to new entrants, but the prospect of competing against the likes of Digicel and CWC is nevertheless a considerable deterrent.

Table I   LTE licensing across Latin America & Caribbean, 31 March 2017

Country	Spectrum Band MHz	Reserved New Entry	Date	Licence winners
Antigua	-[1]	-	-[1]	CWC[1]
Argentina	AWS-1/700[2]	Yes[2]	Nov 2014[2]	América Móvil, Arlink[2], Telecom Argentina, Telefónica
Aruba	-[3]	-	-	-
Bahamas	700[4]	Yes[4]	Sep 2012	BTC
Bahamas	700/850/AWS	Yes[5]	-	-
Bermuda	700	-	Oct 2016	CellOne, Digicel
Bermuda	850	-	Oct 2016	Digicel
Bolivia	700/1900/AWS-1[6]	-	2013[6]	Entel, Millicom, NuevaTel[6]
Bonaire	n/a[7]	-	n/a[7]	Telecom Bonaire
Brazil	2600/450[8]	-	Jun 2012	América Móvil, Oi, Telecom Italia, Telefónica
Brazil	700	-	Sep 2014	América Móvil, Telecom Italia, Telefónica [9]
Brazil	2G/3G/4G	Yes	Nov 2015	EUTV[9]
Brazil	1800	-	Dec 2015	América Móvil, Nextel, Telecom Italia, Telefónica
Brazil	1900	-	Dec 2015	Multiple[9]
Brazil	2600	-	Dec 2015	América Móvil, Nextel, Telecom Italia, Telefónica
Brazil	1800/1900/2600		Nov 2016	-[9]
British Virgin Is	700	-	Aug 2016[10]	CCT Wireless, CWC, Digicel
British Virgin Is	1900		Aug 2016	CCT Wireless, CWC, Digicel
British Virgin Is	AWS-1		Aug 2016	CCT Wireless, CWC, Digicel
Cayman Is	700	-	Jul/Aug 2013	CWC, Digicel
Chile	2500	-	May 2012	América Móvil, Entel, Telefónica
Chile	700	-	Mar 2014[11]	América Móvil, Entel, Telefónica
Colombia	2600	-	Jun 2010	UNE-EPM
Colombia	1900	-	Aug 2011	América Móvil, Millicom, Telefónica
Colombia	1900	-	Jun 2013	-
Colombia	2600	Yes[12]	Jun 2013	América Móvil, Avantel, DirecTV
Colombia	AWS-1	-	Jun 2013	ETB/Millicom[13, 14], Telefónica
Costa Rica	-[15]	-	-	-[15]
Costa Rica	1800	-	2016	
Costa Rica	3G	-	2016	
Dominica	n/a[16]	-	n/a[16]	CWC, Digicel[16]
Dominican Rep	AWS-1[17]	-	May 2014	América Móvil, Altice/Orange[17]
Ecuador	700	All[18]	Dec 2012	CNT[18]
Ecuador	1900/AWS-1[19]	-	Jan 2015	América Móvil, Telefónica
French Guiana	800	-	Oct 2016	Altice, Digicel, Orange
French Guiana	900	-	Oct 2016	Altice, Digicel, Iliad, Orange
French Guiana	1800	-	Oct 2016	Altice, Digicel, Iliad, Orange
French Guiana	2100	-	Oct 2016	Altice, Digicel, Iliad, Orange
French Guiana	2600	-	Oct 2016	Altice, Digicel, Iliad, Orange
Guadeloupe	800	-	Oct 2016	Altice, Iliad, Orange
Guadeloupe	1800	-	Oct 2016	Altice, Digicel, Iliad, Orange
Guadeloupe	2100	-	Oct 2016	Altice, Digicel, Iliad, Orange
Guadeloupe	2600	-	Oct 2016	Altice, Digicel, Iliad, Orange
Guatemala	900[20]	-	-	-
Honduras	AWS-1	Yes[21]	Oct 2013	América Móvil, Hondutel[21], Millicom
Honduras	700	Yes[22]	-[22]	-
Jamaica	700	Yes[23]	-	Digicel
Jamaica	AWS	-	Apr 2015	CWC[24]
Jamaica	700	Yes[23]	May 2016	Symbiote
Martinique	800	-	Oct 2016	Altice, Iliad, Orange
Martinique	1800	-	Oct 2016	Altice, Digicel, Iliad, Orange
Martinique	2100	-	Oct 2016	Altice, Digicel, Iliad, Orange
Martinique	2600	-	Oct 2016	Altice, Digicel, Iliad, Orange
Mexico	1900	-	Jun 2010	-[25]
Mexico	AWS-1	Yes[26]	Jul 2010	Televisa/Nextel[26]
Mexico	AWS-1	-	Feb 2016	América Móvil, AT&T
Mexico	700	-	Nov 2016	Altan
Nicaragua	1800	-	Nov 2012	Xinwei Telecom
Nicaragua	700	-	n/a	América Móvil, Telefónica
Nicaragua	AWS-1	-	n/a	América Móvil, Telefónica
Panama	700[27]	-	-[27]	CWC, Telefónica, América Móvil [27]
Paraguay	700	-	Sep 2015	Copaco[28]
Paraguay	AWS-1	-	Dec 2015	América Móvil, Millicom
Peru	AWS-1	-	Jul 2013	Entel, Telefónica
Peru	700	-	May 2016	América Móvil, Entel, Telefónica
Puerto Rico	-[29]	-	-	AT&T, América Móvil[29]
St Bartélemy	800	-	Oct 2016	Digicel, Iliad, Orange

Country	Band		Launch date	Operators
St Bartélemy	900	-	Oct 2016	Dauphin Telecom, Digicel, Iliad, Orange
St Bartélemy	1800	-	Oct 2016	Dauphin Telecom, Digicel, Iliad, Orange
St Bartélemy	2100	-	Oct 2016	Dauphin Telecom, Digicel, Iliad, Orange
St Bartélemy	2600	-	Oct 2016	Dauphin Telecom, Digicel, Iliad, Orange
St-Martin	800	-	Oct 2016	Digicel, Iliad, Orange
St-Martin	900	-	Oct 2016	Dauphin Telecom, Digicel, Iliad, Orange
St-Martin	1800	-	Oct 2016	Dauphin Telecom, Digicel, Iliad, Orange
St-Martin	2100	-	Oct 2016	Dauphin Telecom, Digicel, Iliad, Orange
St-Martin	2600	-	Oct 2016	Dauphin Telecom, Digicel, Iliad, Orange
Trinidad & Tobago	-[30]	-	-	-
Turks & Caicos	700	-[31]	Feb 2013	Digicel, Islandcom
Uruguay	900	-[31]	Sep 2011	Antel[30]
Uruguay	1900	-	Sep 2011	América Móvil, Telefónica
Uruguay	AWS-1	-[31]	Sep 2011	América Móvil, Antel[30]
US Virgin Is	-[32]	-	-	-
Venezuela	1700-1900	-	Sep 2012	Digitel, Móvilnet, Telefónica
Venezuela	AWS-1/2600[33]	-	Dec 2014	DirecTV, Móvilnet, Telefónica

Notes: 1. The situation is confused. Digicel appears to have launched using the 700 MHz band but without providing a fully mobile service. For its part, CWC (LIME) claims to have launched (probably using its AWS spectrum) as a result of receiving a licence in May 2014, but has refused to reveal any details; 2. AWS varies according to region but normally includes spectrum in the 1700 MHz band paired with spectrum in the 2100 MHz (2.1 GHz) band. This auction was for national licences in the AWS band. However, these were awarded in conjunction with pro-rata spectrum in the 700 MHz band which had not itself been auctioned. The licences were not handed over until June 2015. A new entrant, Arlink, was awarded a licence but due to its failure to pay by the end of June 2015 its licence was adjudged to be in default; 3. Setar launched using 20 MHz of re-farmed 1800 MHz band spectrum in November 2013 although it is not possible to untangle when it received permission to use the band for LTE; 4. Three licences were available but only one was awarded to the monopoly provider, BTC. A new entrant was denied a licence due to a decision to revise plans for the issue of new 2G/3G licences – the licence monopoly did not terminate until April 2014; 5. The auction has yet to take place due to feuding with the regulator over the ownership rules for new licences; 6. In December 2012, Entel claimed – having been given special permission by the government – to have launched in the lower section of the 700 MHz band although a date in 2014 is also cited for this launch. The 700 MHz licence granted to Millicom was in July 2013, but all three incumbents appear to have won spectrum in the 1900 MHz and AWS bands during 2013 to add to existing holdings and these appear to be technology-neutral; 7. Telecom Bonaire (Bonairiano) activated its LTE network in April 2015 even though it had yet to receive regulatory permission to provide services over the network. However, the launch allegedly took place in June using unspecified spectrum; 8. The 450 MHz band was offered separately for rural coverage, but when no bids were forthcoming the 2.6 GHz band winners were forced to roll out a complementary 450 MHz band network; 9. In addition to the nationwide licences awarded in 2014, regional operator Algar won a licence covering its home region. Surprisingly, a new nationwide licence was awarded, seemingly without a competitive procedure, to EUTV in November 2015. The licence was technology-neutral and hence included LTE provision. In December 2015, there were numerous winners of spectrum in the 1900 MHz band which had been divided into a large number of small lots. The winners of the residual spectrum sold in November 2016 were not disclosed; 10. It was sometimes claimed that CWC and Digicel had launched '4G' prior to November 2016 but in practice this was HSPA+ and not LTE; 11. The licences were not officially handed over until August 2015; 12. A new entrant was offered a choice of two packages in the band. The licence was won by Avantel; 13. UNE-EPM and Millicom were merged in August 2014. The merged entity initially ended up with two LTE networks but was obliged to return 50 MHz of spectrum to the regulator in order to keep within the 85 MHz spectrum cap; 14. In November 2013, ETB agreed to sell out of Colombia Móvil – the network half-owned by Millicom – having arranged to keep for itself half of the 30 MHz of spectrum it had acquired with Millicom in 2013 – in order to launch independently as ETB Móvil in October 2014. However, reports indicate that in September 2016 ETP was fully consolidated into UN-EPM and would use that brand from 2017; 15. It is clear that the launches by América Móvil and Telefónica involved re-farming of the 1800 MHz band (which had presumably been rendered technology-neutral) whereas ICE was alleged to have used the 2.6 GHz band even though evidence that a licence had been issued in that band is hard to come by (see www.spectrummonitoring.com); 16. The two incumbents have both launched but neither has disclosed the spectrum band in use which is alleged to be the 700 MHz band even though there is no clear evidence of licences in that band; 17. The issue of AWS band spectrum for LTE use is clear-cut. However, after a lengthy dispute with the regulator, Orange (now owned by Altice Group) had been permitted to use the 1800 MHz band for LTE in January 2013. For its part, Tricom used the 800 MHz and 1900 MHz bands for its own launch in 2013 but it is unclear when 2G and 3G bands were made technology-neutral; 18. The spectrum was issued to new entrant CNT without an auction; 19. The spectrum was issued to the incumbents without an auction; 20. Since August 2011, the 450 MHz, 800 MHz, 900 MHz, 1700-1800 MHz, 1700-2100 MHz, 1800-1900 MHz and 2000 MHz bands have been made available on a technology-neutral basis including LTE; 21. One of the three licences was pre-assigned to Hondutel; 22. In September 2014, the regulator launched auction CNT-CP001/2014 whereby one licence consisting of 733-748 MHz paired with 788-803 MHz would be sold for LTE use in December 2014. However, a further block, comprising 703-718 MHz paired with 758-773 MHz, was pre-assigned to Hondutel. This created disquiet and a public consultation on the two Hondutel blocks was instigated in October. So far, no further progress has been forthcoming; 23. The hope was expressed that a new entrant would bid, and if successful in obtaining one of the two core licences on offer it would be awarded a bonus of additional spectrum in higher bands. However, there were no bids and in April 2014 spectrum in the band was allocated to Digicel, effective from early 2015, as part of its licence renewal process. New entrant Symbiote (trading as 'Caricel'), was awarded spectrum in May 2016; 24. AWS spectrum suitable for LTE was allocated to CWC (LIME) without competitive bidding; 25. In the event, there did not appear to be any interest in using this band for LTE; 26. One nationwide licence was acquired by Televisa/Nextel but the other was left unsold because spectrum caps effectively prevented it from being acquired by an incumbent. However, Nextel (now owned by AT&T), América Móvil and Telefónica all used the AWS band for their initial launches of LTE; 27. In October 2013, CWC was awarded increased amounts of spectrum as part of its forthcoming licence renewal. These included spectrum in the 700 MHz band which was used for its launch in 2015. Telefónica received the same treatment in March 2014 with the same outcome. However, although América Móvil was reported to have launched later in 2015 using the 1900 MHz and 700 MHz bands, it is not clear when it was awarded the spectrum in the latter band; 28. The 10 MHz block was allocated to Copaco (Vox) without any contest; 29. The position is complicated because the regulator is the FCC in the USA which treats Puerto Rico as a region. The original 700 MHz licences were issued in 2007 (AT&T) and 2008 (América Móvil) but in different bands to those used elsewhere in Latin America – which is usually the APT 700 version – and the 1900 and AWS bands have in some cases been converted from cdma2000 1xEV-DO (a version of 3G) to LTE (by Sprint and Open Mobile). The main licensees – América Móvil (a network formerly owned by Verizon), AT&T, Sprint and T-Mobile US consequently include three of the 'big four' in the USA but Open Mobile is also active

having taken over a network with a 700 MHz licence dating from 2007 that was previously known as NewComm Wireless; 30. The sole provider of LTE switched its network from WiMAX in the 2.6 GHz band, but no LTE licences as such have been issued so far; 31. Antel was awarded spectrum in these bands without needing to participate in the auctions; 32. The situation is not dissimilar to Puerto Rico except that the number of operators is inevitably smaller. In this case, AT&T and Sprint appear to have launched using re-farmed 1900 MHz band spectrum; 33. It was not disclosed which licences had been awarded to which bidders.
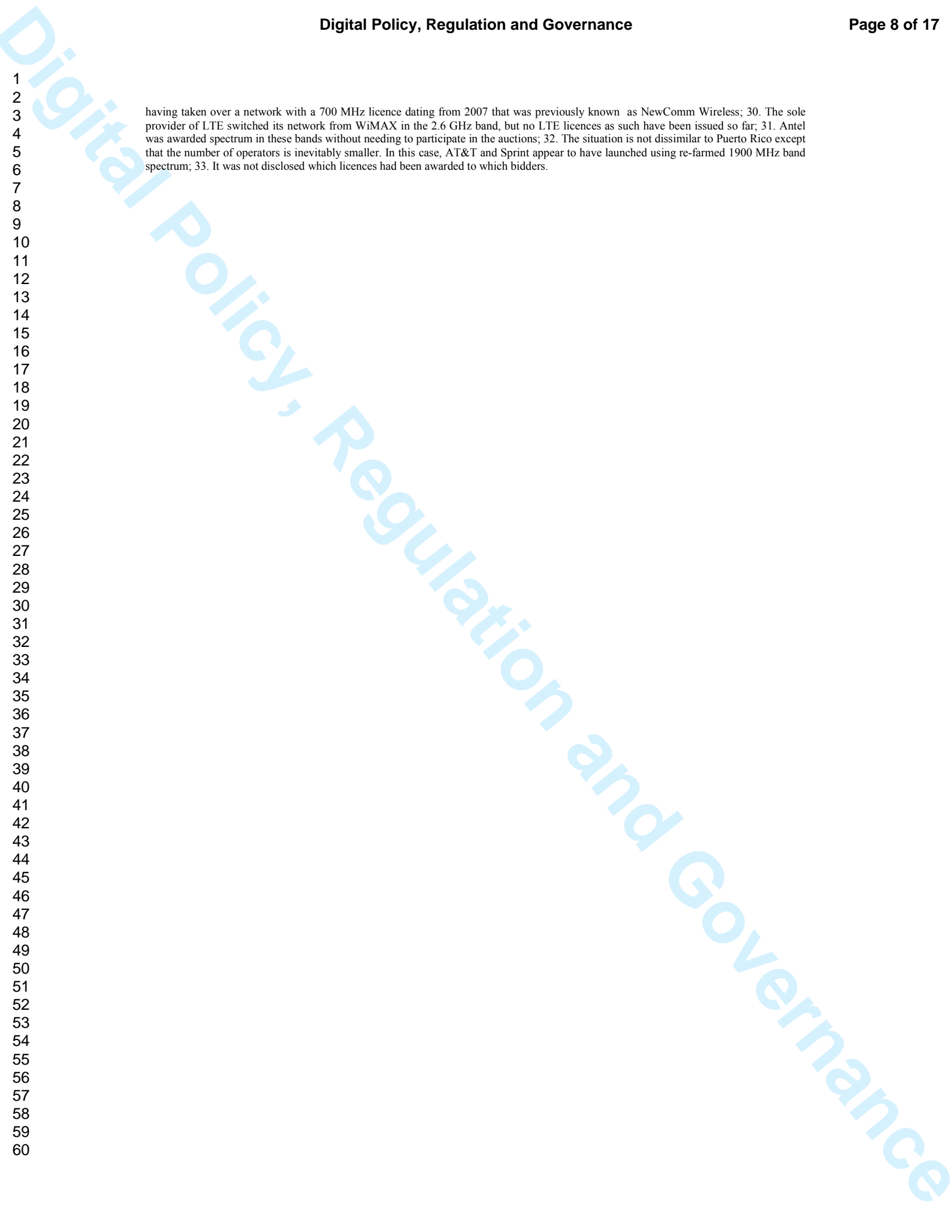
LTE launches in LA&C

If one considers the countries where launches by operators with substantive networks have occurred then the following data applied at the end of March 2017:

- Anguilla (1): CWC (11/15)
- Antigua & Barbuda (2): Digicel (11/12); CWC (11/14)
- Argentina (1): Telefónica (12/14)
- Aruba (1): Setar (11/13)
- Bahamas (2): BTC (02/14); Aliv (11/16)
- Barbados (2): Digicel (10/16); CWC (03/17)
- Belize (2): SpeedNet (12/15); Belize Telemedia (12/16)
- Bermuda (1): CellOne (05/16)
- Bolivia (3): Entel (12/12); Millicom (07/14); Viva (07/15)
- Bonaire (2): Telecom Bonaire (06/15); UTS (06/15)
- Brazil (7): Sky Telecom (12/11), América Móvil (12/12); On (03/13); Telefónica (04/13); TIM (07/13); Oi (10/13); NII Holdings (06/14)
- British Virgin Islands (1): CWC (11/16)
- Cayman Islands (2): CWC (12/13); Digicel (12/13)
- Chile (4): América Móvil (06/13); Telefónica (11/13); Entel (03/14); WOM[1](11/15)
- Colombia (7): Une-EPM[2] (06/12); Millicom[2] (12/13); Telefónica (12/13); América Móvil (02/14); DirecTV (07/14); Avantel (08/14); ETB (10/14)
- Costa Rica (3): ICE (06/13); América Móvil (04/14); Telefónica (07/14)
- Cuba (0):
- Curaçao (1): UTS (05/15)
- Dominica (1): CWC (10/14)
- Dominican Republic (3): Orange (01/13); Tricom (03/13); América Móvil (07/14)
- Ecuador (3): CNT (03/14); Telefónica (05/15); América Móvil (07/15)
- El Salvador (2): Millicom (12/16); Telefónica (12/16)
- French Guiana (2): Altice (12/16); Orange (12/16)
- Grenada (0):
- Guadeloupe (2): Altice (12/16); Orange (12/16)
- Guatemala (2): Telefónica (10/14); Millicom (05/15)
- Guyana (1): GTT (03/17)
- Haiti (0):
- Honduras (2): Millicom (12/14); América Móvil (03/15)
- Jamaica (2): Digicel (06/16); Symbiote (06/16)[3]
- Martinique (2): Altice (12/16); Orange (12/16)
- Mexico (3): América Móvil (11/12); Telefónica (11/12); AT&T[4](10/14)
- Montserrat (0):
- Nicaragua (2): América Móvil (10/15); Telefónica (11/15)
- Panama (3): CWC (03/15); Telefónica (03/15); América Móvil (08/15)
- Paraguay (4): Copaco (02/13); Personal (02/13); América Móvil (04/16); Millicom (04/16)
- Peru (4): Telefónica (01/14); América Móvil (05/14); Entel (10/14); Viettel (12/16)
- Puerto Rico (5): AT&T (11/11); Open Mobile (04/12); América Móvil (11/12); Sprint (12/12); T-Mobile (07/13)
- Saba (1): UTS (12/16)[5]

- Saint-Bartélemy (2): Altice (12/16); Orange (12/16)
- Saint-Martin (2): Altice (12/16); Orange (12/16)
- Sint Eustatius (1): UTS (12/16)
- Sint Maarten (0):
- St Kitts & Nevis (0):
- St Lucia (0):
- St Vincent & the Grenadines (0):
- Suriname (0):
- Trinidad & Tobago (1): TSTT (12/14)
- Turks & Caicos (2): Digicel (03/15); CWC (08/15);
- Uruguay (3): Ancel (12/11); América Móvil (03/14); Telefónica (09/14)
- US Virgin Islands (3); AT&T (07/13); Sprint (12/13); Choice Wireless (02/15)
- Venezuela (3): Digitel (07/13); Telefónica (02/15): Móvilnet (CANTV) (01/17)

Notes:
1. Nextel (NII Holdings) was taken over by Novator, using the brand name WOM, in January 2015
2. Une-EPM and Millicom have subsequently merged
3. It is unclear whether Symbiote is operational despite its claimed launch date
4. Nextel (NII Holdings) was taken by AT&T in April 2015
5. Saba is a special municipality of the Netherlands, not an independent country, located south of Sint Maarten. It has 2,000 residents.

LTE-A, branded as '4G+', has been launched by Entel in Chile (05/16), by Telefónica (07/16) and América Móvil (09/16) in Perú and by Belize Telemedia (12/16).

The annual totals are as follows: 2011 (3); 2012 (9); 2013 (19); 2014 (24); 2015 (21); 2016 (24); 2017 (3). Not only were there few launches by end-2013 – 31 out of 270 worldwide is a modest performance for an entire region – but most of these occurred in December 2012 or later. Furthermore, the limited presence of América Móvil (four appearances) and Telefónica (four appearances) was striking. They went head to head in Brazil, Chile and Mexico presumably because they simply could not afford to let each other gain too much of an advantage – a factor which also seems to have applied to the other similarly sized competitors in Brazil – but elsewhere it was almost as though each was happy not to have to spend too much money provided the other behaved likewise. Progress in 2014 was better than in 2013 with 24 launches in total. América Móvil was relatively active with five launches and went head-to-head with Telefónica (with five launches in 2014) in Costa Rica, Peru and Uruguay. It may be noted that although Colombia appeared to be in the vanguard for LTE provision by end-2014, both Une-EPM and DirecTV launched on a very limited basis and Une-EPM subsequently merged with Millicom. In 2015, América Móvil and Telefónica went head-to-head in Ecuador, Nicaragua and Panama, making 10 occasions all told. For its part, Millicom was much less active, going head-to-head with both of its larger rivals only in Colombia.

By the end of 2016, the region accounted for 100 of the 454 launches by incumbents worldwide, a huge improvement over the position in 2013. However, it has not been possible to trace more than a handful of launches by non-incumbents – primarily mobile virtual network operators (MVNOs – see Wikipedia, 2017g) – of which there had been a minimum (traceable by the authors) worldwide total of 260 by that point in time. It is evident, therefore, that the nature of LTE provision is out of line with other regions where wholesaling spare capacity to MVNOs is well-established.

Operator presence in LA&C

It is helpful to divide up operator presence between the larger and smaller parts of the LA&C region for the reasons indicated previously. Table II refers to the larger countries and, as can immediately be seen, there are two dominant operators involved in the provision of mobile services, one based in Mexico and the other – for historical reasons to do with colonisation – in Spain. It may be noted that the largest market by far, Brazil, is Portuguese speaking, but in practice roughly one quarter of the market is provided by each of the 'big two' and one quarter by Telecom Italia (due to widespread emigration from Italy to Brazil).

Table II Presence in larger LA&C countries/islands and position in respect of LTE provision

	América Móvil	Telefónica	Millicom	AT&T[1]	Digicel
Argentina	No	Yes	-	-	-
Bolivia	-	-	Yes	-	-
Brazil	Yes	Yes	-	-	-
Chile	Yes	Yes	-	-	-
Colombia	Yes	Yes	Yes	-	-
Costa Rica	Yes	Yes	-	-	-
Cuba	-	-	-	-	-
Dominican Rep.	Yes	-	-	-	-
Ecuador	Yes	Yes	-	-	-
El Salvador	No	Yes	Yes	-	No
Guatemala	No	Yes	Yes	-	-
Haiti	-	-	-	-	No
Honduras	Yes	-	Yes	-	-
Jamaica	-	-	-	-	Yes
Mexico	Yes	Yes	-	Yes	-
Nicaragua	Yes	Yes	-	-	-
Panama	Yes	Yes	-	-	-
Paraguay	Yes	-	Yes	-	-
Peru	Yes	Yes	-	-	-
Puerto Rico	Yes	-	-	Yes	-
Uruguay	Yes	Yes	-	-	-
Venezuela	-	Yes	-	-	-

Note: 1. AT&T expressed an interest in entering the Dominican Republic in 2017.

América Móvil controls – derives revenue from – almost 250 million subscribers in the LA&C region – that is, after gross subscriber numbers have been adjusted for the equity stake in each country where it is present. In practice, it owns 100 per cent of almost all of its networks so the controlled total is not much smaller than the gross total. These subscribers form much the greater part of its worldwide subscriber total since what is missing is mainly the 25 million or so subscribers in the USA and the 10 million controlled subscribers that it derives from its stake in Telekom Austria. It is evident, therefore, that the region is crucial for América Móvil – especially Mexico (with 73 million subscribers) and Brazil (with roughly 60 million) – and that it not merely needs to be present almost throughout but to provide the most advanced technology available in order to protect its status.

Telefónica is less straightforward. It has (as of end-March 2017) roughly 190 million gross subscribers in the LA&C region of which 74 million are to be found in Brazil but only 27 million in Mexico. However, only 160 million are controlled subscribers, primarily because

the ownership stake in Brazil is 73.7 per cent. In other words, it has only roughly 60 per cent of the controlled subscriber numbers in the region that are attributable to América Móvil. In total, Telefónica has roughly 235 million controlled subscribers worldwide so LA&C yields roughly 68 per cent of its controlled subscribers. In many ways this seems to be a surprisingly large proportion for an operator located in, and assumed to be highly active in, Europe. However, in practice, LA&C accounts for 14 of its 21 mobile networks and it has only three large networks in Europe – Germany (28 million controlled subscribers), the UK (23 million) – which it has attempted to sell in recent times – and Spain (17 million).

Curiously, América Móvil has a direct or indirect stake – primarily via Telekom Austria and KPN – in 11 networks in Europe (widely defined) so it has a much broader presence across Europe than Telefónica. It is clear, therefore, that Telefónica must compete fiercely in LA&C if its profitability is to be maintained – and that means it must compete head-to-head against América Móvil on the technological front. The close – and relatively early – launch dates in Brazil and Mexico are easy to understand in this context.

As previously noted, only Millicom – which, despite being head-quartered in Europe operates only in the LA&C region and Africa – plays any role of note in Table II other than the 'big two'. However, Millicom is a much smaller concern overall with 47 million worldwide controlled subscribers and its largest network in LA&C is in Guatemala from which it derives 5 million of the less than 20 million total LA&C controlled subscribers.

Otherwise, it is essentially a case of operators with strong competing networks in individual countries such as Telecom Personal in Argentina and Entel in Chile. In summary, therefore, technical progress is driven by the need for the 'big two' to keep up with one another, especially in Brazil.

If we now turn to the smaller countries – predominantly islands – the picture is quite different because the 'big two' have shown no interest in acquiring a presence, essentially because the scale of operations is too small. The equivalent 'big two' on the islands are Digicel and CWC (Liberty Global) but these are specialists in operating networks with subscribers counted in their thousands rather than millions.

This puts a premium on acquiring a major share of the market and although data for end-2016 are as yet unavailable – Digicel, as noted, is a very private company – it would appear that Digicel is the market leader in 14 of the countries/islands listed in Table III, and second-placed in the others. Because there are duopolies on many islands, this generally implies that Digicel merely has more than 50 per cent of the subscribers and it commonly has a share in the 50-60 per cent range. However, by the same token, it can only be deemed to be dominant on Bonaire, St Lucia and St Vincent & the Grenadines. Interestingly, Digicel is the dominant operator in Haiti (where it has over 5 million subscribers) and Jamaica (where it has over 2 million). Indeed, these two islands account for roughly half of all of Digicel's gross subscribers.

Table III   Presence in smaller LA&C countries/islands and position in respect of LTE provision

	Digicel[1]	CWC[2]	Orange[3]	Altice
Anguilla	No	Yes	-	-
Antigua & Barbuda	Yes	Yes	-	-
Aruba	No	-	-	-
Bahamas	-	No	-	-
Barbados	Yes	No	-	-
Belize	-	-	-	-
Bermuda	No	-	-	-
Bonaire	No	-	-	-
British Virgin Isles	No	Yes	-	-
Cayman Isles.	Yes	Yes	-	-
Curaçao	No	-	-	-
Dominica	No	Yes	-	-
French Guiana	No	-	Yes	Yes
Grenada	No	No	-	-
Guadeloupe	No	-	Yes	Yes
Guyana	No	-	-	-
Martinique	No	-	Yes	Yes
Montserrat	-	No	-	-
Saba	-	-	-	-
Saint-Bartélemy	-	-	Yes	Yes
Saint-Martin	-	-	Yes	Yes
Sint Eustatius	-	-	-	-
Sint Maarten	-	-	-	-
St Kitts & Nevis	No	No	-	-
St. Lucia	No	No	-	-
St. Vincent & Grenadines	No	No	-	-
Suriname	No	-	-	-
Trinidad & Tobago	No	Yes	-	-
Turks & Caicos	Yes	Yes	-	-
US Virgin Isles	-	-	-	-

Notes: 1. Digicel expressed an interest in entering Sint Maarten in 2016; 2. CWC was bought by Liberty Global in May 2016. It has also launched in Panama; 3. Orange has also launched in the Dominican Republic (see Table II).

Overall, its only significant rival does appear to be CWC but CWC currently goes head-to-head with Digicel with respect to LTE only in Antigua, Cayman Isles and Turks & Caicos. Table III shows clearly that this is because Digicel has launched LTE in less than a handful of cases – even fewer in practice than CWC. It is worthy of note that Digicel has frequently claimed to have launched '4G' on the islands while in reality providing HSPA+.

What is interesting is that the French operators Altice and Orange have both rolled out LTE on the same five islands where they are present. However, this reflects the fact that licensing on these islands is the responsibility of the French regulator, ARCEP. Hence, this is not going to be repeated on the historically British or Dutch islands.

Inevitably, the situation is in a period of flux and in March 2017, Digicel selected Chinese vendor ZTE to roll out LTE networks across the LA&C region (TeleGeography, 2017). Presumably, therefore, there will be a sudden surge in LTE launches in the reasonably near future.

Future progress

It is possible that the opening up of the 700 MHz band (698-806 MHz) across LA&C will bring about some structural changes, but even if incumbents are subjected to caps on their overall spectrum holdings, new entrants are likely to need owners with deep pockets if they are to succeed in acquiring even modest market shares via this route (Curwen and Whalley, 2013: chapter 7).

The position as of end-March 2017 is that the countries in Table I have decided the year in which they will be switching off the analogue services that occupy what is known as the digital dividend spectrum bands, essentially the 700 MHz band in LA&C (4G Americas, 2015: Table 1). Although a few – Bolivia, Mexico and Uruguay – have already reached their deadlines, the others essentially span the period 2018 to 2024. As shown in Table I, preparations to auction off the band are reasonably well progressed, with existing allocations in Bolivia, Brazil, Chile, Mexico, Nicaragua, Panama, Paraguay and Peru.

On the islands there has been much less progress so far with auctions only in the Bahamas, Bermuda, British Virgin Islands, Cayman Islands and Turks & Caicos, although it can be argued that there is plenty of spare capacity in higher bands and distances to be covered by signals are relatively short.

It should be noted that there are incompatibilities between the various allocations because Bolivia, for example, has opted for the band segmentation in use in the USA whereas the majority have opted for the Asia Pacific Telecommunity (APT) version that pairs 703-748 MHz with 758-803 MHz.

Conclusions

The structure of the mobile sector in LA&C is by no means set in stone – indeed, there has been a plethora of deals since 2013. A few that are worthy of particular mention are the exit of NII Holdings (branded as Nextel) from Argentina, Chile and Peru; the activity surrounding Oi in Brazil; the sale of Orange Dominicana to Altice in April 2014; the largely unsuccessful asset exchange involving América Móvil and Digicel in El Salvador, Honduras and Jamaica; AT&T's entry into Mexico; and Viettel of Vietnam's entry into Peru. However, none of this has significantly altered the fact that América Móvil and Telefónica dominate the countries and CWC and Digicel dominate the islands in the LA&C region.

This is not set to change in the foreseeable future. América Móvil has not enjoyed its time in Europe. In July 2015, it accounted for its 21.1 per cent stake in KPN as 'available for sale', and it reduced its stake in Telekom Austria from a peak of 59.7 per cent in 2014 to 51 per cent in August 2016. It is under regulatory pressure to reduce its dominant position (in both fixed-wire and mobile) in Mexico, but it clearly has nowhere much to go either within LA&C or worldwide so consolidation of its existing operations is likely to be its over-riding aim. This, in turn, implies making as much money as possible from high-speed data contracts.

As for Telefónica, it has thrown its hat into the LA&C ring in no uncertain terms, indicating at the same time by, for example, putting its UK network up for sale, that it its huge debts (Baigorri and Orihuela, 2016; Buck, Fildes and Espinosa, 2017) preclude maintaining European networks that are insufficiently profitable. It has no choice but to continue the LTE

arms race against América Móvil in LA&C, which in turn requires heavy investment, so its quest to dispose of non-core assets lies at the heart of its current strategy.

Given the size of the islands, there is much less pressure on CWC and Digicel to generate funds running into the billions of dollars. Nevertheless, with the backing of Liberty Global's extensive resources, CWC is better placed than Digicel which as a private company does not wish to be taken over or to raise funds via a public offering of shares. As noted, it has finally contracted with ZTE to roll out LTE across most of the islands, so once again it seems that the battleground is to be defined in terms of LTE coverage and speed.

Given the entrenched position of the respective 'big twos' in the countries and islands, a case could be made for trying to effect new entry to take them on. As noted above, most of the competition has come from networks that operate only in one or two countries/islands, and even Millicom's presence is patchy. This suggests that the way forward is to license new entrants specifically to provide LTE with 2G and 3G provided entirely via roaming arrangements. That way the investment is limited and concentrates on state-of-the-art networks.

It is difficult to find successful examples of this strategy elsewhere in the world – the only significant case relates to Reliance Jio in India although its acquisition of more than 100 million LTE subscribers was achieved by the difficult to replicate strategy of offering the service for free over a period of many months.

In essence, it can be argued that regulators in the region have made/are making some basic errors in trying to effect structural change via LTE licensing. The errors include the allocation of spectrum to state-owned bodies (as in the cases of CNT in Ecuador, Hondutel in Honduras, Copaco in Paraguay and Antel in Uruguay). State ownership has, at best, a patchy record in the mobile sector and it is rarely a good idea to require bureaucrats to take on market-driven private operators. One exception might be the award of a single network licence to a state-owned operator which will subsequently provide wholesale services to all-comers as this provides an apparently level playing field. However, it can potentially be highly disruptive given existing arrangements for 2G and 3G provision.

A second controversy surrounds the imposition of spectrum caps on incumbents (as in Chile and Mexico). On the face of it, this is an excellent means to reduce the stranglehold that incumbents may have in a market, but it pre-supposes, firstly, that there will be any interest from new entrants and, secondly, that incumbents will find it difficult to compete after they have re-farmed spectrum in various bands for the provision of LTE services.

Despite the obvious benefits for competition of placing restrictions on the re-farming of 2G/3G spectrum, the imperative must be to launch LTE services at the earliest possible date because of its benefits for economic growth. Hence, it is very difficult to tilt the playing field away from entrenched incumbents.

A final controversy relates to onerous coverage obligations. Once again, these can be relaxed for new entrants, but such relaxations are highly unlikely to counter-balance the other advantages held by incumbents. Furthermore, while it is the norm to require incumbents to sign a roaming agreement with respect to 2G/3G with LTE new entrants within a specified period, they have a clear incentive to procrastinate and little can be done about it other than to issue fines which may be preferable to the onset of competition.

It is not altogether rewarding to speculate on the extent to which these criticisms are valid in individual cases and it is too early to test the 'what if' alternatives where LTE is concerned. All we know for certain is that whereas the advent of LTE might have been expected to galvanise the mobile sector in LA&C and result in significant structural change in a good number of markets, this has yet to come about in any meaningful way other than in a handful of countries. On the other hand, the spread of LTE has been underpinned by the competition between the 'big two' in the countries and islands respectively. As noted above, LA&C is no longer a backwater for LTE, and with the forthcoming spread of LTE across the islands LA&C may even turn into a regional leader in terms of population coverage. This, in turn, should yield significant benefits for economic growth.

References

Baigorri, R. and Orihuela, R. (2016), Telefonica's debt reduction plans slowed by failed Telxius IPO'. http://www.bloomberg.com. Accessed 20 December

Buck, T., Fildes, N. and Espinosa, J. (2017), Telefónica shaves debt with Telxius masts stake sale to KKR. http://www.ft.com. Accessed 21 February

Carmody, P. (2013) A knowledge economy or an information society in Africa? Thintegration and the mobile revolution. *Information Technology for Development* 19 (1), 24-39

Chavula, H. 2013. Telecommunications development and economic growth in Africa. *Information Technology for Development* 19 (1), 5-23

Curwen, P (2002) *The future of mobile communications: awaiting the third generation.* Basingstoke: Palgrave

Curwen, P. and J. Whalley (2008) *The internationalisation of mobile telecommunications: strategic challenges in a global market. Cheltenham:* Edward Elgar

Curwen, P. and J. Whalley (2010) *Mobile communications in a high-speed world: industry structure, strategic behaviour and socio-economic impact.* Farnham: Gower Press

Curwen, P. and J. Whalley (2013) *Fourth generation mobile communication: the path to superfast connectivity.* London: Springer

Curwen, P. and J. Whalley (2014) *Mobile telecommunications networks: restructuring as a response to a challenging environment.* Cheltenham: Edward Elgar

Curwen, P. and J. Whalley (2016) European mobile markets and the doctrine of "3 networks good, 4 networks bad". *info* 18 (5), 1-23

GSMA (2014) *Mobile broadband reach expanding globally.* GSM Association. December. http://www.gsma.com. Accessed 26 December

GSMA (2016) *The mobile economy: Africa 2016,* GSM Association. www.gsma.com (accessed 26 October 2016)

Jagun, A., Heeks, R. and J. Whalley (2008) The impact of mobile telephony on developing country micro-enterprises: A Nigerian case study. *Information Technology & International Development,* 4 (4), 47-65

Lee, S., Levendis, J. and L. Gutierrez (2012) Telecommunications and economic growth: an empirical analysis of sub-Saharan Africa. *Applied Economics* 44 (4), 461-469

Qualcomm (2016) LTE Advanced Pro. www.qualcomm.com. Accessed 28 July

TeleGeography (2017), 'Digicel enlists ZTE for LTE rollout in Central America/Caribbean', http://www.telegeography.com. Accessed 29 March.

Wamuyu, P. 2015. The impact of information and communication technology adoption and diffusion on technology entrepreneurship in developing countries: the case of Kenya. *Information Technology for Development* 21 (2), 253-280

Waverman, L., Meschi, M. and M. Fuss (2005) The impact of telecoms on economic growth in developing countries. *Africa: the impact of mobile phones* Vodafone Policy Paper Series No 2, March (accessed 26 September 2016) Wikipedia (2017a), 'Latin America', http://en.wikipedia.org/wiki/Latin_America. Accessed 20 March

Wikipedia (2017b), 'List of Latin American countries by population', http://en.wikipedia.org/wiki/List_of._Latin_American_countries_by_population. Accessed 20 March

Wikipedia (2017c) 3GPP Long Term Evolution. http://en.wikipedia.org/wiki/3GPP_Long_Term_Evolution. Accessed 20 March

Wikipedia (2017d) 4G. http://en.wikipedia.org/wiki/4G. Accessed 20 March

Wikipedia (2017e) 3GPP. http://en.wikipedia.org/wiki/3GPP. Accessed 20 March

Wikipedia (2017f) 3GPP Long Term Evolution. http://en.wikipedia.org/wiki/3GPP_Long_Term_Evolution. Accessed 20 March

Wikipedia (2017g) Mobile virtual network operator. http://en.wikipedia.org/wiki/Mobile_virtual_network operator. Accessed 20 March

Wikipedia (2017h) Cable & Wireless Communications. http://en.wikipedia.org/wiki/Cable_and_Wireless_Communications. Accessed 20 March

4G Americas (2015) 700 MHz Spectrum Processes in Latin America, 15 August. http://www.4gamericas.org. Accessed 20 August