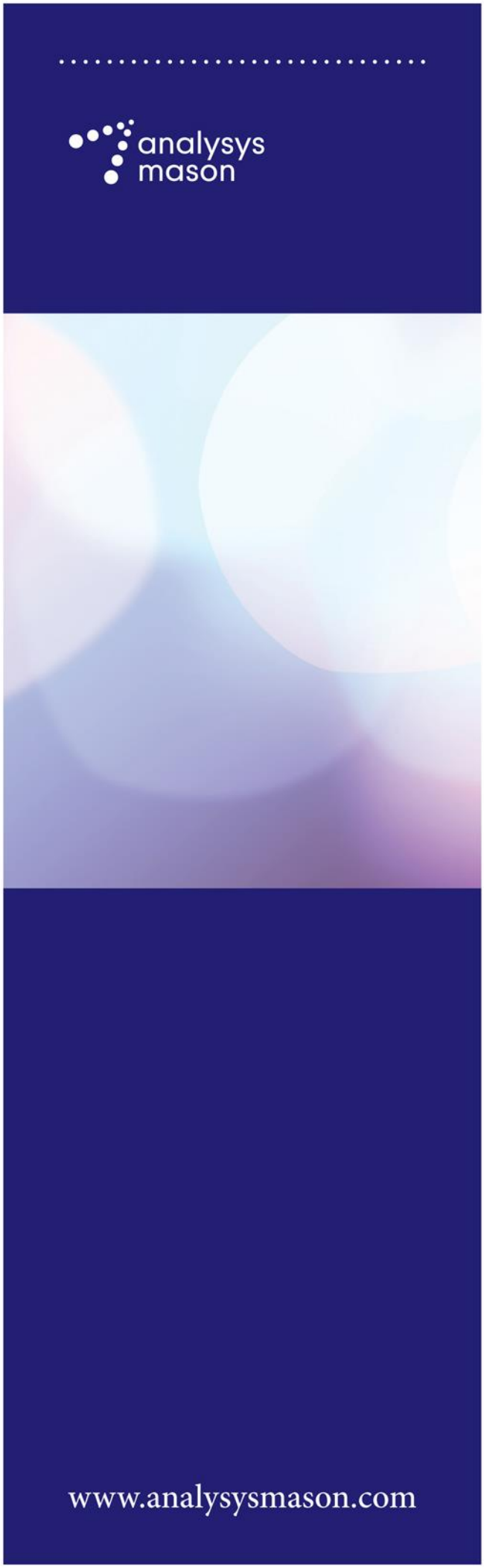

Final report for Trustpower

MVNO aspects of the Commission's mobile market review

25 October 2018

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0 Executive summary

The New Zealand Commerce Commission (the Commission) is studying the mobile market, to gain a better understanding of the current state of the market, how it is developing, and what factors will affect competition and market outcomes in the future. Trustpower has asked Analysys Mason Limited (Analysys Mason) to prepare an independent report on the New Zealand mobile market, the likely impact of mobile virtual network operators (MVNOs) and wholesale aspects of MVNO operation. This report makes comparisons between New Zealand and six countries with similar demographic, telecoms and wealth characteristics (Denmark, Norway, Austria, Ireland, the UK, Australia – the 'comparison countries').

The mobile market and the impact of MVNOs

The mobile retail market in New Zealand is currently dominated by three mobile network operators (MNOs): Vodafone (39% market share), Spark (38%) and 2degrees (23%). Skinny Mobile, a sub-brand of Spark, holds 4% market share and there are fewer than five independent MVNOs, which together serve less than 1% of the market.

In the comparison countries, independent MVNOs have gained around 5% to 15% of the market, and a total of 10% to 35% of the market is served by alternative brands (i.e. not the main MNO brands). The comparison countries also have a larger number of MVNOs, providing a diverse choice for consumers. Denmark, Austria, Norway and Ireland – all countries with a similar population to New Zealand – each have between 7 and 58 MVNO brands.

In New Zealand, the small number of MVNOs and the very low market share held by independent MVNOs highlights that this segment is under-developed and indicates that independent MVNOs are unable to effectively compete in the retail market. However, the relative success of Skinny Mobile (the successful Spark-owned sub-brand in New Zealand) indicates that the market can support alternative brands when they offer competitive retail prices.

Most mobile markets worldwide are moving from prepaid to predominantly postpaid consumer contracts. For example, 63% of subscriptions in Western Europe are postpaid, up from 49% in 2010. Mobile markets in developed Asia–Pacific are heavily dominated by postpaid mobile contracts (at 89%) due to the presence of Japan and South Korea (where close to 100% of contracts are postpaid). The mobile market in New Zealand is substantially behind this trend, with only 40% of mobile subscriptions being postpaid contracts in 2017 (up from 34% in 2010).

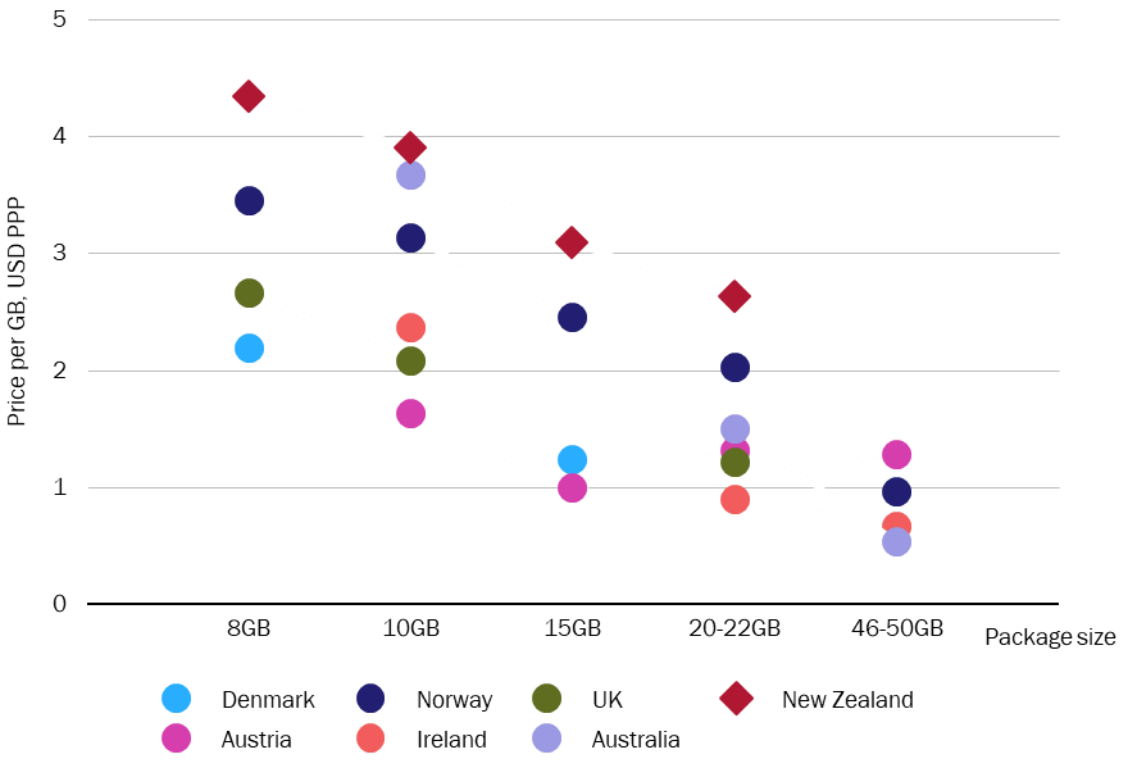
Mobile data usage per connection in New Zealand is also at the low end compared to the comparison countries, with 2017 data usage in Ireland, Denmark and Austria two to three times higher. However, New Zealand's relatively low consumption of data cannot be explained by technological issues – all three MNOs in New Zealand cover at least 92% of the population with 4G, and most mobile phones are 4G capable.

It is widely accepted by stakeholders that **the presence of effective independent MVNOs in a mobile market enhances retail competition**. Independent MVNOs compete directly with the MNOs, while sub-brands and MNO-owned MVNOs contribute to competition in a different way, since MNOs can use them to sub-segment the market. The presence of sub-brands also increases consumer awareness of alternative retail suppliers, such that they may consider mobile services from a non-MNO provider. However, it is important to note that Skinny Mobile makes it very clear to consumers that it is owned by Spark and uses the Spark mobile network.

When looking at retail revenue, New Zealand has a slightly lower ARPU than the average across the six comparison countries (USD22 compared to USD24 on a purchasing power parity (PPP) basis). However, given that monthly mobile data consumption in New Zealand is around half that across the six comparison countries (2.3GB compared to 4.5GB), there is strong evidence that New Zealand consumers are paying a high price for mobile data services.

This is confirmed by analysis of mobile packages, since **New Zealand consistently has the highest price per GB (for unlimited voice and SMS packages)**, as shown in Figure 0.1. In addition, MNOs in New Zealand do not offer very large mobile data packages, since the "unlimited" data package only includes high speeds up to 22GB of consumption and the largest package offered is currently 30GB (from Skinny Mobile). Two MVNOs in New Zealand do not offer packages larger than 5GB, and two other MVNOs directly mirror the terms of the MNOs' throttled 22GB package. In the six comparison countries, MVNOs consistently offer contracts with lower prices than the main MNO brands.

Figure 0.1: Price comparison of mobile data packages, price per GB, USD PPP [Source: Analysys Mason, 2018]



There appears to be no overlap between prepaid and postpaid packages in New Zealand for higher levels of voice and data consumption, as illustrated in Figure 0.2. This means that high-end postpaid contracts face limited competition from prepaid alternatives in New Zealand.

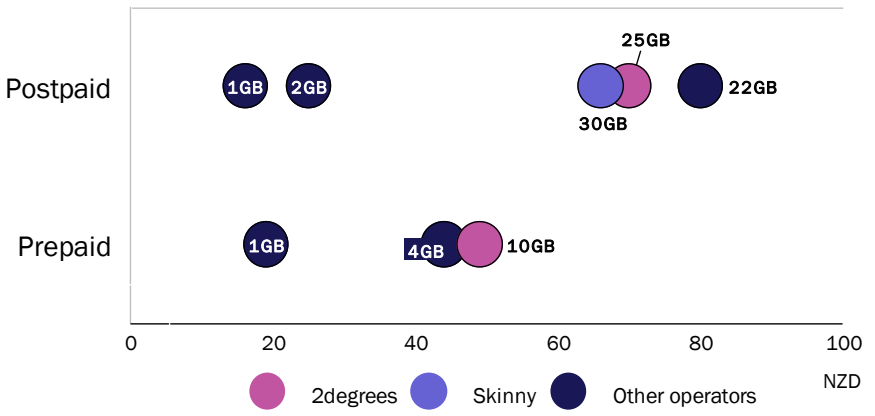


Figure 0.2: Illustration of approximate monthly price overlap between prepaid and postpaid packages for voice and data services in New Zealand [Source: Analysys Mason, 2018]

The lack of competitive retail pressure from MVNOs can explain why retail prices are relatively high in New Zealand and leads to less pressure on MNOs to innovate or offer larger volumes of data to users.

Fixed–mobile service bundles are becoming increasingly popular in many developed markets, benefiting consumers as well as operators. Bundling gives consumers easy access to complete connectivity solutions from one operator and reduces the number of bills they pay. It also provides an efficient way for operators to sign up multiple members of the same household to a single contract.

Fixed–mobile bundling has been growing in European countries since 2013 and Analysys Mason expects that it will increase further. In New Zealand, fixed–mobile bundling only makes up a low percentage of fixed services,[1] but the majority of mobile subscriptions are prepaid and not amenable to contract bundling. This means that even a low percentage of fixed–mobile bundling can tie in a relatively high proportion of domestic postpaid mobile service contracts with fixed broadband services. When households adopt fixed–mobile service bundles, they can combine family member SIMs and devices into a single contract. The ability of fixed-only providers to offer a flexible and attractive complementary mobile service (requiring a wholesale access arrangement with an MNO) will be increasingly important in enabling them to compete effectively in the fixed broadband market.

With 4G networks covering more than 92% of the population in New Zealand, and extensive presence of 4G handsets, Analysys Mason estimates that around 98% of data traffic in New Zealand will be carried by 4G networks. However, 3G (and 2G) networks remain fundamental to the mobile service proposition because they carry the vast majority of mobile voice traffic. This means that while 4G technology access and data services are fundamental to future competition, MNOs and MVNOs will remain reliant on competitive access to existing technologies for voice traffic.

1 Paragraph 91 of the Commission's Issues Paper.

In numerous countries (including Australia, where a fourth entrant recently launched using 4G spectrum), consolidation from four to three MNOs has been attempted or has occurred. Therefore, it appears unlikely that a fourth national MNO will enter the New Zealand market. **Fifth-generation (5G) services are expected to launch in 2020** and to be differentiated at a retail level. The high cost of infrastructure upgrades needed for 5G means that current cost pressures in the mobile market will be relevant in the 5G era, and hence the current trends of consolidation (and network sharing) are expected to continue. 5G services are anticipated to further promote fixed–mobile convergence, as high-frequency 5G spectrum may be used for extensive indoor "mobile" services, potentially marketed in a similar way to domestic Wi-Fi. Nevertheless, initial 5G services in many markets worldwide are expected to be mobile broadband services for consumers – similar to today's 4G services, but with higher speeds and better network performance.

In an environment where there is little prospect of a fourth successful MNO and it will be a few years before 5G is launched, the possibility for increased mobile retail competition in the New Zealand market comes from MVNOs. If MVNOs are to compete effectively and sustainably in the retail market, the right conditions need to be in place, including a wholesale access contract which supports immediate competitiveness, long-term profitability, flexible and attractive retail propositions, and prevailing technology dynamics. This wholesale access needs to support a commercial offering for both high-end data consumers, lower-end prepaid voice users as well as users on 'unlimited' contracts.

The mobile market aspects outlined here indicate that **the supply of such wholesale services to MVNOs in New Zealand is limited and uncompetitive**, which is restricting MVNOs' ability to compete effectively at the retail level.

The supply of wholesale services to MVNOs

There are different types of MVNO ranging from "light" to "heavy", all of which could successfully emerge in New Zealand – at one end of the scale, *light MVNOs* are tied to one MNO through the SIM code range, while at the other end of the scale, *heavy MVNOs* can switch between MNOs because they own their SIM range. Typically, heavy MVNOs are able to offer a wider range of service offerings, because they must own a suite of retail service platforms. The domestic wholesale services available to MVNOs determine the types of retail competition which they can offer:

- **retail-minus** wholesale limits MVNOs to offering similar packages to those of their host MNO
- **volumetric** (per-unit) wholesale prices allow MVNOs to build up prepaid or postpaid packages based on the number of minutes, SMS and data that are included. However, "unlimited" retail packages are challenging to offer with volumetric wholesale charges, since MVNOs could face very high wholesale charges, and they can only offer larger bundles of traffic if the wholesale prices are priced competitively to enable MVNOs to earn commercial margins. As data services become more important and the network unit cost of data declines, volumetric wholesale contracts require repeated price updates to reflect market evolution

- **capacity-based** wholesale contracts allow MVNOs to pay for an amount or proportion of total network capacity, typically throughput Mbit/s (not volumetric Mbytes) of data traffic, and to repackage that capacity into its retail offering in any way the MVNOs choose. As 5G becomes available, capacity-based access can evolve accordingly, and the wholesale arrangement can allow heavy MVNOs to take advantage of 5G's anticipated network slicing capability for customisable network access.

In all these situations, MVNOs contribute wholesale revenue to the host MNO, supporting its network investments and operational costs. The deepest form of mobile network unbundling for MVNOs, capacity-based access to the radio network, gives heavy MVNOs the greatest flexibility in their retail offers. This arrangement also requires the greatest investment commitment from MVNOs and supports increased wholesale (and retail) competition in future years, as a heavy MVNO is able to negotiate future supply deals with alternative MNOs.

While capacity deals give MVNOs more flexibility, volumetric deals can be used to rapidly and competitively provide MVNOs with access to current 4G and 2G/3G networks. However, in conjunction with the deployment of 5G, a capacity deal will be more suitable, as the 5G network will be data-centric and have a large empty capacity available for retail services. A combination of a volumetric deal for existing technologies and a capacity-based deal for new technologies such as 5G would be an effective solution for an MVNO offering a dynamic mix of current voice and data services along with much higher-speed future 5G services, in competition with MNOs also adapting their service mix to include 5G.

Impact of 5G

The emergence of 5G mobile networks might result in changes in the competitive landscape of mobile markets. Network slicing will potentially provide flexibility for new forms of business model to emerge, utilising virtualised slices of network capacity that can be configured to achieve different quality of service (QoS) and performance thresholds.

Regulators worldwide are considering how to licence 5G spectrum currently. Whilst there have been no examples to date of 5G spectrum awards containing specific conditions to ensure capacity for MVNOs, there are several examples where regulators are applying conditions aimed at bringing in new 5G players or enabling non-nationwide players to access spectrum (which may in turn involve mandated wholesale access for these entrants to established 2G, 3G and 4G mobile networks for nationwide service). Whilst 5G licensing precedents are currently limited due to the nascent nature of the 5G market, there is potential that further conditions to promote competition and MVNO capacity could be factored in to future 5G spectrum awards (albeit that initial 5G awards have been focussed on awarding spectrum regionally or nationally to MNOs).

Regulatory action on wholesale MVNO access

There are examples where regulatory authorities have explicitly recognised the importance of MVNOs to retail market competition and taken steps to ensure that wholesale access is available on specified terms.

In Austria in 2012 due to the merger between Hutchison 3G Austria and Orange Austria, the regulator was concerned that there would be price increases due to the reduction in competition. The regulator specified that the combined entity should offer 30% of its network capacity to up to 16 MVNOs in the following ten years through wholesale deals, including one before the merger was concluded. Since then, multiple MVNOs have entered the market via the regulated access offer, which has also stimulated competitive wholesale offers from the other two MNOs on a commercial basis.[2] BEREC notes that following the merger there was a significant increase in prices in 2014 and 2015. However, by 2016, the effect was reduced, which was *"likely caused by competitive pressure from MVNOs, which gained significant market share since entry at the beginning of 2015"*.[3]

During the auction of 3G spectrum in Ireland, Hutchison acquired additional 900MHz spectrum, on condition that it would allow MVNOs to operate over its infrastructure; the regulator stated[4] that "*the added introduction of alternative providers such as MVNOs would enhance competition*".

The imposition of wholesale capacity offers has also been used as a remedy when MNOs merged in Ireland and Germany. In Ireland, Three Ireland had to commit to provide capacity-based wholesale access to two MVNOs before it acquired O2. Eventually, these MVNOs would each have the option of taking up to 15% of the merged entity's network capacity. The regulator considered this approach to be more effective than the traditional volumetric wholesale model,[5] because it would give MVNOs an incentive to fill up the available capacity and offer competitive services. In Germany (in 2014), Telefónica was required to sell up to 30% of its network capacity to up to three MVNOs. The MVNO Drillisch gained the right to acquire 20% of Telefónica's network capacity over a period of five years, with an option to acquire an additional 10% until 2020.[6]

In Norway, since 2016 Telenor has been obliged by the regulator to "*meet all reasonable requests for access to its mobile network on terms which allow smaller companies to make a profit*". The regulator stipulates that "*for national roaming and access for MVNO providers, the requirement is*

2 *Europe's Digital Progress Report – 2017*.

3 BEREC, *BEREC Report on Post-Merger Market Developments – Price Effects of Mobile Mergers in Austria, Ireland and Germany* (June 2018), page 40.

4 ComReg, *Market Review Voice Call Termination on Individual Mobile Networks*.

5 J.P. Morgan Cazenove, *European Telcos, Assessing the prospects for future industry consolidation following failed Danish merger* (September 2015).

6 BEREC, *BEREC Report on Post-Merger Market Developments – Price Effects of Mobile Mergers in Austria, Ireland and Germany* (June 2018).

formulated as a prohibition against subjecting the buyer of access to a margin squeeze".[7] The regulator currently applies three different tests, including:

- production of a regulatory account which must show that the dominant operator could operate profitably if it used its own wholesale price agreement
- a package-specific margin-squeeze test to ensure that small service providers could operate profitably with a competing retail offer
- a segment-specific margin-squeeze test to ensure that small MVNOs could operate profitably with a portfolio of flagship retail offers.

These examples show that in various circumstances, some regulators have used a range of measures to actively support MVNOs in their markets, with the objective of increasing or preserving retail competition to the benefit of end users. Some examples, such as Austria, show how consumers have benefited as a result of MVNO entry into the market. An increased presence of competitive challenger MVNOs in the New Zealand market is likely to contribute to improved price and volume competition in voice and data services, innovation across prepaid and postpaid packages, and wider choice of standalone mobile and fixed–mobile service bundles.

7 Nkom, *Decision on designating undertakings with significant market power and imposing specific obligations in the market for access and call origination on public mobile telephone networks* (July 2016).

1 Introduction

The New Zealand Commerce Commission (the Commission) is undertaking a study of the mobile market in New Zealand, to gain a better understanding of the current state of the market, how it is evolving, and what factors will affect its future developments. Among other things, the study is considering the main developments and issues in the market and their potential impact on competition and market outcomes.

Trustpower provides retail fixed telecoms services to its domestic energy customers. In order to complement this service, it is interested in entering the mobile market as a mobile virtual network operator (MVNO) in order to offer a wider choice of services and service bundles to its customers. Trustpower's launch as an MVNO would enhance competition in the mobile market and could provide customers with a wider choice of services and bundles at reduced prices. The feasibility of Trustpower's mobile-market entry will depend on a number of factors, including the availability of a wholesale mobile access agreement.

Trustpower has asked Analysys Mason to prepare an independent report on the New Zealand mobile market, the likely impact of MVNOs and wholesale aspects of MVNO operation. The aim of this report is to assist the Commission in ensuring that any future market interventions are "appropriate and proportionate", by helping the Commission to understand the benefits of entry and diversity in the mobile retail market, as well as the barriers associated with market entry by MVNOs. The remainder of this document is laid out as follows:

- Section 2 – The market share of MVNOs and sub-brands
- Section 3 – Use of mobile data services
- Section 4 – Competitive effects from MVNOs
- Section 5 – Bundling of fixed and mobile services
- Section 6 – Technological evolution
- Section 7 – Wholesale MVNO access to network
- Section 8 – Regulatory approaches to improve competition.

In this report we make comparisons between New Zealand and a selection of countries with similar demographic, telecoms and wealth characteristics (i.e. Denmark, Norway, Austria, Ireland, the UK, Australia, referred to as the 'comparison countries'). These other countries have been chosen because they provide relevant insight into the MVNO segment of a mobile market and highlight the presence and impacts of MVNOs in a market.[8]

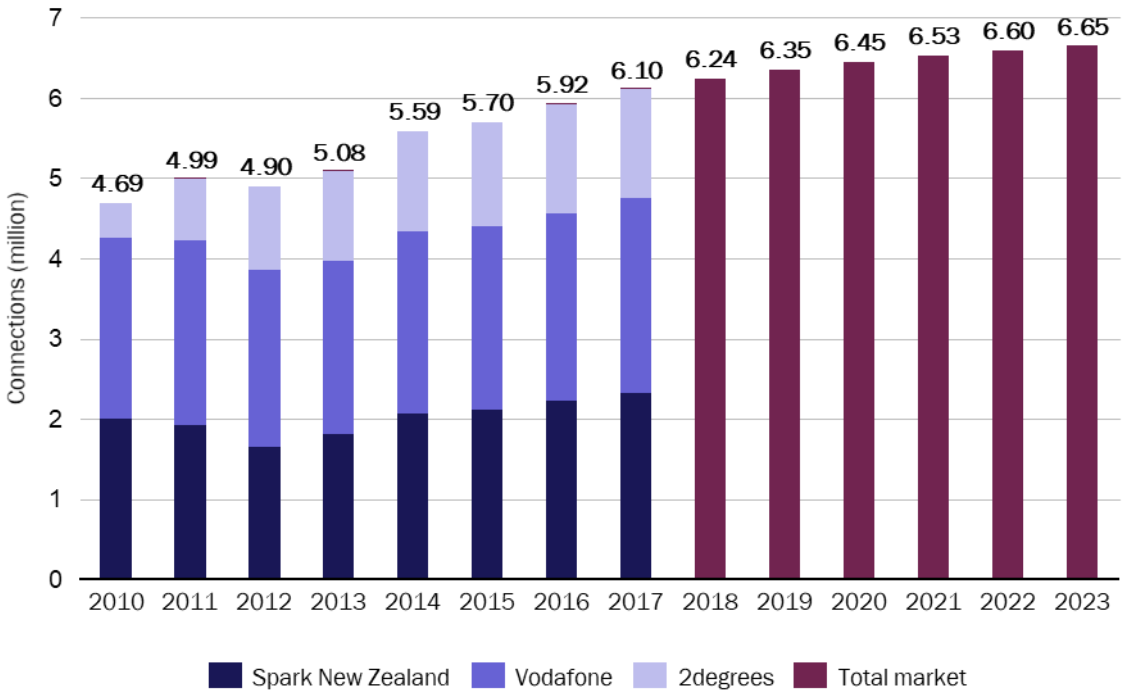
[8] The key features of these countries are shown in Annex A (Figure A.1).

2 The market share of MVNOs and sub-brands

2.1 The New Zealand market has a small number of major suppliers

New Zealand's mobile market is almost entirely served by three mobile network operators (MNOs) – Spark, Vodafone and 2degrees – which provide national coverage using their own infrastructure and their own retail brands. As shown in Figure 2.1, the MNOs' market shares have been stable since 2013. The smallest MNO is 2degrees (with around 1.35 million subscribers), while Spark and Vodafone each have around 2.3 million subscribers.

Figure 2.1: Total mobile connections per operator in New Zealand [Source: Analysys Mason, 2018]



2.2 New Zealand has a low representation of independent MVNOs and one sub-brand

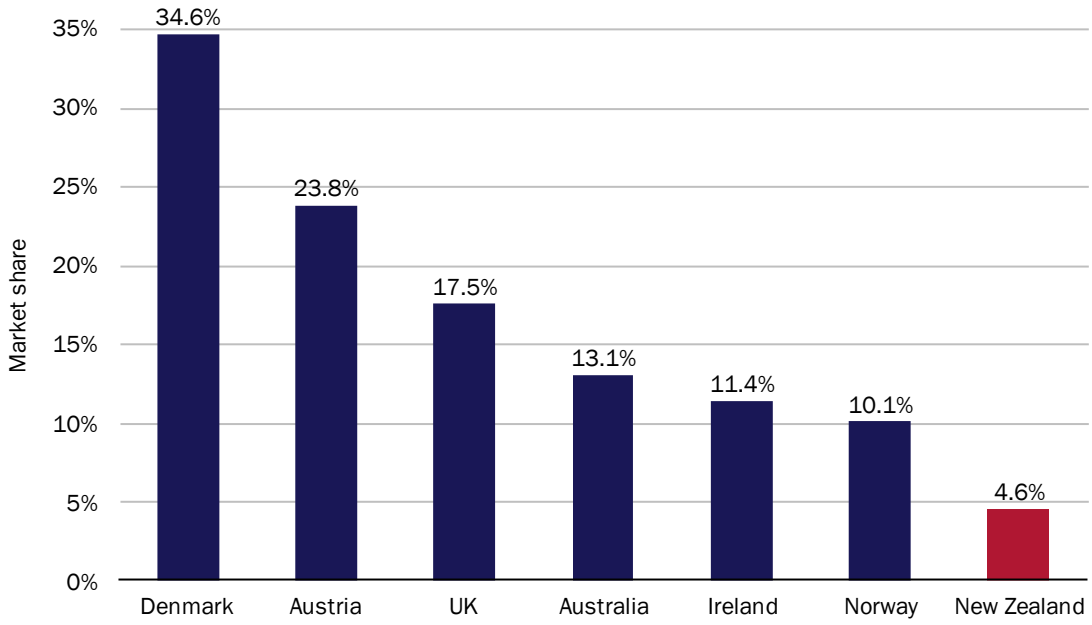
The market is served by one major MNO sub-brand, and a small number of MVNOs which have reached wholesale agreements with the host networks:

- Skinny Mobile (Skinny) is a sub-brand of Spark, operating on its network. It is the only sub-brand in New Zealand, and supplies most of the non-MNO branded market
- Compass, Vocus and megaTEL are MVNOs on Spark's network
- Warehouse Mobile is an MVNO on the 2degrees network
- Kogan Mobile and Vodafone have announced an MVNO agreement.

According to TeleGeography, Skinny serves 90% of the non-MNO brand market, with 4.2% total market share for Skinny, and 0.4% for the other MVNOs.

When looking at other countries, the share of MVNOs is more significant, varying between 10% and 35% for all MVNOs, including sub-brands (see Figure 2.2).

Figure 2.2: MVNO plus sub-brand market share [Source: Analysys Mason, 2018]



2.3 The New Zealand market has not moved materially towards postpaid account customers

Contract or account customers tend to be high-value customers, since they stay with operators for a longer period of time and tend to have higher consumption patterns. As shown in Figure 2.3 overleaf, there has only been a slight shift from prepaid to contract connections in New Zealand in recent years, as mobile operators try to attract customers onto account bundles and postpaid special offers in order to increase their revenue and gain market share.

2degrees has been successful in the lower-value prepaid segment and is slowly gaining postpaid customers through offers to make contract plans more attractive. Meanwhile, Skinny Mobile has gained 280 000 prepaid customers since launch in 2012. Skinny's market share demonstrates that there is space in the market for retail brands offering an alternative to the main MNOs – in Skinny Mobile's case, a simple prepaid proposition with low-price features.

As can be seen in Figure 2.3, other mobile markets are moving steadily from prepaid to contract services. Given the growing importance of mobile voice and data services, customers prefer the convenience of postpaid contracts, since they avoid having to make frequent top-ups up or running out of credit. In addition, capped postpaid contracts are an attractive feature for lower-credit users such as teenagers. In most developed countries the share of postpaid contracts has risen above 50%, reaching more than 80% in countries like Norway and Denmark. The average in Western Europe in 2017 was 63%, while in Developed Asia–Pacific it was as high as 89%. However, New Zealand is at the low end of this scale, at around 40%. As shown in Figure 2.3 and Figure 2.4, it has been lagging behind other developed countries in the last four years. If contract packages are relatively

expensive or inflexible then the migration from lower-spending prepaid users will be constrained in the New Zealand market.

Figure 2.3: Contract connections as a percentage of mobile connections [Source: Analysys Mason, 2018]

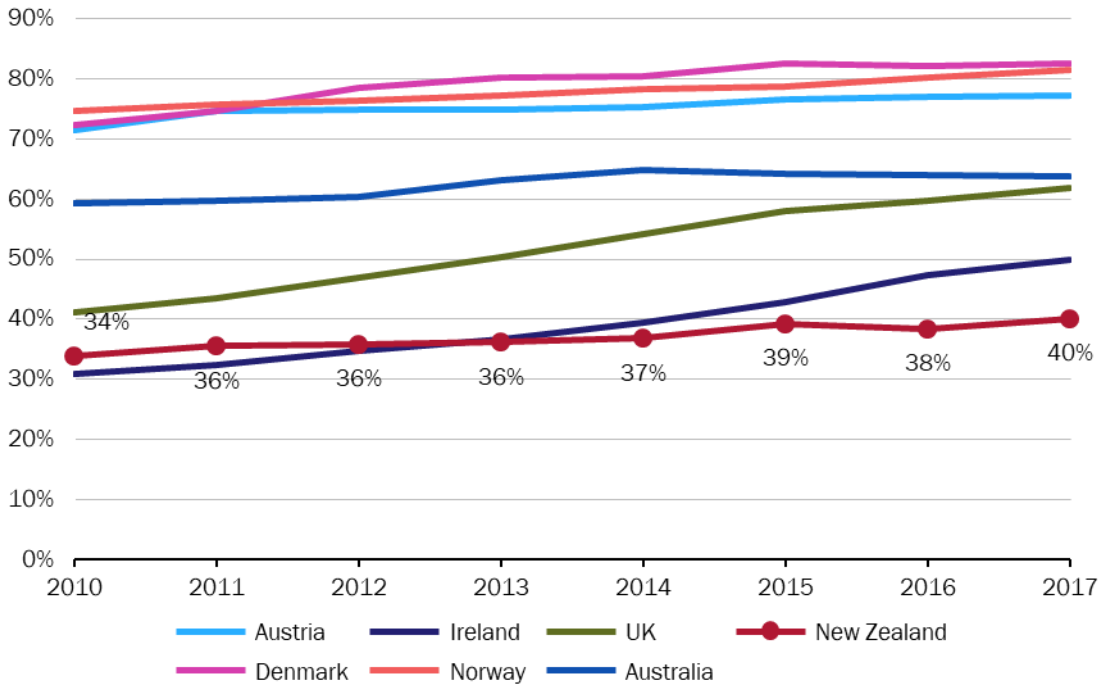
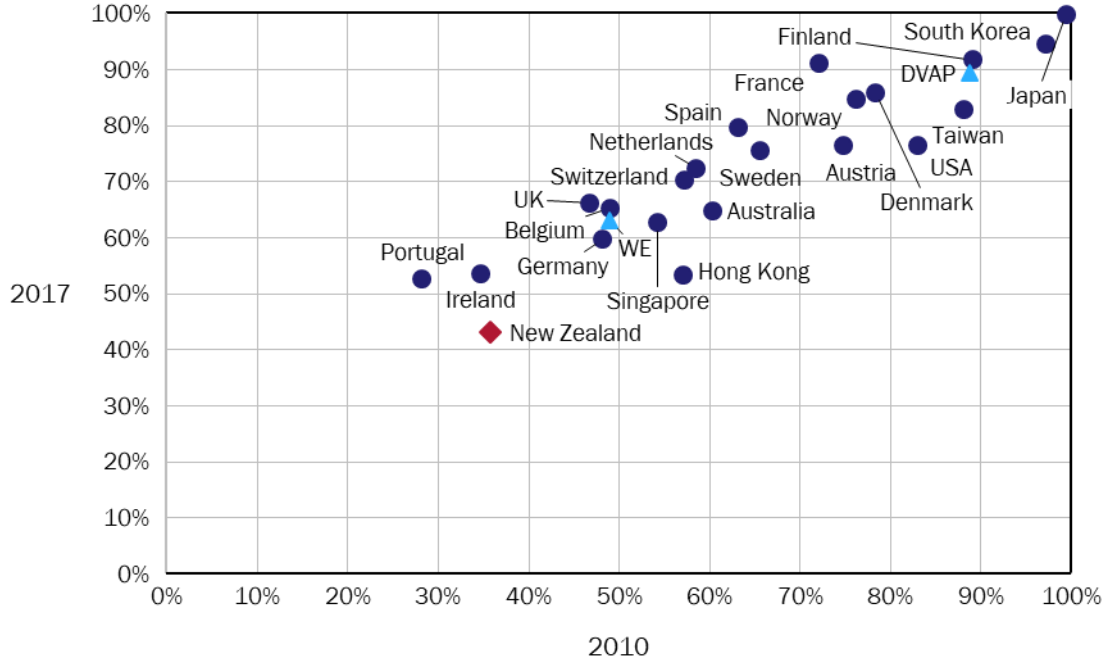


Figure 2.4: Contract mobile connections as a percentage of total connections in 2010 and 2017 [Source: Analysys Mason, 2018]

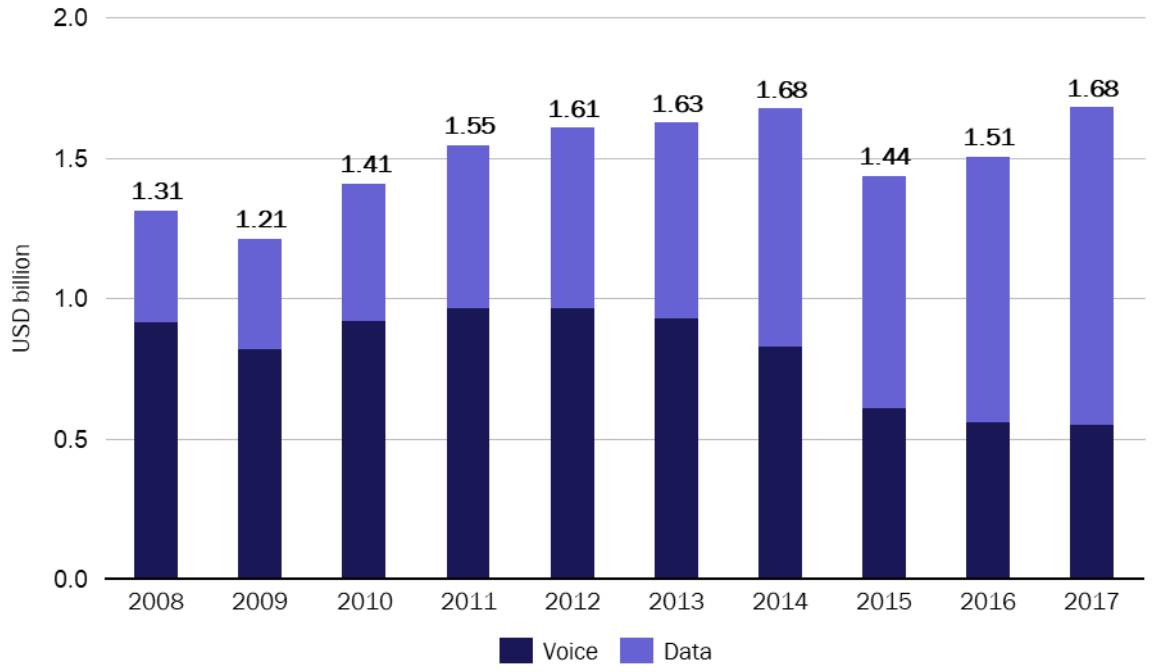


3 Use of mobile data services

3.1 The New Zealand market is becoming more data-focused

Mobile service revenues have increased in recent years, as MNOs have been able to monetise the growth in data traffic. In New Zealand, mobile data revenue overtook mobile voice revenue in 2014 and accounted for 67% of total mobile service revenue in 2017, as shown in Figure 3.1.

Figure 3.1: Total mobile service revenue per service type [Source: Analysys Mason, 2018]

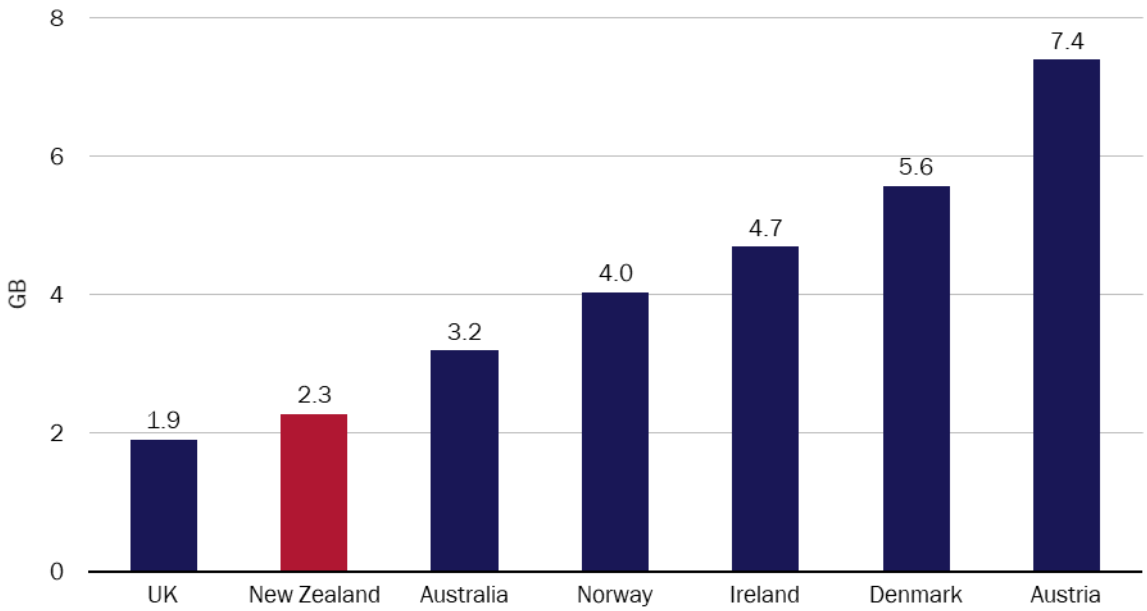


This move to data as the main contributor to customer revenues is seen in developed mobile markets around the globe.

3.2 Data usage in New Zealand is relatively low, and strong growth in consumption will continue for many years

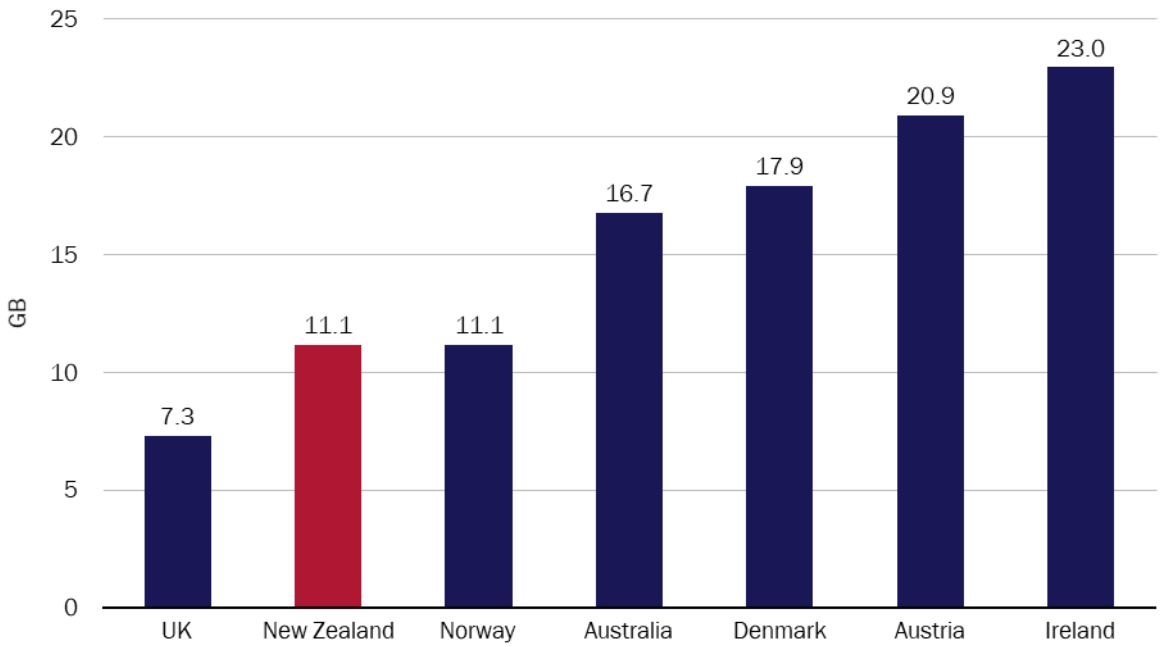
Customers are using an increasing amount of mobile data for mobile apps, video and audio streaming, or mobile gaming. As shown in Figure 3.2, average data traffic per connection per month in 2017 was already significant, and it is expected to continue growing over the next few years. With voice usage relatively stable, data has become the important growth service for consumers. It can be seen from Figure 3.2 that New Zealand has lower data usage than most of the comparison countries.

Figure 3.2: Data traffic per connection per month (GB), 2017 [Source: Analysys Mason, 2018]



Data usage is forecast to grow significantly in all comparison countries. In the current market environment, New Zealand's data usage is forecast to grow from 2.3 to 11.1GB per connection per month between 2017 and 2022, remaining at the lower end of the trend (see Figure 3.3). Ireland is forecast to lead this trend with more than double the amount of data usage compared to New Zealand at 23GB per connection per month.

Figure 3.3: Data traffic per connection per month (GB), 2022 [Source: Analysys Mason, 2018]



Growth in the use of data and in the importance of data revenue is requiring operators to invest in their networks in order to roll out new technologies to deliver higher network capacity. All three MNOs in New Zealand now cover at least 92% of the population with 4G. This increase in network capacity brings down the unit costs of voice and data, enabling operators to offer much larger data bundles at lower prices.

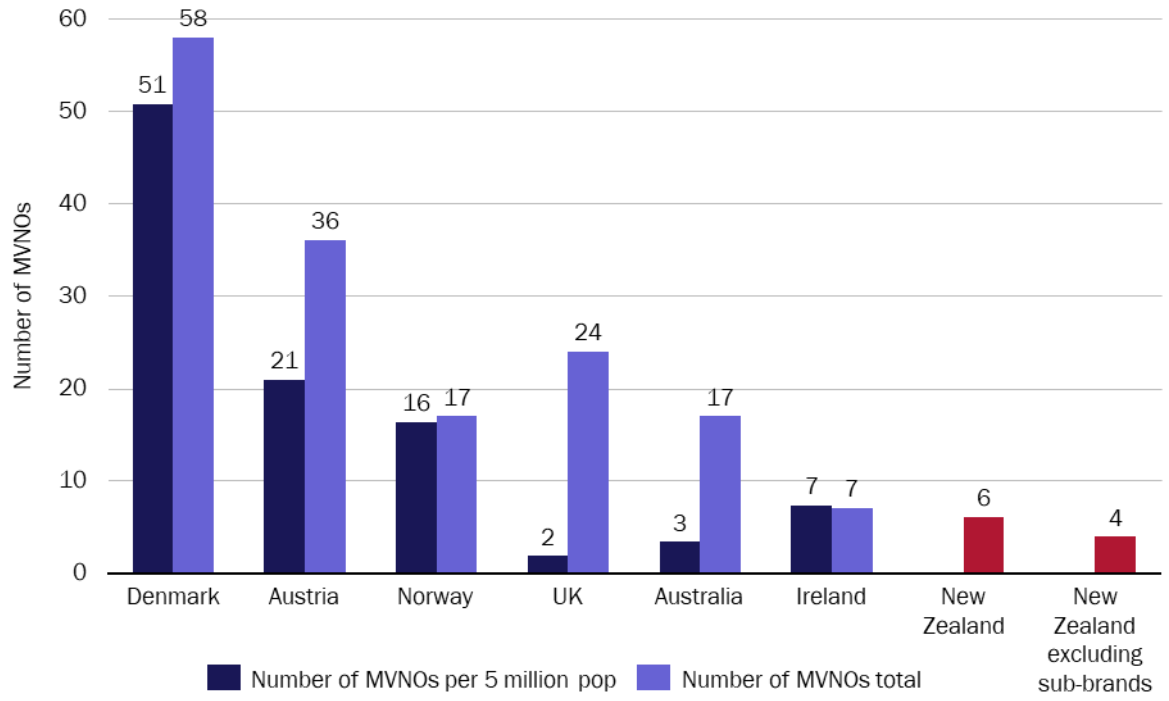
New Zealand's retail mobile market can become more dynamic and competitive if MVNOs are better able to compete with offers from MNOs and the move to large data bundles. Each MVNO therefore needs to agree wholesale contracts with an MNO that will allow the MVNO to offer competitive services that provide larger and larger amounts of data.

4 Competitive effects from MVNOs

4.1 Other retail markets support a higher number of non-MNO brands

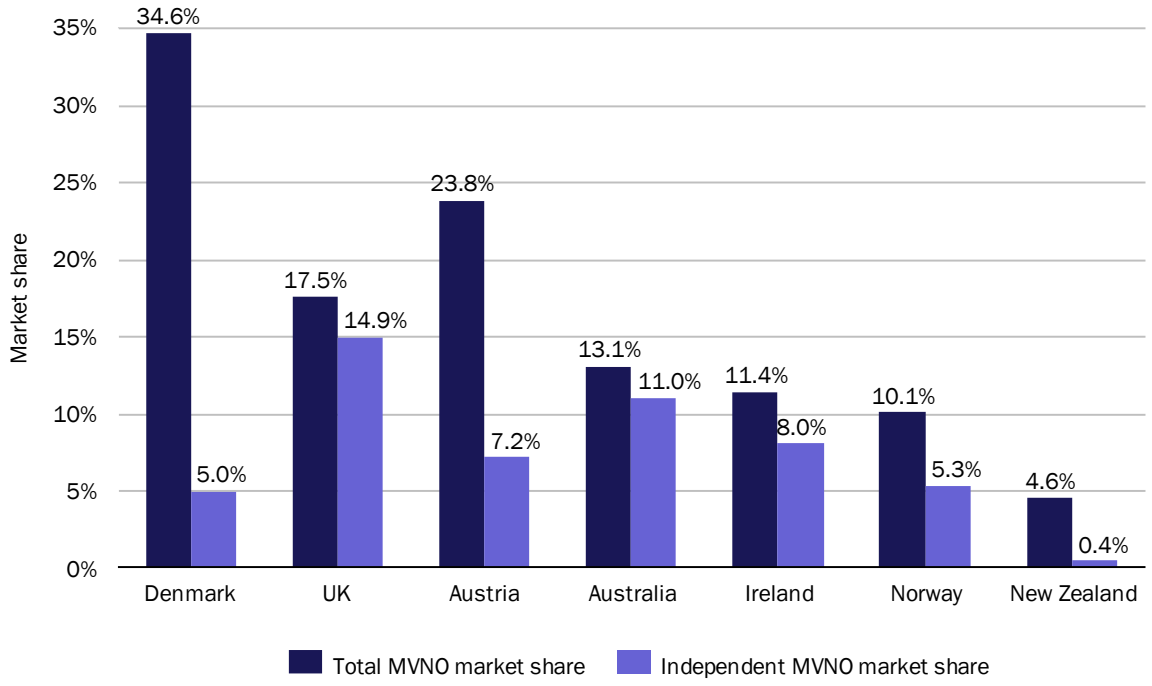
The retail markets in our comparison countries support a higher number of non-MNO brands (i.e. independent MVNOs and non-independent MVNOs) than New Zealand (as shown in Figure 4.1). When expressed per 5 million people, to normalise comparison with New Zealand, the small countries (Denmark, Austria, Norway, Ireland) also have a higher number of MVNO brands than New Zealand.

Figure 4.1: Number of MVNOs in total and per 5 million population [Source: Analysys Mason, 2018]



As well as being more numerous, MVNOs represent a higher share of the mobile market in the comparison countries, as shown in Figure 4.2 overleaf. Market share varies between 10% and 35% in the comparison countries for all MVNOs, and between 5% and 15% for independent MVNOs. New Zealand is significantly below these levels, at 4.6% market share for all MVNOs and only 0.4% for independent MVNOs. This highlights that independent MVNOs make up a negligible part of the overall market in New Zealand, with the majority of alternative supply being provided by Spark's Skinny Mobile sub-brand.

Figure 4.2: Market share of MVNOs, total vs. independent [Source: Analysys Mason, 2018]



The low number of MVNOs in New Zealand indicates that the market does not exhibit a diverse range of competition. It is also evident that independent MVNOs could serve a much larger proportion of the market than they currently do, through an increase in both the number and total scale of independent retail suppliers.

4.2 It is widely recognised that MVNOs enhance competition

If a mobile market includes a wide variety of MVNOs, consumers have access to more choice, since individual brands attempt to differentiate themselves to attract specific segments of the market. Greater retail choice enhances competition, as when MNOs face more competitors this stimulates innovation in the variety and quality of services offered. In particular, MNOs and MVNOs have incentives to offer attractive and creative bundles, discounts and additional benefits (as discussed in Section 5 below). Independent MVNOs enhance competition by competing directly with MNOs, while non-independent MVNOs contribute to competition in a different way since MNOs can use them to segment the market themselves.

Examples can be observed from the comparison countries:

- **Denmark** has a large number of MVNOs per capita and, according to the EDPR,[9] "pricing for mobile broadband services in Denmark is significantly below the EU average".

- In **Austria**, following the merger of Hutchison 3G and Orange Austria, the regulator attached a condition that the merged entity must accept up to 16 MVNOs on its network. According to

9 *Europe's Digital Progress Report – 2017*, Denmark, page 3.

information from the Federal Chamber of Labour,[10] "the new low-end brands with simple and transparent pricing effectively contributed to cheaper prices". The EDPR also notes that the availability and quality of service is good in Austria, with competitive prices, and that regulatory remedies to encourage the entry of MVNOs contributed to the positive rebound of pricing trends. Similarly, according to BEREC, a reduction in prices in the Austrian market was "likely caused by competitive pressure from MVNOs, which gained significant market share since entry at the beginning of 2015".[11]

- In **Ireland**, two MVNOs entered the market due to regulation that was imposed when O2 Ireland merged with Hutchison Ireland to form Three Ireland, and Three Ireland subsequently signed three more MVNO agreements in 2015 and 2016. However, GSMA notes[12] that the impact of the MVNO remedy was small, with MVNOs achieving a market share of less than 1%. Similarly, BEREC notes that the effects of the MVNO remedy were small and that MVNOs have not gained significant market share so far but that it is still too early to measure the impact of the MVNO remedy.[13]

In addition, in the **Netherlands**, the European Commission notes the "strong presence of the MVNOs as one of the factors countervailing the possible loss of competition from the reduction in the number of MNOs in the Netherlands mobile telecom market".[14]

4.3 The impact of competition on data pricing is a key indicator of market performance

Spark and Vodafone now offer 'unlimited' data bundles in New Zealand for NZD79.99 per month. It should be noted that unlimited data bundles are not the most expensive offers in the market. This is because these bundles are restricted to personal use only, exclude tethering and hotspot use, and the maximum speed is reduced ("throttled") once data consumption reaches 22GB in a particular month. Other bundles which include 17GB to 25GB of data are priced higher than the throttled unlimited deals, since they do permit tethering and hotspot use, and data which is not consumed in a month can be rolled over to the next one. The most attractive high data tariff offered in New Zealand is a 30GB bundle from Skinny for NZD66 per month. Relative to the comparison countries where it is possible to buy data packages that include 80GB to 100GB of data, New Zealand does not offer customers very large data packages. Two MVNOs (Compass and Warehouse Mobile) are not offering data packages over 5GB.

By comparing the prices per GB of mobile packages (which include unlimited voice and SMS) for different amounts of data offered by MNOs in the six comparison countries (see Figure 4.3 overleaf),

10 *Europe's Digital Progress Report – 2017*, Austria, page 3.

11 BEREC, *BEREC Report on Post-Merger Market Developments – Price Effects of Mobile Mergers in Austria, Ireland and Germany* (June 2018), page 2.

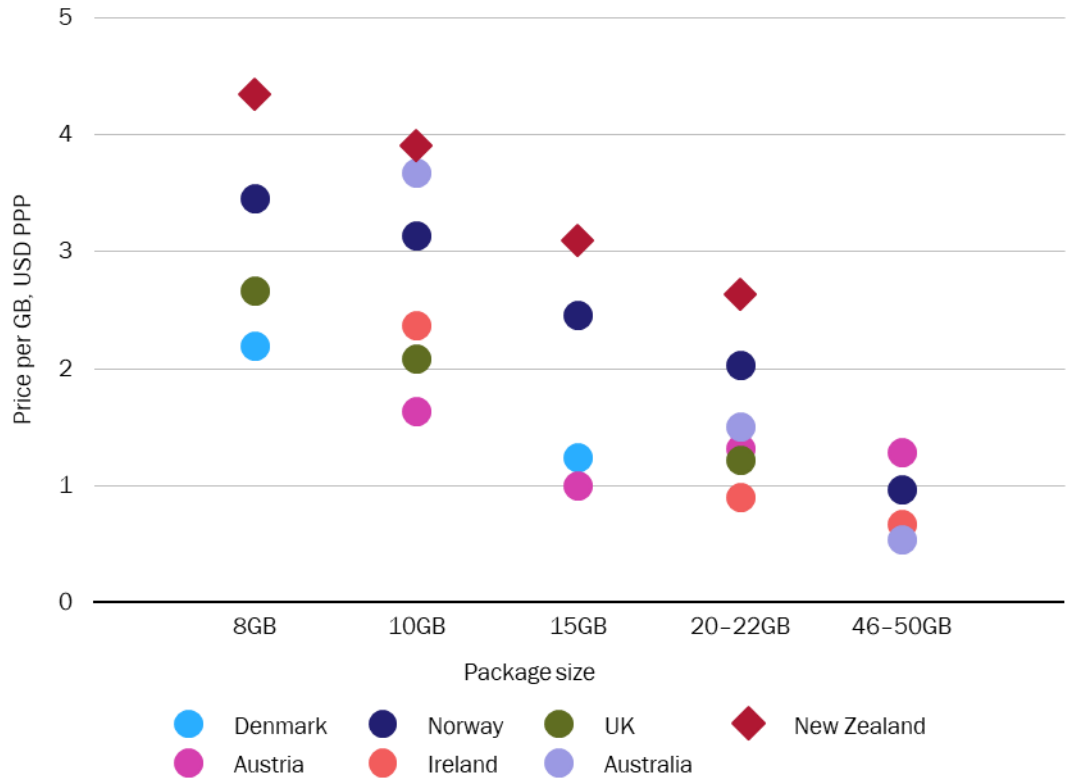
12 GSMA, *Assessing the impact of mobile consolidation on innovation and quality; an evaluation of the Hutchison/Orange merger in Austria* (2017).

13 BEREC, *BEREC Report on Post-Merger Market Developments – Price Effects of Mobile Mergers in Austria, Ireland and Germany* (June 2018), page 40.

14 See http://ec.europa.eu/competition/publications/reports/kd0215836enn.pdf

we see that New Zealand consistently has the highest price per GB. Additionally, MNOs do not offer very large mobile data packages since the "unlimited" package only offers high speeds for data consumption up to 22GB, and the largest package offered is 30GB.

Figure 4.3: Comparison of mobile data package pricing per GB, excluding VAT, USD PPP [Source: Analysys Mason, 2018]



We note that, in all six comparison countries, MVNOs consistently offer contracts with lower prices than the main MNO brands. While not all consumers will be attracted to 'no-frills' lower-priced deals offered by MVNOs, the existence of such offers puts pressure on the main MNOs to maintain more competitive pricing. Based on this analysis of postpaid mobile contracts in the six comparison countries that include unlimited calls and SMS plus 8GB to 20GB of data, it appears that the presence of MVNOs gives customers access to lower data prices.

Figure 4.4 shows that independent MVNOs are not able to offer lower prices than MNOs in New Zealand, while MNOs include additional features in their packages such as Spotify (Spark) or Netflix (Vodafone). Only Skinny Mobile offers lower-priced 'no-frills' packages, due to its position as a sub-brand.

Figure 4.4: Pricing of mobile packages in New Zealand, NZD [Source: Analysys Mason, 2018]

	10GB	22GB	Over 25GB
MNOs			
Spark	79.99	79.99 (no tethering or hotspot)	none
Vodafone	79.99 (15GB)	79.99 (no tethering or hotspot) 99.99 (tethering and hotspot allowed)	none
2degrees	55		70 (25GB)
MVNOs			
Skinny Mobile	46 (12GB)		66 (30GB)
Slingshot	55	79.99 (no tethering or hotspot)	none
Orcon	55	79.99 (no tethering or hotspot)	none

In the six comparison countries, however, MVNOs are able to offer lower-priced, more attractive packages.[15] Some MVNOs target the lower end of the market, offering small data packages for low prices, while other MVNOs focus on offering large data packages at a price that undercuts the MNOs. Generally, in the six comparison countries, all MVNOs offer lower prices than MNOs across all levels of data package.

4.4 Product and price offerings appear relatively constrained in New Zealand

In New Zealand, there are variations in pricing between prepaid and postpaid packages. The MNOs offer prepaid packages priced at around NZD20 for 1GB up to around NZD45 for 4GB, with the highest prepaid voice and data offer for 10GB of data from 2degrees for NZD49; while most postpaid packages range from around NZD40 for 2GB to around NZD70-100 for 22-25GB.

New Zealand's MNOs do include additional features in their contract packages, such as subscriptions to Spotify (Spark) or Netflix (Vodafone). In addition, Vodafone and 2degrees offer open-term postpaid packages, giving consumers more flexibility.

In contrast, MVNOs offer basic monthly packages with few, if any, additional features. For example, independent MVNOs such as Slingshot and Orcon offer similar 30-day packages ranging from NZD20 for a 1GB package to NZD79.99 for 22GB. These prices are the same as those offered by the MNOs, and do not include additional features. The sub-brand MVNO, Skinny, is the only MVNO to offer more-attractive four-week contracts, offering a 30GB package for NZD66.

The following examples illustrate the situation in the six comparison countries.

15 This is illustrated in Figure A.2 to Figure A.7 of Annex A, which set out the prices of mobile packages offering various levels of data (plus unlimited calls and SMS).

- In ***Denmark***, all MNOs as well as MVNOs offer non-binding one-month packages which renew automatically if not cancelled. Similarly, in ***Austria*** and ***Norway***, SIM-only packages are generally offered on a monthly non-binding basis.

- In ***Ireland***, Vodafone offers 24-month packages from 5GB to 15GB, as well as prepaid packages from 6GB to 8GB. Eir offers 30-day SIM-only plans as well as four-week prepaid plans. Three Ireland offers "all you can eat" plans on prepay and postpaid SIM-only plan. MVNOs offer 30-day contracts, with Virgin providing an unlimited data/minutes/text package for EUR25.

- In the ***UK***, MNOs offer 12-month as well as 30-day plans, ranging from 250MB to "All You Can Eat" (Three UK). Most MVNOs also offer 12-month or 1-month packages, although Giffgaff only provides 1-month packages, from 500MB to 20GB.

- In ***Australia***, MNOs also offer 12-month deals, as well as 1-month or pay-as-you-go packages. 12-month packages vary from 6GB to 80GB, while 1-month packages offer between 2.5GB and 40GB. MVNOs mainly offer 1-month packages, varying from 1GB to 40GB.

Based on observations from these comparison countries, it appears that consumers have a wide choice of prepaid and postpaid packages which both offer a variety of data allowances. As a result, low-end customers have access to postpaid packages. Postpaid customers benefit from competition between a wider variety of contract options, including competition from prepaid packages. In contrast, the situation in New Zealand is less diverse and competition appears more constrained.

4.5 There is little evidence of detrimental impacts arising from MVNOs

Although MVNOs increase competition in the market they also provide wholesale revenues to MNOs, which support network investments. MNOs can also benefit from selling excess capacity on their network to MVNOs. The impact that MVNOs have on network investment by MNOs is hard to quantify with certainty, as it depends on the degree to which MNO and MVNO profits at a retail level are passed through to finance network activities. Many markets contain successful MVNOs and still exhibit a positive investment situation. As they do not operate in the network layer, the presence and activity of MVNOs is unlikely to materially undermine MNOs' network investments. Network investments are predominantly related to supplying and developing the underlying network services (currently voice, SMS, data, etc.): the Belgian regulator BIPT recently noted[16] that investment decisions in the mobile sector depend on the investment cycles associated with the various technological evolutions (3G and 4G).

MNOs make relatively little investment in the retail layer of mobile services. MVNOs might also invest in their own billing systems, retail channels and value-distinguishing services. Within the retail layer, competition from MVNOs can encourage investment in more-diverse retail channels and service differentiation.

16 BIPT, *Impact study of 26 June 2018 regarding a fourth mobile network operator on the Belgian mobile market*; see https://www.bipt.be/en/consumers/press-release/168-bipt-publishes-a-report-on-the-impact-of-a-fourth-mobile-operator

5 Bundling of fixed and mobile services

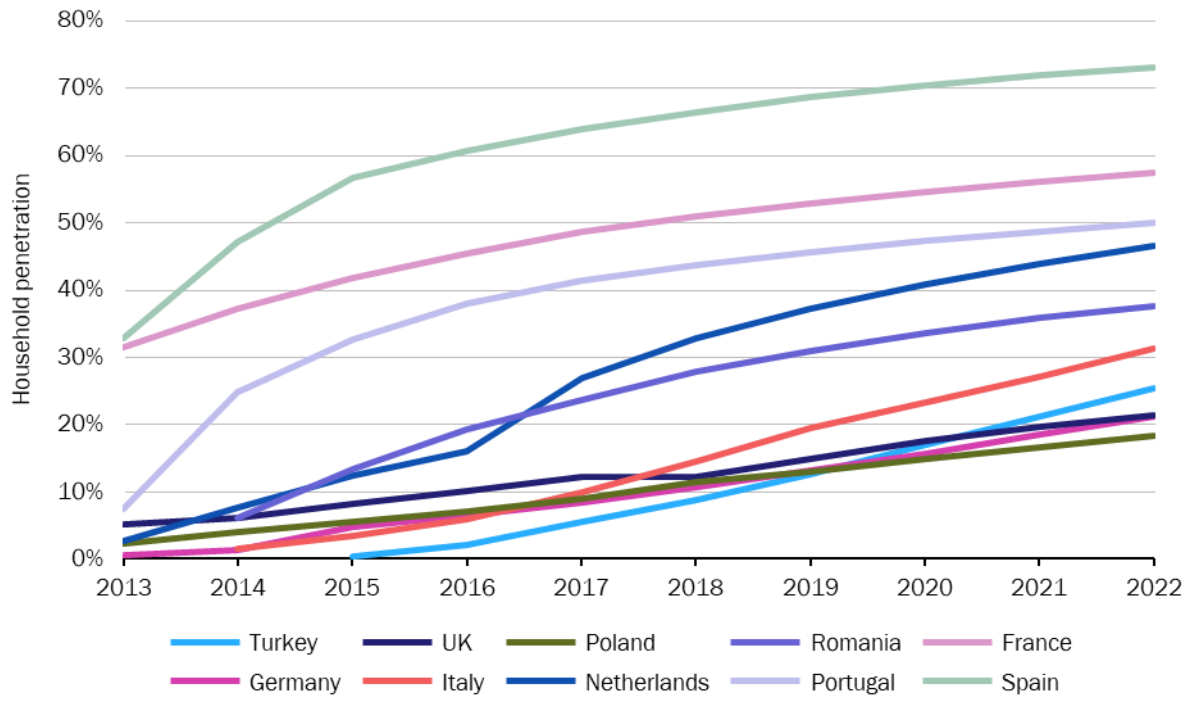
5.1 The number of households using fixed–mobile bundling is a steadily increasing minority

Fixed–mobile bundles, combining fixed and mobile services, are becoming increasingly popular in developed markets, benefiting consumers as well as operators. Fixed–mobile bundles give consumers easy access to complete connectivity solutions from a single operator, which reduces the number of bills a household has to pay and provides an efficient way for multiple members of the same household to join a contract with a single network. In addition, customers can benefit from discounts and additional offers and services when they take fixed–mobile bundles.

For operators, fixed–mobile bundles can help to increase their mobile or fixed customer base, and they often reduce churn. Fixed–mobile bundles can also help an operator migrate customers from prepaid to postpaid, thus increasing its revenue and providing the benefit of higher and more predictable postpaid average revenue per user (ARPU).

As illustrated in Figure 5.1, the household penetration of fixed–mobile bundling has been growing in European countries since 2013, and is expected to increase further.[17]

Figure 5.1: Household penetration of FMC SIMs[18] [Source: Analysys Mason, 2018]



17 Analysys Mason does not produce data for five of the six comparison countries, but the other EU countries shown in Figure 5.1 provide a reasonable representation of the trend.

18 FMC SIMs represent the total number of mobile connections sold as part of FMC bundles.

In Europe, according to the EDPR, an average of 23% of multi-play bundles included mobile services in 2016. Looking at individual comparison countries:

- In ***Denmark***, 31% of bundles included mobile telephony in 2016. The EDPR notes that mobile services are growing in importance relative to fixed services, reflecting "*the increasing match in consumer choice between Danish users' mobile lifestyle and the highly competitive offers in the mobile market*"
- In ***Austria***, a greater diversity of bundles (double, triple, quadruple play) means that fixed–mobile offers are increasingly relevant in the market[19]
- Similarly, in ***Ireland***, bundles play a growing role in the market:[20] the EDPR notes that single-play subscriptions continued to decline in 2016, while the share of bundles increased
- There has also been a notable rise in retail bundles in the ***UK***, as "Telecommunications providers now focus more on selling bundles than standalone services".

In New Zealand, all three MNOs offer fixed–mobile bundling. The Commission has estimated that "*the volume of fixed broadband services sold by the three MNOs at a discount due to a mobile service also being purchased accounts for less than 20% of their fixed broadband services.*" This proportion – up to 20% of the fixed broadband market – is not insignificant, given that only 40% of mobile subscriptions in New Zealand are postpaid[21] and eligible for the offers bundling fixed and mobile services. This means that the remaining 60% of prepaid mobile connection are not eligible for such offers.

The high-value postpaid segment of the market is underrepresented in New Zealand and the 20% of the fixed broadband market that is eligible for bundled offers would make up a much larger proportion of the postpaid segment of the mobile market. Indeed, a relatively small proportion of bundling can account for a material share of domestic mobile users, especially those with higher spend (the ARPU of prepaid customers is NZD10.3, i.e. less than half the ARPU of contract customers (at NZD26.5)).

This indicates that fixed–mobile bundles are important in New Zealand's high-value postpaid segment, and with the forecast increase in postpaid customers and the general trend towards bundled offers, this relevance is likely to grow materially.

Vodafone and 2degrees both offer a discount of NZD10 per month when a broadband subscription is added to a postpaid mobile subscription. MVNOs also offer fixed–mobile bundles. Slingshot and Orcon (both belonging to the Vocus group) offer a NZD5 saving on mobile every month when it is added to a fixed subscription, as well as offering bundles that include discounted energy services.

19 EDPR, *Austrian market report* (2016).

20 EDPR, *Irish market report* (2016).

21 See Figure 2.3 earlier.

5.2 Bundling of additional services also increases with the presence of MVNOs

Fixed–mobile bundling can take different forms, such as the inclusion of IPTV (Internet Protocol television) or energy services. Operators can also add extra features to bundles to attract customers, while MVNOs can take advantage of other business segments in which they operate. For example:

- telecoms services add-ons such as international SMS, calls or roaming, additional data, higher speeds and Wi-Fi connectivity
- content and entertainment add-ons such as TV (Netflix), music (Spotify), gaming, cloud storage, anti-virus software and financial services
- extending connectivity though data sharing, multi-devices bundles or multi-screen access
- loyalty points, rewards and other consumer benefits.

Some examples of benefits offered by MVNOs in different countries are provided in Annex A (see Figure A.8).

ARPUs may also fall when fixed–mobile bundling is introduced, because discounts are offered to customers who buy bundles, and discounts may be fully or partly allocated to the mobile revenue line.[22] Innovations such as eSIMs (SIMs integrated in devices which can change provider without the need to change the physical SIMs) can support shared data plans using shared device and service fees to attract consumers who do not wish to commit to individual plans for each companion device. These types of plan can also accommodate the replacement cycles of different devices, as the contract can continue even after migrating from old to new devices.

The anticipated increase in popularity of bundles in New Zealand's telecoms market, as well as the shift from prepaid to contact subscriptions, suggests that customers will increasingly choose to purchase domestic telecoms (and family member) bundles inclusive of mobile services. The convenience and savings offered by fixed–mobile bundling means that operators which lack a mobile product will find it much harder to attract high-value customer groups, regardless of the other telecoms, TV or utility products offered in the bundle.

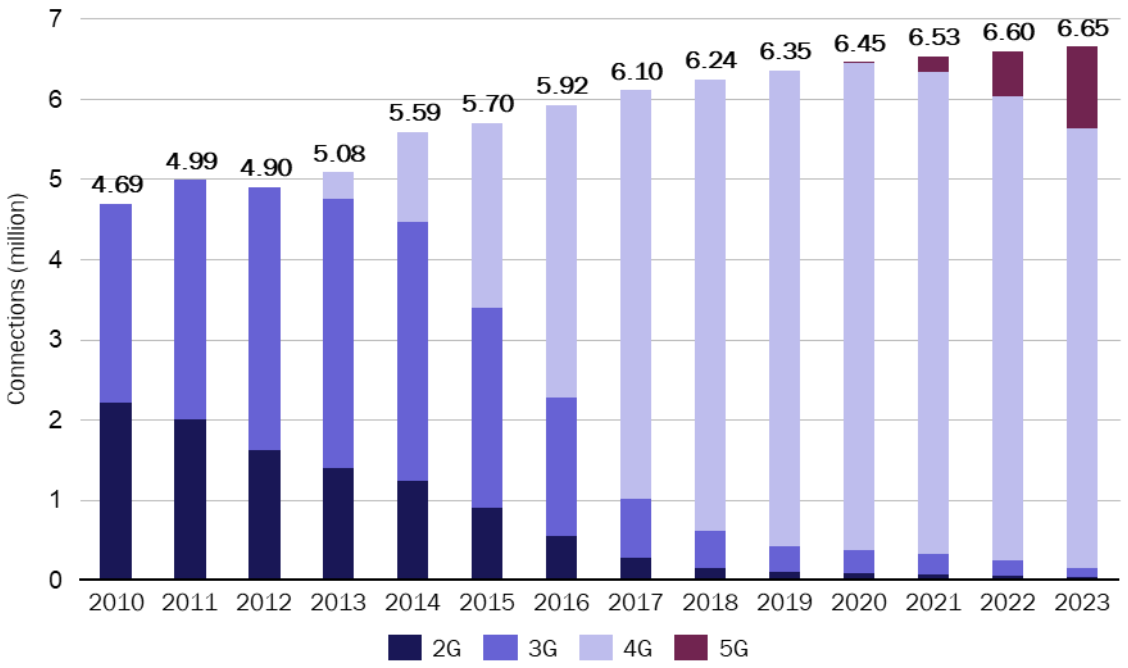
22 Discounts are sometimes allocated to a business unit as a 'cost of sale' (i.e. affecting profit margins but not the revenue line).

6 Technological evolution

6.1 Migration to 4G will continue for data, but legacy technologies still provide wide-area fall-back service coverage, particularly for voice traffic and M2M

The deployment of 4G technology has been completed by the MNOs in New Zealand, with all three operators achieving at least 92% 4G population coverage (compared to 98% coverage for 2G or 3G). The number of 2G-only connections is now almost zero, and 2degrees recently switched off its 2G network. Operators are now focusing on offering better services to 3G and particularly 4G subscribers, to meet the increasing demand for data. As shown in Figure 6.1, 4G is already the main technology on mobile devices and will remain so in the coming years. This is particularly the case for data traffic, with Analysys Mason Research estimating that 4G currently carries 98% of mobile data traffic in New Zealand, and forecasting that it will carry 100% of data traffic by 2020. After 5G is launched in 2020, take-up will depend on the availability of 5G-compatible devices. As with 4G, once devices are available it is expected that there will be a relatively rapid deployment of initial 5G networks by MNOs (e.g. into urban areas), with the aim of attracting users onto 5G through the offer of attractive tariffs and new handsets.

Figure 6.1: Connections by technology in New Zealand [Source: Analysys Mason, 2018]



However, 3G (and 2G, to the extent it is present) remain important for carrying voice traffic and any legacy data services (e.g. machine to machine, or M2M), which might use 2G/3G SIMs). The 2G/3G networks can also provide national fall-back for (slower) data traffic in locations where 4G is unavailable (e.g. in some rural areas and between conurbations, where 4G spectrum propagation is not as good), and they might also support roaming traffic. Although many devices in New Zealand are

now 4G capable and data consumption is concentrated towards the 4G network, users rely on 3G (and 2G) networks to support their voice and SMS usage, and at times their 'necessary' data usage.

The vast majority of mobile voice traffic in New Zealand is still carried as circuit switched traffic on 3G and 2G networks. 2degrees is the only MNO in New Zealand offering VoLTE or "Wifi Calling", having launched the service in November 2017 for Android and in April 2018 for iPhone. As MNOs continue to actively migrate spectrum to 4G, we would expect further deployments of 4G-based voice (e.g. VoLTE) to facilitate a move away from 2G/3G network use.

6.2 5G services are on the horizon and are anticipated to be integral to future mobile and converged fixed–mobile services

Spark is planning its 5G commercial launch for 2020, having launched 4.5G in 2017. MNOs are already testing 5G: for example, Vodafone tested a 5G connection at the beginning of 2018, in partnership with Nokia; and Spark conducted a live 5G mobile test in Wellington in March 2018. The Vodafone/Nokia 5G trial focused on virtual-reality applications and low-latency robots, whereas the Spark 5G trials have demonstrated higher-speed, lower-latency mobile connections. A 5G consultation entitled "Preparing for 5G" has been launched by the New Zealand Ministry of Business, Innovation and Employment, and an associated '5G spectrum roadmap discussion document' was published earlier in 2018.[23] Securing access to spectrum in the bands discussed in the roadmap document (600MHz, 3.5GHz and 26GHz) will give operators the opportunity to deployment 5G mobile services, using globally harmonised 5G frequency bands.

2020 is now less than two years away, and we expect 5G services will be marketed to consumers as soon as possible. Consumers are aware that 4G services are "faster, smoother and sharper",[24] and so they will expect 5G to be even better. As such mobile service providers will use 5G technology to differentiate services at a retail level.

In terms of spectrum, the frequencies currently used for 2G and 3G services will be migrated to 4G services. To support 5G roll-out, the regulator is considering the release of spectrum in one or more of the following bands: 600MHz, 1400MHz, 3.5GHz and 26GHz. Some of these bands might be used in combination with existing 4G bands (e.g. 3.5GHz spectrum might provide high-speed downlink services, with the uplink services provided via 4G, over one of the existing 4G bands). Utilising new virtualised core network technology and techniques such as network function virtualisation (NFV) and software-defined networking (SDN), 5G networks will be designed to have slices of customisable network capacity (for industrial applications or special services), and dynamically reconfigurable radio access networks (RANs), using technologies such as 5G self-organising networks (SON). This virtualised configuration could also be used to give MVNOs greater control over slice(s) of wholesaled network capacity, with the potential to offer service-specific or (in future) application-specific slices.

23 See https://www.rsm.govt.nz/projects-auctions/current-projects/preparing-for-5g-in-new-zealand/technical-consultation

24 Spark, New Zealand.

5G represents a significant shift in RAN and core network technology with much more convergence anticipated between fixed and mobile services, due to the much higher data rates possible and the small-cell, 'Wi-Fi-like' potential of higher-frequency spectrum. The network functions of the 5G core network (5G core, or 5GC) will be simplified such that many are software-based, making them easier to adapt and scale. The intention is that the 5GC network will be RAN-technology agnostic, allowing for more seamless service integration between 3GPP RANs (e.g. 4G and 5G air interfaces) and non-3GPP (e.g. Wi-Fi). However, it is likely that these enhancements will be added to multiple 3GPP specification releases over a period of time,[25] and the timing (of specific features being added to specifications) is uncertain.

Service priorities for the initial deployment of 5G vary somewhat between MNOs and between markets. Many MNOs are targeting better capacity, and higher speeds, for consumer use. However, as well as consumers, it is widely expected that various industry sectors might use 5G technology in future, including transport, health and public safety. To deploy 5G services, MNOs will need to bid for new 5G-suitable spectrum, such as in the 3.5GHz or 26/28GHz bands.

Like other governments worldwide, the government in New Zealand considers 5G as critical for generating socio-economic benefits and future growth. The New Zealand Ministry of Business, Innovation and Employment describes 5G as "*central to future economic growth, employment, education, transport and more. It is anticipated to facilitate transformative change for New Zealanders and New Zealand businesses*."

Telecoms providers, both MNOs and MVNOs, will therefore benefit from access to both fixed and mobile services to offer integrated consumer/household services in a 5G network environment, with 4G (and 3G) providing wide-area national mobile coverage. It is not yet clear if there will be market interest for new players to offer 5G services. To some extent, the emergence of new players will depend on how 5G spectrum is packaged for award.

There are several reasons why existing MNOs will need new spectrum to launch 5G (rather than launching in existing bands):

- To add network capacity
- For alignment with global 5G equipment specifications, and equipment availability (initial 5G devices are likely to use the 3.5GHz band, for example)
- Because of the need to keep existing bands deployed for 3G/4G.

Having an adequate amount of spectrum for 5G launch, in the appropriate bands, will be important for existing MNOs, as it will allow them to increase network capacity and coverage and to deploy 5G in bands where there is 5G device support. Having further spectrum will also allow operators to increase network capacity as network traffic grows.

[25] 3GPP is the Third Generation Partnership project and is the inter-regional specification body responsible for developing the 2G, 3G, 4G and 5G infrastructure and device specifications widely used in the mobile market.

If MNOs do not have new spectrum, they can still build additional capacity on 4G sites, but this approach has some drawbacks:

- The combination of certain bands allows their characteristics to be used in parallel providing both capacity and coverage benefits. Low-frequency bands provide additional coverage but poor capacity; conversely, high-frequency bands provide additional capacity but poor coverage. It is therefore important for operators to have the right combination of spectrum to achieve good network performance and, in the case of 5G, to align with initial 5G device availability (which as noted above is likely to focus on 3.5GHz)

- Even though operators have to bid for 5G spectrum and will incur new upfront and licence fees, it is generally cheaper to increase network performance this way, rather than trying to replicate similar network performance by building more sites

- Better network performance (e.g. higher average user speeds or better in-building coverage) may lead to higher revenues or lower non-network costs (e.g. lower churn or acquisition costs), which cannot be easily replicated by building new sites

- Operators will need large amounts of spectrum to maximise 5G speeds (since the 5G air interface works in channel widths of 100MHz, compared to today's 20MHz carriers for 4G).

It can be hard for MNOs to achieve these commercial benefits if they lack sufficient spectrum. In particular, the cost of improving network performance (e.g. increasing average user speeds) without new spectrum may be so high that it is unprofitable to attempt to do so.

4G networks will still be widely used for most of the next decade and will continue to evolve. The use of carrier aggregation (CA) will help to increase bandwidth and peak speeds within LTE-A RANs. The most advanced 4G networks are aggregating three to four LTE bands, known as component carriers (CC). Increasing the speed on 4G networks using CA depends on the availability of sufficient spectrum, either from the refarming of existing bands, made possible by a reduction in 2G/3G use, or from new bands. It will therefore be essential for operators to have access to 4G as well as 5G spectrum in order to deploy the initial phases of 5G and then fully deploy 5G and make the most of its capacity improvement benefits.

As such, there is likely to be high demand from existing MNOs for the 5G spectrum to be offered by the regulator in New Zealand. There is also potential for other players to have demand for 5G spectrum – e.g. large enterprises planning private 5G deployments, or other local providers that do not wish to hold a nationwide licence.

There is evidence of novel approaches to 5G licensing in some markets, aimed at enabling non-nationwide players to access spectrum, and allowing nationwide MNOs to boost network capacity by accessing shared spectrum (typically at low cost, without requiring significant upfront investment from the MNO to acquire dedicated spectrum via an auction).

One of the most widely referenced models of this kind is the 'CBRS' (citizens broadband radio service) spectrum-sharing framework being deployed in 3.5GHz spectrum in the USA. This licensing framework was designed so that MNOs can use the spectrum to offer improved 4G (and 5G) services, as well as enabling smaller providers/enterprises to build their own private 4G/5G networks. These possibilities stem from a tiered authorisation model whereby users of 'priority access licences' share spectrum with 'general authorised access' (GAA) users. GAA users can use any spectrum that is not required for the higher-tier priority access use, or by incumbents (i.e. US government radar). A dynamic spectrum access system (SAS) manages the tiers of sharing, using information on use of the band held in FCC databases.

6.3 The conditions attached to 5G spectrum awards will have an impact on the market environment

There are a number of possibilities for the conditions under which 5G spectrum could be awarded to players in the market. These include:

- creating an allocation for a new MNO
- specifying regional lots of spectrum so that firms can consider sub-national operation
- attaching conditions to the award of spectrum so that alternative operators and/or MVNOs can also offer 5G services, either by making capacity available for third parties, or through the entry of new wholesale-only players.

Since there have been relatively few 5G spectrum auctions to date, there is limited precedent. So far, MVNO access conditions and/or reservations of 5G for new entrants have not featured in 5G spectrum awards, even though these conditions have been used in previous generations of mobile spectrum award (e.g. relating to the 3G or 4G market). Countries that have previously made MVNO provisions in 3G/4G (e.g. France and Ireland) have not so far made similar provisions in 5G. However, given the nascent nature of the 5G market, there is potential that regulators might consider conditions granting access to MVNOs in future 5G spectrum awards even if initial 5G spectrum awards are (generally) focussed on assigning blocks of spectrum regionally or nationally to MNOs.

The inclusion of conditions granting access to MVNOs in 5G awards could be a way to stimulate competition, despite the limited evidence on this approach being used in 5G awards to date. Furthermore, the properties of some 5G spectrum – particularly in the millimetre-wave bands – might allow for new forms of spectrum sharing, which could facilitate new forms of MVNO and/or new-entrant deployment, if the auction formats chosen by regulators enable this.

For example, a new way of using 5G spectrum could be an inside-out proposition, with an MVNO or new non-nationwide player acquiring spectrum to provide in-building mobile services, but relying on an MVNO-type access deal with a nationwide MNO to provide national outdoor services. Capacity-based wholesale deals will then be particularly relevant for 5G, as discussed in Section 7.

Planned mobile auctions with spectrum reserved for new players

Some 5G spectrum auctions are being planned which propose to reserve spectrum for new entrants. Examples include:

- **Belgium's multi-band 5G auction**, planned for 2019.[26] In July 2018, BIPT confirmed that an auction of spectrum in the 700MHz, 1400MHz and 3.4–3.8GHz bands is scheduled for 2019, along with the renewal of licences that expire in March 2021[27] (900MHz, 1800MHz and 2.1GHz bands). A significant amount of spectrum will be reserved for a new entrant: 2×5MHz in the 700MHz band, 2×5MHz in the 900MHz band, 2×10MHz in the 2.1GHz band and 2×15MHz in the 1800MHz band.

- **Canada's 600MHz auction**, planned for 2019.[28] On 6 June 2018, ISED published its spectrum outlook for 2018–2022. The document confirms that 2×35MHz of spectrum in the 617–652/663–698MHz range will be auctioned in March 2019, with 2×15MHz set aside for regional players and new entrants.

Licensing 5G at higher frequencies to exploit sharing for added capacity, and facilitate non-nationwide players

Several national regulatory authorities (NRAs) are considering how to design award processes for higher-frequency 5G spectrum (i.e. mm-wave ranges). Given that these frequencies have not been used for mobile systems to date, regulators are considering if current mobile spectrum award mechanisms are applicable or whether to apply new approaches. A specific consideration for regulators seems to be how to facilitate spectrum sharing, which would potentially allow smaller (non-MNO) players to bid, as well as providing additional capacity for nationwide MNOs. Some specific examples of approaches for awarding millimetre-wave spectrum are as follows:

- **Italy's multi-band 5G auction**, completed in October 2018.[29] Italy recently completed a multi-band auction of 5G-suitable spectrum in the 700MHz FDD, 700MHz SDL, 3.6–3.8GHz and 26GHz bands. Six 2×5MHz blocks were made available in the 700MHz FDD band, two of which were reserved for a new entrant. New entrant Iliad won the reserved 2×10MHz at reserve price.

  In addition, in order to use the spectrum in the 2.6.5–27.5GHz range efficiently, the regulator introduced a spectrum sharing arrangement, "club use", in which "*the club members and the access criteria are decided by the regulator, while the club "members" decide on their own rules of coexistence and management*".[30] The 26GHz band licence is subject to an obligation to

26 See https://www.bipt.be/public/files/fr/22543/Communication_parametres_26_juillet.pdf

27 Spectrum in the 2.6GHz band also appears to be available; existing licences in this band expire in 2027.

28 See http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11403.html

29 See http://www.sviluppoeconomico.gov.it/index.php/it/per-i-media/comunicati-stampa/it/194-comunicati-stampa/2038666-gara-5g

30 See https://www.agcom.it/documents/10179/3478659/Allegato+7-8-2018/637af9a9-8a60-4b3e-8ac0-3ce2cd808ac4?version=1.0, page 38.

share spectrum in specific geographical locations, where operators can boost their capacities by using the frequencies in close proximity.[31]

- In **Hong Kong,**[32] a total of 4.1GHz is to be made available across the 26GHz (24.25–27.5GHz) and 28GHz (27.5–28.35GHz) bands in 41 100MHz lots. Spectrum will be assigned on a co-primary basis (with fixed services). Two types of spectrum will be assigned: (i) 3.3–3.7GHz for 'large-scale public 5G services' to be made available via exclusive national licences through an administrative assignment, and (ii) the remaining spectrum for 'specified location services' on a geographically shared basis in specific locations (e.g. university campus, industrial estates, airports, technology parks). Licences will be administratively assigned on a 'first come, first served' (FCFS) basis.

- In **Germany**,[33] BNetzA is currently consulting on an individual base-station licensing regime in the 24.25–27.5GHz range for 5G use. Under the proposals, applicants can apply to install 5G base stations in specific locations on a FCFS basis. BNetzA will approve an application if it will not cause interference with incumbent licensees (which are fixed links and satellite services).

  Additionally, when the 2GHz and 3.6GHz frequencies are auctioned in 2019, the government is considering imposing an obligation forcing MNOs to provide access to competitors who do not have their own networks, "*Holders of nationwide assignments shall, on a non-discriminatory basis, enable shared use of capacity and services for the maximum diversity of business model*".[34]

Spectrum licences requiring MVNO access

While there are no specific examples of MVNO access conditions in currently proposed 5G spectrum awards, there are several examples of where such conditions have been applied previously, in 4G spectrum. Some examples are as follows:

- The **French 4G auction** in 2011 required candidates to offer in their bid the possibility for MVNOs to use their network. In the 2.6GHz band,[35] three of the four winners (Orange, Free Mobile and Bouygues) committed to providing full MVNO access to their networks; and in the 800MHz band,[36] all winning bidders committed to the same condition. The condition of the

31 See http://antonionicita.wixsite.com/antonionicita/single-post/2018/03/09/ITALY-AGCOM%E2%80%99s-5G-Market-Inquiry-and-the-Draft-proposal-for-the-5G-spectrum-auction

32 See https://www.cedb.gov.hk/ccib/eng/paper/pdf/cp20180726_e.pdf

33 The deadline for response is 19 October 2018; see https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Frequenzen/OffentlicheNetze/RegionaleNetze/Erw%C3%A4gungenAntragsverfahren26GHz.pdf?__blob=publicationFile&v=1

34 See https://www.bundesnetzagentur.de/SharedDocs/Downloads/EN/Areas/Telecommunications/Companies/TelecomRegulation/FrequencyManagement/ElectronicCommunicationsServices/FrequencyAward2018/20180613_Decision_I_II.pdf?__blob=publicationFile&v=1

35 See https://archives.arcep.fr/index.php?id=8571&no_cache=1&tx_gsactualite_pi1%5buid%5d=1431&tx_gsactualite_pi1%5bbackid%5d=1&chash=136860fe4eb69ee4fb08ce241c378d76&l=1

36 See https://archives.arcep.fr/index.php?id=8571&no_cache=1&l=1&tx_gsactualite_pi1%5buid%5d=1478&tx_gsactualite

licences included the rights given to MVNOs such as the right to have access to all technologies available on the MNO's network and to be subject to "reasonable economic conditions".[37]

- In **Ireland**, the 21GHz spectrum licence included a condition requiring MVNO access. As a result, the owner of the licence, Three Ireland, was obliged to allow MVNO access with retail-minus 35% wholesale charges.[37] Additionally, as a condition of the Three Ireland and Telefónica Ireland merger, the new entity had to give one MVNO the option to acquire certain spectrum rights of use, to enable the MVNO to become an MNO.[38]

_pi1%5bannee%5d=0&tx_gsactualite_pi1%5btheme%5d=0&tx_gsactualite_pi1%5bmotscle%5d=800%20mhz&tx_gsactualite_pi1%5bbackid%5d=2122&chash=131ed5455f1cccd964db8c91959c0702

37 Response to BoR (17) 176, Draft BEREC Work Programme 2018, MVNO Europe, November 2017.

38 See https://www.comreg.ie/media/dlm_uploads/2015/12/ComReg15131.pdf

7 Wholesale MVNO access to network services

7.1 The type of MVNO business determines the flexibility it has to offer different services

MVNOs come in different forms, with various levels of flexibility in offering services. There are three main classes of MVNO:

- A **resale MVNO** simply resells services offered by its host MNO and can potentially offer its own value-added services, but it has limited options to differentiate its mobile services at the retail level. This type of MVNO often operates under a per-SIM retail-minus wholesale agreement, with wholesale prices structured directly from the MNO's existing retail offers.

- A **light MVNO** owns a customer service platform but may still be limited in its options to differentiate retail services (depending on the relationship with the host MNO). A light MVNO normally uses volumetric wholesale pricing (although may use retail-minus packages) and is often tied to one host MNO. This type of MVNO may be subject to restrictions in terms of the services it can offer, as it depends on the capabilities and commercial arrangements available from the MNO.

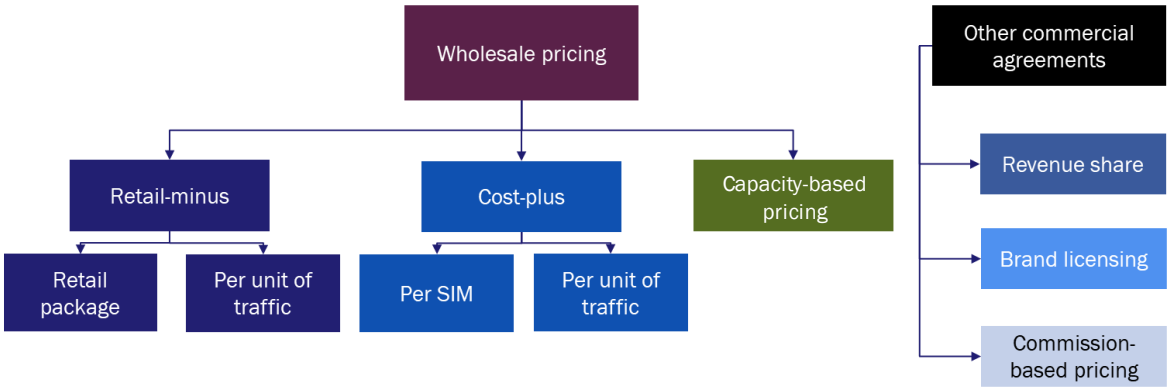
- A **heavy MVNO** operates in a very similar way to an MNO, but it does not own any of the RAN. This type of MVNO owns its own billing and service platforms to manage network capacity, either developing retail services volumetrically or from a fixed wholesale allocation of radio network capacity. This allows the MVNO to develop its own services and manage its own data capacity, as well as potentially switch host MNOs to obtain improved wholesale access terms.

Although MVNOs pose a competitive threat to MNOs at the retail level, MVNOs can also allow an MNO to target other segments where it may be under-represented or less able to monetise customer preferences (e.g. for ethnic emphasis, international calling or specific value-added services). MNOs retain all wholesale services revenues, as well as saving any direct costs associated with the acquisition and retention of customers.

7.2 The wholesale access terms determine the type of competition which can be introduced

As summarised in Figure 7.1 overleaf, MNOs and MVNOs can conclude different types of agreement.

Figure 7.1: MVNO pricing structure [Source: Analysys Mason, 2018]



Traditionally the most common forms of MVNO wholesale pricing agreement have been ***volumetric***. Prices are typically set per minute of voice, per megabyte of data, and per message carried. In a situation in which operators had to pay interconnection fees to use other networks for voice services, such an approach made sense. Indeed, regulated interconnection fees were often a useful benchmark for MVNO pricing. With such agreements, costs are essentially variable, and ideally unit wholesale prices would decrease in line with the MNO's unit costs.

Volumetric wholesale prices are good for MVNOs that sell specified bundles of traffic and prepaid services, since the MNO and the MVNO can predict with certainty the likely wholesale and retail revenues per customer.

However, volumetric prices are not best-suited to MVNOs offering unlimited voice and SMS tariffs, since it is difficult to predict whether a retail price will be margin positive (at a gross or a net level). This is because some unlimited voice customers make 'average' use of voice, whereas other unlimited voice customers may have exceptionally high consumption of the service. Volumetric wholesale prices are better suited for offering high-volume data packages if the unit price of the data is sufficiently low to allow a predictable positive margin from the retail service over time. Given the rate of increase in data consumption, particularly with increasing use of 4G, and the ability for smartphone users to monitor their data consumption and use up to their bundle limit every month, MVNOs may not be able to offer attractive large-bundle data retail tariffs unless their wholesale pricing contract can commercially accommodate the likely usage growth.

Due to these changes in the use of mobile services, a new type of wholesale contract has become more relevant for MVNOs: ***capacity-based deals***. In a capacity deal, the MVNO typically pays a set annual amount for a pre-determined fixed amount (or proportion) of the MNO's network data capacity (and possibly also voice and SMS). With a data capacity arrangement, the MVNO can also choose to develop its own voice and messaging services to be carried 'over the top' of data-only capacity. A capacity agreement represents a deeper form of wholesale access, since the MVNO typically obtains a capacity 'pipe' to the GGSN gateway interface of the mobile radio network. In addition, this type of market entry requires more significant investment from the MVNO, which takes on a higher level of risk than with another forms of wholesale agreement.

A capacity agreement has advantages for both MVNOs and MNOs:

- **For MVNOs**, the main benefit is that total capacity is supplied and the MVNO can share this among all of its retail customers using large and small traffic bundles. A proportional allocation of capacity may also increase in line with network upgrades. The effective unit charge for data Mbytes will decline as the volume of consumption rises (and is shared across more users), and the MVNO can more easily react to market demand for larger data bundles for a comparable monthly retail price. The main risk for an MVNO arises if it is unable to effectively fill the network capacity, as its variable costs are exchanged for fixed costs.

- **For the MNO**, a capacity deal ensures a constant and reasonably guaranteed source of income for a certain proportion of its network capacity, regardless of whether it has been filled by the MVNO. This aids the MNO with future planning and network investment, and it may encourage the MNO to seek collaboration from its MVNOs during future spectrum award bidding.

7.3 Capacity-based MVNO access agreements will have a strong and increasing competitive dynamic for current and future services

In recent years, there has been an evolution in mobile networks and consumer demand. New technologies have been deployed that enable operators to offer new data-intensive services. Data consumption has increased considerably, and consumers are demanding more and more data from their mobile services. The roll-out of new technologies and the release of new spectrum have resulted in higher network capacity. Such deployments require significant capital investment by MNOs and result in falling unit costs for carrying voice and data, allowing operators to offer larger and larger data bundles. Such evolutions affect MVNOs, which have had to adapt in order to compete effectively in the retail market. The key factor for MVNO competitiveness is the nature of their wholesale agreement with the MNO.

In a data-focused market with falling unit prices, volumetric wholesale pricing deals would require repeated updates to reflect such trends. An MVNO with a static wholesale deal will lose its competitiveness over time, as network capacity and data demand increase, while network unit costs decrease. A capacity agreement can mitigate this main drawback of volumetric pricing, particularly if, or when, data services on 4G (and 5G) become the predominant service. In addition, 5G's anticipated network-slicing technologies could be tailored for customisable capacity-based network access.

Wholesale MVNO capacity deals have been used as a remedy for mergers between MNOs in Ireland and Germany. The imposition of a 'monitoring trustee' in mergers also imposes a form of light-touch regulation on the providers to support the desired outcomes, and to report to the responsible authorities on progress.

Capacity-based agreements also strongly incentivise MVNOs to enter the market quickly and compete strongly for customers in order to cover up-front costs for capacity.[39] In addition, the higher

[39] BEREC, *BEREC Report on Post-Merger Market Developments – Price Effects of Mobile Mergers in Austria, Ireland and Germany* (June 2018).

capital investment required by such a wholesale agreement encourages an MVNO to develop its business with long-term stability in mind. This reduces the risk of an MVNO starting a price war, operating for a quick return, or exiting the market rapidly to the detriment of consumers.

Although capacity deals have mainly occurred due to regulatory action, under the right circumstances (e.g. an MVNO seeking to offer an innovative data pricing model unrelated to simple volume of consumption; or an MNO with a relatively high level of spare network capacity), and at the right price, it can make sense for both MNOs and MVNOs. The 'deep' form of wholesale access to the RAN is also technically straightforward, not least because there are numerous MVNO-enabling firms (MVNEs) worldwide which can support MVNOs with their platform and network interfaces. While capacity deals give MVNOs more flexibility, volumetric deals with competitive prices can also be used to enable MVNOs access to current networks. However, with the deployment of 5G, a capacity deal will be more suitable (for the reasons mentioned above). A combination of a volumetric deal for "old" technologies and a capacity-based deal for new technologies such as 5G could also be anticipated as services migrate across technology generations.

8 Regulatory approaches to improve competition

8.1 New Zealand lacks a healthy MVNO sector, yet the need for regulation to foster wholesale access to the benefit of competition has previously been recognised

The lack of a healthy MVNO sector in New Zealand (especially when Skinny Mobile is excluded) suggests that there may be:

- a lack of support from MNOs for MVNOs to enter the market, and
- limited incentives for MNOs to offer flexible and suitable wholesale agreements to lead to successful MVNO growth.

There is also limited diversity in what is offered by MVNOs in New Zealand today, as both Vocus brands (Orcon and Slingshot) appear to be using retail-minus offers and mirroring the MNOs' high-end packages, while Compass and Warehouse Mobile do not offer large data bundles. Skinny Mobile offers a package with 30GB of rollover data, which indicates that flexible, high-consumption bundles can be offered by a sub-brand. However, Skinny is the only MVNO to do this, and it has not obtained this through an independent wholesale deal. This shows that independent MVNOs struggle to offer a good diversity of packages and compete effectively in the market. This indicates that independent MVNOs do not and/or cannot present an effective and sufficiently diverse level of retail competition in New Zealand.

In New Zealand, roaming regulation[40] "*requires the country's three mobile network operators – 2degrees, Spark, and Vodafone – to provide wholesale access to their networks for a period of time to any new mobile network operator. This allows a new operator to attract customers by being able to offer immediate nationwide coverage while it builds its own network*." The Commission has announced its intention[40] to retain the power to regulate domestic mobile roaming in order to ensure choice and competition, particularly with the imminent deployment of 5G that may encourage the entry of a new market player. This indicates that wholesale access to an established network is seen as a pre-requisite for effective competition from players which cannot compete directly with the established MNOs.

Support for (more) MVNOs to successfully enter the market and provide more-diverse retail competition would be provided by:

- a form of regulation which encourages suitable wholesale agreements to be concluded (which could be a backstop regulation in the event of no commercial agreement)
- agreements which reflect the changing technology situation
- the facility for agreements to be capacity based.

40 See https://comcom.govt.nz/regulated-industries/telecommunications/regulated-services/mobile-services/review-of-national-roaming

8.2 Regulation to support MVNOs exists in some of our comparison countries

There are examples of regulation in other countries where the entry of MVNOs is used to enhance competition in the mobile market and where MVNO entry into the mobile market has brought about benefits to consumers, as discussed below.

8.2.1 Ireland

In Ireland, a number of regulatory interventions have encouraged the entry of MVNOs. During the auction of 3G spectrum, Hutchison acquired additional 900MHz spectrum, on condition that it would allow MVNOs to operate over its infrastructure. The regulator stated[41] that "*the added introduction of alternative providers such as MVNOs would enhance competition*".

In 2014, one of the conditions for Three Ireland to acquire O2 Ireland (reducing the number of MNOs from four to three) was that it was required to allow two MVNOs to operate on its network through a capacity-based deal involving up to 30% of the network capacity. Three Ireland also agreed to offer one MVNO part of the spectrum of the new entity, allowing it to potentially become the fourth network operator (although this option has not yet been taken). The regulator feared that without such an MVNO remedy there would be a risk of price increases and possible problems in the wholesale market.[42] In addition, imposing a capacity-based deal was considered to be more effective than the traditional volumetric unit cost type deal, because it would provide better incentives for MVNOs to fill up the capacity and offer competitive services.[43] This example also highlights the risks of wholesale capacity details, as one of the designated MVNOs has since exited the market.

8.2.2 Austria

Regulation supportive of MVNOs arose in Austria in 2012, when the merger between Hutchison 3G Austria and Orange Austria led to the mobile market concentrating from four to three MNOs. The regulator feared price increases due to the reduction in competition and an increased threshold for entry in the market. The regulator specified that the combined entity should offer 30% of its network capacity to up to 16 MVNOs in the following ten years through wholesale deals, including one before the merger was concluded. Since then, multiple MVNOs have entered the market through the regulated MVNO reference offer, and the other two MNOs have also introduced competitive wholesale offers on a commercial basis.[44]

A study by RTR concluded that "the merger had a significant and strong price increasing effect for smartphone users as well as for traditional users before the merger remedies (MVNO entries)

41 ComReg, *Market Review Voice Call Termination on Individual Mobile Networks*.

42 BEREC, *BEREC Report on Post-Merger Market Developments – Price Effects of Mobile Mergers in Austria, Ireland and Germany* (June 2018).

43 J.P. Morgan Cazenove, *European Telcos, Assessing the prospects for future industry consolidation following failed Danish merger* (September 2015).

44 EDPR, 2017.

became effective".[45] Indeed, as mentioned above, BEREC concludes that although remedies took three years to become effective, the increase in prices caused by the merger in 2014 and 2015 were reduced, most likely due to "*competitive pressure from MVNOs, which gained significant market share since entry at the beginning of 2015*".[46]

8.2.3 Denmark

The Danish mobile market has an active MVNO segment. In 2000, the regulator found that the entry of MVNOs could lead to "new and innovative mobile services", and it introduced regulation obliging MNOs with significant market power (SMP) to enter into MVNO wholesale agreements. Since then a large number of MVNOs have entered the market, now representing 34.6% market share (though some of the more successful ones have been acquired by host MNOs), creating varied competition and leading to Denmark being one of the countries with the lowest prices for mobile services in Europe.[44]

8.2.4 Norway

Since 2016, Telenor has been obliged to "meet all reasonable requests for access to its mobile network on terms which allow smaller companies to make a profit". The regulator stipulates that "for national roaming and access for MVNO providers, the requirement is formulated as a prohibition against subjecting the buyer of access to a margin squeeze".[47] The regulator currently applies a number of tests, including:

- production of a regulatory account which must show that the dominant operator could operate profitably if it used its own wholesale price agreement
- a package-specific margin-squeeze test to ensure that small service providers could operate profitably with a competing retail offer
- a segment-specific margin-squeeze test to ensure that small MVNOs could operate profitably with a portfolio of current (flagship) retail offers.

The regulator has also implemented a back-stop to introduce regulation of wholesale access for national roaming, if a commercial agreement cannot be reached by an access seeker and a host MNO.

8.2.5 The UK

There is currently no regulation on wholesale access to mobile networks or MVNO agreements; MNOs supply wholesale access to MVNOs on a commercial basis for around 15% of the total market. To date, Ofcom has not found it necessary to impose access obligations on network operators, as competition among MNOs allows MVNOs to obtain wholesale network access through

45 RTR, *Ex-post analysis of the merger between H3G Austria and Orange Austria* (March 2016).

46 BEREC, *BEREC Report on Post-Merger Market Developments – Price Effects of Mobile Mergers in Austria, Ireland and Germany* (June 2018), page 40.

47 Nkom, *Decision on designating undertakings with significant market power and imposing specific obligations in the market for access and call origination on public mobile telephone networks* (July 2016).

commercial negotiation.[48] Indeed, all UK MNOs currently host at least one MVNO on their network.[49] Ofcom recognises that having MVNOs competing efficiently in the mobile market brings benefit to consumers, as they provide "enhanced retail competition".[48]

Additionally, the historical position of Oftel (Ofcom's predecessor) indicates that in the case of a new MNO entering the market, if a roaming agreement cannot be reached the regulator reserves the right to intervene. The regulator also recognised that in the process of introducing new competition into the market, agreements should take into account new technologies and services.[50]

8.3 Other countries also provide examples of MVNO access regulations

In South Korea, the Ministry of Science and ICT has the power to oblige an MNO to allow MVNOs to use its network facilities at a mutually agreed rate that complies with standards set by the regulator. The regulator obliges MNOs with SMP, such as SKT, to offer wholesale services to MVNOs and to offer discounted prices to MVNOs that make significant investment in their own equipment.[51]

In **Japan**, the Ministry of Internal Affairs and Communication obliges MNOs to provide MVNOs with access to their network. Wholesale service are to be decided commercially, but the regulator can intervene if the MNO refuses with no solid grounds.[52] The regulator has also set up regulation to shorten the SIM unlocking process and to improve sale practices for smartphones.[53]

In **Hong Kong**, the award of 3G licences was subject to MNOs opening up 30% of their network capacity to MVNOs.[54] As a condition for the merger between CSL New World Mobility and HKT, the merged entity was required to continue providing wholesales network access to MVNOs.[55]

In **Malaysia**, to help access negotiations, the regulator, MCMC, put in place frameworks to facilitate access and interconnection among MNOs and MVNOs.[56] MVNO access has been regulated following the Access List Determination framework.[57]

In **Singapore**, in 2013 the regulator, IMDA, stated that MVNOs wishing to offer 3G services must negotiate commercially with the MNOs for access to their networks, with the regulator only intervening in a situation of "unduly restrictive or anti-competitive practices". The re-allocation of the 900MHz and TDD-LTE band aims to help facilitate the implementation of MVNO wholesale

48 Ofcom, *Strategic Review of Digital Communications* (2015).

49 EDPR, 2017.

50 Oftel, *Oftel statement on national roaming* (October 1999).

51 TeleGeography, *South Korea country regulation* (2018).

52 TeleGeography, *Japan country regulation* (2018).

53 See https://www.reuters.com/article/us-japan-mobilephone-simcards/japans-wireless-carriers-told-to-unlock-phones-starting-next-year-idUSKBN0IK0EU20141031

54 Xu Yan, *3G licensing in Hong Kong: A Unique approach* (2003).

55 RBB Economics, *An economic assessment of the likely competitive effects arising from the proposed HKT/CSL transaction* (2014).

56 TeleGeography, *Malaysian country regulation* (2018).

57 Malaysian Communications and Multimedia Commission, *Access List Review* (2015).

services. Additionally, in 2016, IMDA published guidelines for the provision of MVNOs via negotiations 'in good faith'.[58]

In **France**, Orange, SFR and Bouygues are required by the regulator, ARCEP, to abide by a ruling to comply with all 'reasonable' requests from MVNOs for access to their networks. In the auction of the 2100MHz band MNOs were required to show commitment to improve wholesale service conditions offered to future as well as existing MVNOs.[59]

In **Spain**, due to MNOs' reticence to offer wholesale deals to MVNOs, the regulator appealed to the European Commission, demonstrating that the market wasn't competitive and the MNOs had SMP.[60] This led to MNOs being obliged to offer access and origination services to MVNOs.[61]

In **Germany**, as a condition for the merger between Telefónica and E-Plus, the merged entity was required to offer at least 20% of its network capacity to an MVNO, with an option for the MVNO to acquire a further 10% at a later stage. The wholesale deal included access to all the existing and future technology developments on the MNO's network.[62]

In **Chile**, following a consultation on the barriers to MVNO entry, the regulator put into place a "Regulation on the provision of facilities and the resale of plans for mobile virtual network operators".[63] This regulation includes specific requirements for wholesale agreements between MVNOs and MNOs, determining the rights and obligations of both. The regulation also includes a process for conflict resolution.[64]

58 See https://www.imda.gov.sg/-media/imda/files/inner/pcdg/consultations/20150707_secondpublicconsultation/decision.pdf?la=en

59 MVNO Europe, *Response to BoR (17) 176, Draft BEREC Work Programme 2018* (2017).

60 See http://europa.eu/rapid/press-release_IP-06-97_en.htm

61 *Europe's Digital Progress Report – 2017*, Spain.

62 BEREC, *BEREC Report on Post-Merger Market Developments – Price Effects of Mobile Mergers in Austria, Ireland and Germany* (June 2018).

63 TeleGeography, *Chile country regulation* (2018).

64 See https://www.telecompaper.com/news/chile-to-amend-mvno-regulation-to-boost-competition--1213400

Annex A Supplementary tables

Figure A.1: Characteristics of New Zealand and the six comparison countries [Source: Analysys Mason, 2018]

	Denmark	Norway	Austria	Ireland	UK	Australia	New Zealand
Population (million)	5.7	5.2	8.6	4.8	65.5	24.6	4.8
Land area (000 km^2)	42.4	304	82.4	68.8	241.9	7862	264.5
Number of MNOs	4	3	3	3	4	3	3
Recent consolidation	4 to 3 was blocked	3 to 2, and new entrant	4 to 3	4 to 3	4 to 3 was blocked	Recently 3 to 4; but back to 3 if TPG–VHA merger is approved	none
GDP per capita (USD thousand)	52.9	74.1	43.5	62.2	37.8	54.9	40.9
Mobile penetration	137%	114%	150%	113%	127%	115%	127%
Mobile ARPU (USD)	19	35	16.5	24.4	20.5	32	23.3
Mobile ARPU (USD PPP)	17	28	20	28	24	28	22
Fixed broadband household penetration	94.7%	95.6%	74%	80.3%	98.2%	80%	87.5%

Figure A.2: Pricing of mobile packages in Denmark, DKK [Source: Analysys Mason, 2018]

	10GB	15–20GB	Over 25GB
MNOs			
TDC	169 (8GB)	199 (15GB)	299 (50GB)
Telenor		160 (15GB)	249 (unlimited)
Telia	129 (12GB)		149 (30GB)
Three	130 (7GB)	150 (20GB)	200 (40GB)
MVNOs			
Telmore		159 (15GB)	169 (30GB)
CBB Mobil	99 (10GB)		129 (40GB)
Fullrate		159 (15GB)	199 (30GB)
Call me	99 (10GB)	129 (20GB)	149 (40GB)

Figure A.3: Pricing of mobile packages in Austria, EUR [Source: Analysys Mason, 2018]

	10GB	15–20GB	Over 25GB
MNOs			
Telekom Austria	15	20 (17GB)	
Deutsche Telekom	19.9	29.9 (20GB)	
Three		20 (20GB)	
MVNOs			
Bob		14.9 (20GB)	
Hot Telekom	13.9 (8GB)		
yesss!	13.99 (10GB)		
Spusu	13.5 (12GB)	14.8 (17GB)	

Figure A.4: Pricing of mobile packages in Norway, NOK [Source: Analysys Mason, 2018]

	10GB	15–20GB	Over 25GB
MNOs			
Telenor	449 (10GB)	499 (15GB)	599 (30GB)
Telia	449 (12GB)	499 (15GB)	699 (40GB)
Ice	399(10GB)	529 (18GB)	589 (25GB)
MVNOs			
Chillimobil	349 (12GB)		399 (unlimited data]
NextGenTel	229 (10GB)	299 (20GB)	599 (100GB)
Get	184.5 (12GB)	219 (20GB)	

Figure A.5: Pricing of mobile packages in Ireland, EUR [Source: Analysys Mason, 2018]

	10GB	15–20GB	Over 25GB
MNOs			
Vodafone	35 (10GB)		
Eir	39.99 (10GB)		54.99 (40GB)
Three			30 ('all you can eat')
MVNOs			
Tesco Mobile		25 (20GB)	
Lycamobile			15 (25GB) 20 (35GB)
Virgin Mobile			25 (unlimited)

Figure A.6: Pricing of mobile packages in the UK, GBP [Source: Analysys Mason, 2018]

	10GB	15–20GB	Over 25GB
MNOs			
O2	17 (10GB)	20 (20GB)	
Vodafone	22 (8GB)	20 (20GB)	
EE	20 (10GB)	25 (20GB)	
Three	18 (12GB)		20 (30GB)
MVNOs			
Tesco Mobile		15 (15GB)	35 (50GB)
Virgin Mobile	12 (8GB)		18 (45GB)
Giffgaff	15 (8GB)	20 (20GB)	25 (unlimited)

Figure A.7: Pricing of mobile packages in Australia, AUD [Source: Analysys Mason, 2018]

	10GB	15–20GB	Over 25GB
MNOs			
Telstra		49 (20GB)	69 (40GB)
SingTel (Optus)		55 (15GB)	35 (30GB, promotion)
Vodafone/3G		45 (15GB)	35 (30GB, promotion), 60 (40GB)
MVNOs			
Amaysim	30 (10GB)	40 (20GB)	50 (40GB)
ALDImobile	35 (10GB)	45 (20GB)	55 (30GB)
Dodo	10 (6GB)	15 (20GB, promotion)	20 (30GB, promotion)

Figure A.8: Examples of extra benefits offered by MVNOs [Source: Analysys Mason, 2018]

Operator	Benefit
Lebara, Lycamobile	International minutes
Telmore (Denmark)	Music (Spotify, Telmore music service)
Telmore (Denmark)	Entertainment (HBO, Netflix, video gaming)
Amaysim (Australia), Virgin (UK)	Flexibility of contracts
yesss! (Austria), Chillimobil (Norway), Virgin (UK, Ireland), ALDImobile (Australia)	Rollover of data and/or voice
Virgin (UK)	Free data usage on social media such as Facebook, Instagram, WhatsApp
Phonero (Norway)	Multiple SIM discounts (families)
Tesco Mobile (Ireland, UK)	Loyalty points (Tesco Clubcard points)
Telmore (Denmark)	Food take-away voucher (hungry.dk)