ASSESSING THE DRAFT ELECTRONIC COMMUNICATIONS AMENDMENT BILL

Part I: Impact Assessment

January 2018

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EXECUTIVE SUMMARY

In November 2017, the Department of Telecommunications and Postal Services (DTPS) of the Government of South Africa published an invitation to provide comments on the Electronic Communications Amendment Bill (the "Bill") hereinafter).

The Bill includes a number of significant amendments to the Electronics Communications Act (ECA). Frontier Economics has been asked by Vodacom to provide an economic assessment of the Bill. Our assessment is composed of two parts:

- **Part I:** An assessment of the economic impact of the package of Bill amendments on the mobile sector and the wider economy; and
- **Part II:** An assessment of the economic basis for the Bill amendments.

This report covers Part I, drawing on evidence from Part II where relevant. In particular, this report:

- sets out the Government's key policy objectives in relation to the mobile sector;
- considers the likely evolution of the market without the Bill being implemented in its proposed form; and
- presents the main measures of the Bill and their impact on the likely evolution of the mobile market in South Africa if the Bill is fully implemented.

In conducting our assessment we have taken into account the methodology used to assess the impact of SA Connect, and aimed to ensure that our approach is consistent with the South African Government's guidelines[1] on how to carry out Regulatory Impact Assessments (RIA).

Policy objectives underlying the Bill proposals focus on improved access to high quality data services in South Africa

The overall objectives for the telecommunications sector, as expressed through the Government's 2012 National Development Plan (NDP), the 2016 White Paper (WP) and most recently the Memorandum on the objects of the Bill, include the promotion of broadband coverage in rural and under-serviced areas, ensuring that as many users as possible can benefit from affordable broadband, promotion of innovation that addresses national developmental challenges and goals and transformation of the sector through enforcement of broad-based black economic empowerment.

Likely evolution of the mobile sector without the Bill being implemented in its currently proposed form

To help assess the likely impact of the Bill, it is important to first consider how the South African telecommunications market is likely to evolve without the Bill's proposed

[1] "The Presidency: Republic of South Africa (2012) – Guidelines for the implementation of the regulatory impact assessment (RIA) process in South Africa"

amendments to the ECA being fully implemented. This is so that market outcomes in the two "states of the world" can be compared i.e. a scenario where the Bill is fully implemented in its current form (the "Bill scenario") and a scenario in which the Bill is amended to address the key issues identified in Vodacom's submission (the "Amended Bill scenario").[2]

As explained below, the "Amended Bill scenario" is unlikely to be a continuation of the status quo as there are a number of other policy and regulatory initiatives that are aiming to improve the functioning of the market and consumer outcomes. We assume these are implemented under the "Amended Bill scenario".

Proposed policy and regulatory initiatives in the Amended Bill scenario

The Government has indicated that the mobile market is underperforming in certain areas.[3] A number of initiatives are underway, which aim to improve the functioning of the mobile market:

- **ICASA's award of LTE spectrum:** ICASA has issued an ITA (Invitation to Apply) for radio frequency spectrum licences to provide mobile broadband wireless services in urban and rural areas using the complementary bands 700 MHz, 800 MHz and 2.6 GHz. The ITA has also set aside low and high frequency spectrum for the Wholesale Open Access Network (WOAN), and attaches comprehensive population coverage targets to the licences to be awarded.
- **ICASA's Priority Markets Inquiry:** ICASA is conducting an inquiry to assess which markets or market segments within South Africa's telecommunications sector should be susceptible to ex-ante regulation. Following this, ICASA will be able to focus its market reviews on these markets and impose targeted regulation to remedy any market failures it identifies.

In addition to these initiatives, we understand that the Ministry has been engaged with the industry on options for setting up a WOAN. One proposal that has been considered is a "competitive WOAN" which would operate alongside the networks of the existing operators.

The impact of these initiatives

Overall, we envisage that, if the above initiatives were implemented successfully, the likely evolution of the mobile market in South Africa would be characterised by the following impacts:

- The release in a timely fashion of additional spectrum suitable for 4G use will allow operators to improve the coverage and quality of high-speed data services in a cost-efficient manner;
- A competitive WOAN that is established to support the achievement of the Government's objectives, and with the broad support of the industry, could serve as a source of more choice and competition, as a means of encouraging new retailers

[2] Vodacom's submission in response to the Department of Telecommunications and Postal Service's invitation to provide written comments on the Electronic Communications Amendment Bill [Government Gazette Number: 41261 of 17 November 2017]

[3] See WP pages 66 – 70 for more detail

into the market place, and as an enabling vehicle for supporting the government's transformation objectives;

- The ITA's coverage obligations, including in rural and under-serviced areas, should support the achievement of the objective of increasing availability of broadband;
- The proposed ITA attaches the obligation to each licence to provide wholesale access to three MVNOs, which should support the strengthening of service-based competition; and
- The Priority Markets inquiry should identify areas of market failure, where regulatory intervention is required, and could lead to the introduction of appropriate regulatory remedies to redress any such failures.

This expected market evolution under the "Amended Bill" is therefore the benchmark used when evaluating the impact of the Bill on the mobile market and the wider economy of South Africa.

Key measures of the Bill

The Bill includes a number of amendments which relate to the award of spectrum, and the establishment of a WOAN. These include:

- HD spectrum which is currently assigned to existing MNOs must be returned following a study by ICASA. Spectrum could be returned before the expiry of the current ECNS licences;
- All assignments of HD spectrum will be subject to the principles of open access and non-exclusivity, with radio spectrum licences being renewed annually;
- The WOAN is expected to be assigned a substantial amount of HD spectrum, leading to less or no HD unassigned spectrum being awarded to existing MNOs, and granted advantages that are currently unavailable to other licensees; and
- The WOAN will need to be established and functional, before the award of any currently unassigned HD spectrum to the MNOs.

Furthermore, the Bill stipulates that all mobile operators have to provide wholesale access to their networks and facilities, and this can no longer be refused on the grounds of reasonableness. "*Deemed entities*"[4] must provide wholesale open access to their networks and facilities at cost-based prices.

Whilst there may be some uncertainty around the implementation/timing of the proposals (for example, the return of the currently used spectrum is subject to a study by ICASA), the 'package' of the proposed changes will likely have a significant impact on the future structure and functioning of the mobile market in South Africa.

[4] The DB defines as a "deemed entity" any licensee that i) has more than 25% of the total electronic communication infrastructure in a relevant market; or ii) controls an essential facility or a scarce resource such as exclusively assigned radio frequency spectrum.

Likely evolution of the mobile sector with the Bill

It is not clear how the Bill envisages the functioning of the mobile market in the **long run.** There are a number of factors which imply that under the package of the Bill proposals, the most likely outcome will be a fundamental change in the market structure of the SA mobile market towards the establishment of the WOAN as a **dominant mobile network**:

- **First, all or most of the currently unassigned spectrum being assigned to the WOAN:**[5] under such an outcome, the WOAN would be in a position to offer higher speed mobile broadband services than the MNOs This would make it challenging for MNOs to compete with the WOAN and dampen their incentives to invest to upgrade their own networks. Without additional spectrum, other operators will also find it difficult to expand capacity in a cost-efficient manner and become increasingly reliant on renting capacity from the WOAN to meet demand from retail customers.
- **MNOs having to return their existing spectrum:** exclusively assigned spectrum will be returned under the Bill and henceforth be subject to principles of "*open access*". MNOs make significant capital investments in their networks to utilise the spectrum they are assigned, investments which are of little value without spectrum. In combination with proposals for most MNOs to offer cost-oriented access, this proposal will dis-incentivise MNOs from making significant further investments in their networks, particularly given that the terms and conditions and timeframe for the return of such spectrum will not be known until the ICASA study is complete.
- **Other measurers to promote the WOAN and give it a preferential treatment:** the WOAN will be provided with a number of incentives and benefits which will not be available to other licensees.

We recognise that the Bill does not state as an explicit objective the creation of a dominant mobile network. Nevertheless, when assessing the *cumulative effect* of the Bill proposals, even if not by design but as unintended consequence, there is a significant risk that the current competitive dynamic in South Africa will be replaced by a market structure in which the WOAN will evolve over a period of time into the single dominant mobile network.

There are a number of complex issues that would need to be addressed, as part of the Bill amendments, for the WOAN, to be fully functional (by which we mean the WOAN being established legally, the network being built and operational and offering full national coverage). These include the issue of the use of currently used and unassigned spectrum; the legal structure of the WOAN and shareholder participation; agreement and implementation of necessary changes to the current regulatory framework; and agreement on the terms and conditions for transfer of MNOs' (and other) assets to the WOAN.

Given the complexity of establishing such a network, it is likely to take a significant period of time for the WOAN to become fully functional. In the case of Mexico[6], the planned

[5] Whilst the Bill does not specify how much spectrum will be allocated to the WOAN, p.91 of the WP states that "*All currently unassigned high demand spectrum will be set aside for assignment to the Wireless Open Access Network*"

[6] The legislation supporting the establishment of a WOAN in Mexico came into force in June 2013, the contract for deploying WOAN was awarded to ALTAN consortium in November 2016, and the deployment of the network has

completion date is 7 years after the contract for deploying WOAN was awarded. In the case of Australia, it is expected that the establishment of a single national fixed broadband infrastructure will have taken around 10 years by the time it is completed. In view of the package of measures that the Bill includes in South Africa, it does not seem unreasonable to consider that the WOAN in South Africa could well take longer than seven years to become fully functional**.** Through this period, for the reasons explained above, the Bill proposals will have a significant chilling effect on MNOs' incentives to invest, leading to a delay in the deployment of new mobile technologies, until a (dominant) WOAN is fully functional.[7]

The expected impact of the Bill on the mobile sector

To assess the impact of the Bill on the mobile sector, we first consider below:

- the drivers of improved consumer outcomes in the mobile sector; and
- the main costs and benefits that would arise if a dominant WOAN were established in South Africa.

We then present a quantification of the net effect.

Timely technology transition is a key driver of improved consumer outcomes in mobile

The adoption of new generations of more efficient network technologies, such as 4G and 5G, is a key driver of improved consumer outcomes in the mobile sector, including price reductions. For instance, moving from 2G (EDGE) to 3G (HSDPA) led to more than 90% decrease in the unit cost for delivering mobile data services.[8] In addition, investing in new technologies leads to step changes in the quality of service experienced by consumers, including higher speeds and increased reliability.

The reduction in costs from these dynamic efficiencies are generally passed on to consumers through lower retail prices. This effect can be seen by examining the trend in unit prices in Europe from 2004 to 2014 – an empirical analysis of the drivers of this trend found that the vast majority of the price reductions (more than 80%) during this period were the result of cost reductions, which occurred during the period of transition from 2G to 3G technologies.[9]

The role of network competition in promoting investment and technology transition

Where there are competing networks, operators would typically have an incentive to differentiate their services by seeking to introduce new technologies in advance of their

started in 2017. According to the contract, the WOAN has to cover 30% of population by Q1 2018 and it has to meet the final coverage objective of 92.2% of population by 2023. In the case of Mexico the WOAN was not awarded any 800 or 2.6 GHz spectrum.

7 If the transition to a dominant WOAN could be achieved speedily, then the impact on the investment incentives of existing MNOs from the creation of a dominant WOAN could be mitigated by the WOAN investing itself.

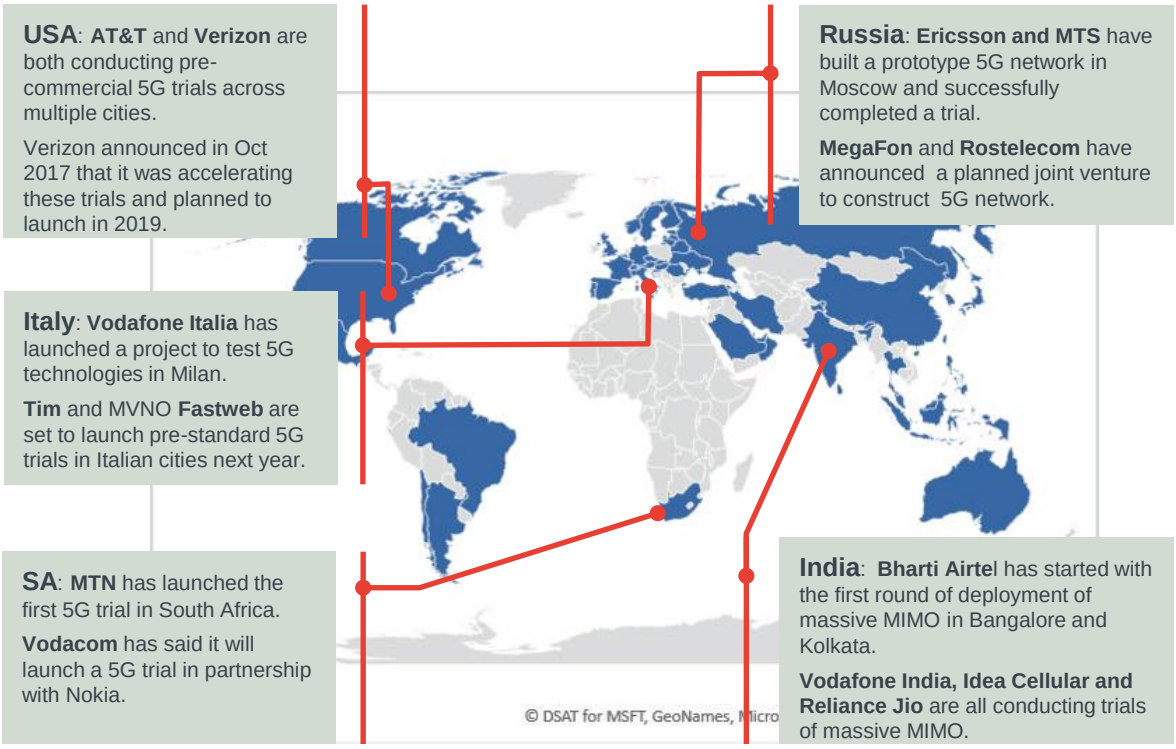
8 https://www.gsma.com/spectrum/wp-content/uploads/2012/03/22092009182239.pdf

9 https://www.gsma.com/publicpolicy/wp-content/uploads/2015/05/Assessing_the_case_for_in-country_mobile_consolidation.pdf

rivals, as technology transition offers a chance to 'steal' competitors' customers or capture a greater share of new mobile subscribers (else there is a risk of losing customers to a competitor). This competitive dynamic encourages all operators to invest in new technologies as soon as possible.

This is currently evident from mobile operator initiatives in competitive markets throughout the world, including South Africa, as the mobile industry is in the process of transition to 5G technology. According to the Global mobile Suppliers Association (GSA), by the start of January 2018, 113 operators in 56 countries (spanning the OECD and BRICS regions) had demonstrated that they are testing, or trialling, or have been licensed to begin field trials of 5G-enabling and candidate technologies. (see Figure 1 below).[10]

Figure 1 Map of countries with operators that have been, are conducting, or are planning to conduct 5G trials



Source: Global mobile Suppliers Association and various news sources

The incentives to invest and innovate are much weaker in markets where there is a single dominant firm. This is because the incentive for a dominant firm to introduce and develop innovative improvements to their products is limited, as the new innovation will often displace the previous technology or product. This is supported by available empirical evidence from the evolution of mobile markets in the transition to 3G: in countries with '*monopolistic'* market structure, **3G technology upgrades** took place more than **2 years later** than in the countries with network competition, leading to a significantly lower level of 3G take-up [11].

[10] GSA (January 2018), 5G Update – Global Market Trials, p. 2

[11] See, for instance, the GSMA report on Single Wholesale Networks

The main costs and benefits of establishing a dominant WOAN

The establishment of a dominant network provider will be associated with costs and benefits. Starting with the longer term impact, a dominant WOAN will have more limited incentives to invest, even if regulated (as it will need to be). The WOAN's dominant position means that it will face very limited competitive pressure – and regulation will be a weaker substitute to effective network competition. As a result, a dominant WOAN will be slower to transition to next generation mobile technologies compared to the speed of transition under competing networks. It will also be associated with higher costs and inefficiencies in the running and maintenance of its network (compared to the costs and efficiencies that would result under competing networks). Lower levels and rates of investment will, *all else the same*, translate into slower price reductions and lower quality of mobile services to end users.

When quantifying the impact of the Bill, we have assumed that, in the 'Bill scenario", the deployment and transition to new mobile technologies will occur at a slower speed until 2025 when a dominant WOAN is fully functional. For the period after 2025 we have conservatively assumed the same speed of technology transition under "the Bill" and "the Amended Bill" scenario. .

In the long term, a dominant WOAN could potentially reduce the amount of network duplication, by reducing the fixed "coverage" costs that need to be incurred, which could lead to lower (unit) network costs, translating into lower prices. Our quantification of the likely economic impact of the Bill has taken into account this potential benefit (in combination with marginal efficiencies from spectrum aggregation), by considering a sensitivity where unit network costs of a dominant WOAN could be up to 15% lower under "the Bill scenario" compared to the "Amended Bill scenario".

An evaluation of the net benefits of a dominant WOAN needs to also take into account its economic impact during the transition period. during the transition period from 2021 to 2025, the investment incentives of existing MNOs would be dampened, as explained above – leading to a slower transition, higher prices and lower quality and usage under the "Bill scenario". The significance of this effect depends primarily on the length of this transition period - as once the transition period is over, the dominant WOAN will be able to offer next generation mobile services. In our modelling, we have therefore considered the economic impact of greater progress being made in the transition to new technologies, such that two years' worth of progress is made in the transition period rather than one years' worth of progress (as per our base case).

Finally, in terms of the impact on retail competition, under the Bill, the dominant WOAN could serve as a network enabler of retail competition, as the WOAN will be the only wholesale-only network, providing services to others competing in the retail market. As the "Amended Bill" scenario includes also a competitive wholesale-only WOAN, and the ITA also foresees additional MVNO entry, it is not clear that there would be any significant incremental retail competition benefits under the Bill scenario in SA relative to the "Amended Bill scenario", so we have not explicitly considered this effect in the quantification of the economic impact.

Quantifying the impact of the Bill on consumers, economy and Government

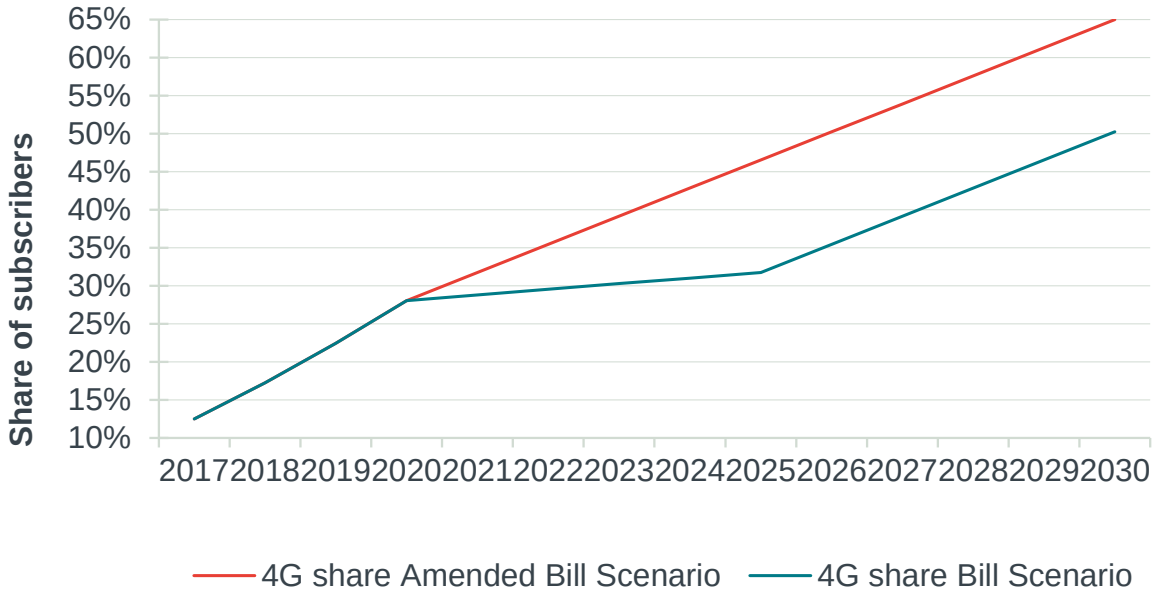
The impact on mobile consumers - usage and prices

We have quantified the impact of the Bill during the transitional period in which a WOAN is being established on unit costs, data prices and data usage in South Africa, by comparing market outcomes across these measures in the "Bill scenario" with the "Amended Bill scenario". Under the 'Amended Bill scenario', we have assumed that the impact of the current initiatives will start being seen in 2021, as a significant amount of low frequency spectrum (700/800 MHz) is not expected to be available for deployment before then.

We have assumed that a dominant WOAN would be fully functional by 2025. Hence, in our base case assessment, under the Bill, the migration achieved by 2025 would be 'equivalent' to the migration achieved without the Bill by 2021.

After 2025, we have assumed that the deployment and migration to new technologies happens at the *same speed* under both the "Amended Bill scenario" and the "Bill scenario". Therefore, the difference between the "Amended Bill scenario" and the "Bill scenario" persists, but does not worsen, once the WOAN becomes fully functional. We consider this to be a conservative assumption given the lack of competitive pressure that the WOAN is likely to face. To illustrate the results of this, the following figure shows how 4G evolves under the "Bill scenario" and "Amended Bill scenario".

Figure 2 4G share of subscribers



Source: Frontier

Our other key assumptions are as follows:

- We explicitly model the period up to 2030 and then assume a steady state between 2031 and 2040;
- The rate of cost pass-through increases from 90% to 100% between 2020 and 2025 under both the "Bill scenario" and "Amended Bill scenario";
- Non-network costs fall at the same speed under both the "Bill scenario" and "Amended Bill scenario", as the growth in data usage outweighs increases in subscriber numbers and the increase in the proportion of total non-network costs recovered from data services;
- The speed at which unit network costs fall for the different technologies is estimated by taking the cost estimates in Ofcom's Mobile Termination (MTR) model and calibrating them to South Africa;
- We use a price elasticity of -1 to estimate the impact of changes in data prices on data usage; and
- We use a social discount rate of 8.6% to estimate the Net Present Value of the consumer impact of the "Bill scenario" up to 2040.

The slower migration to new technologies under the "Bill scenario" means that **(unit) prices fall less quickly under the "Bill scenario" than under the "Amended Bill scenario", leading** to prices that are approximately 36% higher by 2030 in the "Bill scenario" compared the "Amended Bill scenario". As a result of the higher prices under the "Bill scenario", data usage will be lower compared to the "Amended Bill scenario". We estimate that **the overall loss in consumer benefits (surplus) under the "Bill scenario" is ZAR153bn** in net present value terms.

We have then considered whether the potential benefits from lower network duplication (including some spectrum aggregation efficiencies) under the Bill scenario could outweigh the negative impact from the move to a dominant WOAN. We estimate that, even with network cost savings of the order of 15% under the "Bill scenario", the loss in consumer benefit is reduced, but remains significant at ZAR107bn. In any case, we consider a 15% reduction in network costs to be optimistic because:

- Operators already rely on widespread site and tower-sharing, as well as national roaming;
- The competitive WOAN should help to reduce network duplication in rural areas; and
- We have not taken into account that the WOAN under the "Bill scenario" will face very limited competitive pressures to reduce its costs.

The faster the WOAN becomes functional, the lower the loss in consumer benefits from the transition. We have therefore run a sensitivity where we assumed that the WOAN under a Bill scenario begins to have an impact on the migration to technologies earlier in the period (although we still assume it only becomes fully functional by 2025) and hence the migration achieved by 2025 would be 'equivalent' to the migration achieved without the Bill, by 2022 (rather than 2021). In this case we estimate that the impact on mobile consumers from the Bill scenario is ZAR116bn. Even though a faster transition to newer technologies reduces the negative impact of the Bill, this still remains very substantial.

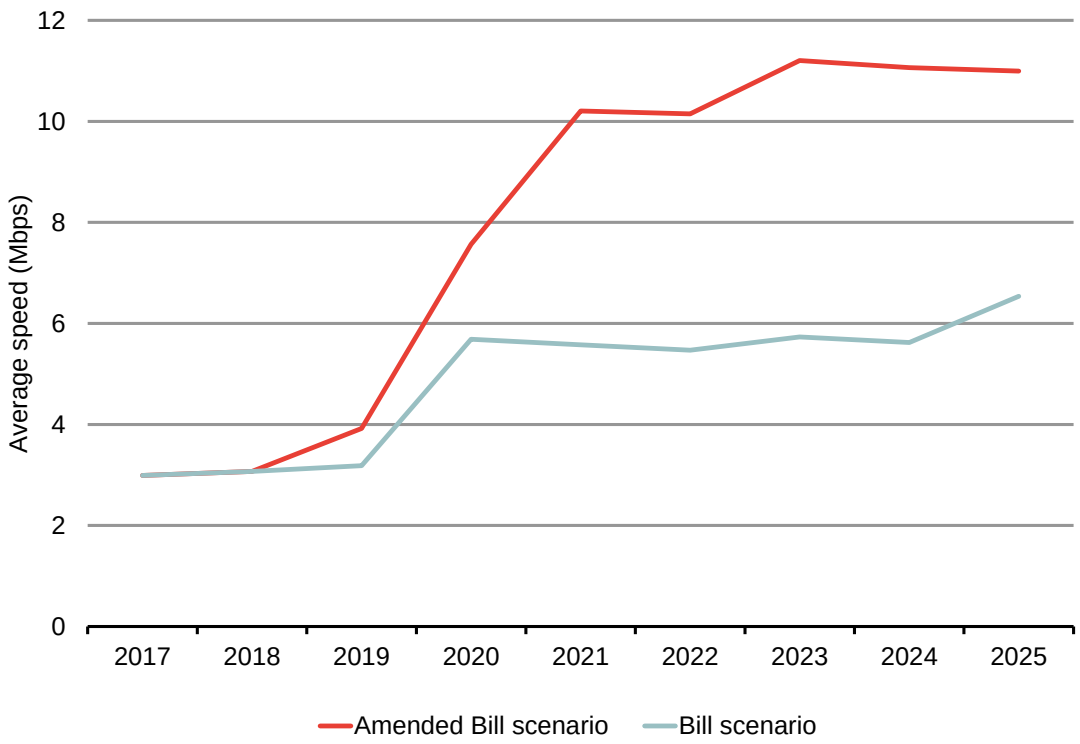
This is not surprising, in view of all the evidence on the pivotal role that a timely transition to new, more efficient mobile technologies plays in delivering benefits to mobile consumers.

Therefore, on balance, we conclude that whilst it could be argued that there are potential benefits in South Africa from the establishment of a dominant WOAN in the form of lower network duplication and/or spectrum aggregation, the detrimental impacts from the chilling of investment in South Africa and the slower transition to new, more efficient technologies are likely to significantly outweigh any possible benefits.

Impact on mobile network speeds and coverage

In addition to the analysis of the impact of the Bill on mobile data prices and usage, Vodacom also instructed Northstream, a mobile technology consultancy, to estimate the impact of the Bill scenario on average speeds, during the transitional period before the WOAN is established.[12] Northstream has undertaken this estimation by carrying out a granular town-by-town analysis/modelling of the dampening impact under the Bill scenario on operators' investment in 4G sites, and the lack of spectrum. As shown by the following figure, average speeds are estimated to be significantly lower under the Bill scenario. For example, by 2025, the **average speed is 68% higher** under the "Amended Bill scenario".

Figure 3 Average speeds under the Bill scenario and Amended Bill scenario



Source: Northstream

[12] Northstream (2018), Bill Impact: Modelling the Impacts on Speed and Coverage

The Northstream methodology also allows an estimation of the impact on population/geographic coverage. As a result of the lack of spectrum and lower investment by operators during the period 2021 to 2025 under the "Bill scenario", by 2025, Vodacom's 4G population coverage is 89.50% compared to 99.32% under the "Amended Bill scenario" (a **10 percentage points difference).** Vodacom's 4G area coverage is also significantly lower under the "Bill scenario" compared to the "Amended Bill scenario" (**39 percentage points difference)**. The detrimental impact of the Bill on the 4G coverage of the other operators is even greater since they are less advanced with their 4G roll-out than Vodacom.

Impact on the wider economy

In view of the significant impact that the Bill could have on the South African mobile market, and the role that the South African telecommunications sector can play in supporting wider economic growth, as recognised by South Africa Connect (2013), we have also estimated the wider impacts of the Bill on the South African economy – beyond the impact on mobile consumers. We have done this by estimating quantitatively the likely impact on GDP, employment and tax revenues.

There is a wide range of studies that have sought to assess the impact of growth in mobile and broadband on the wider economy. We have selected two approaches, to reflect both recent estimates of the economic impact of growth in connectivity in South Africa, and the data available from our earlier analysis. The two approaches we used are:

- The SA Connect approach[13] – we combine the Katz et.al. (2012) study on the link between digitisation and GDP, and the Bohlin (2012) study on the link between speeds and GDP to estimate the wider impact of the Bill on GDP in South Africa. This is in line with the approach used in SA Connect.
- The Deloitte/GSMA approach – we use the Deloitte study (2012)[2] to estimate the impact of higher data usage on GDP. This approach is based on the empirical estimation of a relation between the level of fixed/mobile data consumption, as a proxy for the ways in which the increased use of broadband data can support economic development, and the level of GDP. We have used this relationship together with the estimation of the impact of the Bill on average data consumption in SA, to arrive at a GDP impact estimate.

In terms of employment effect, and in line with the approach used to assess the impact of SA Connect, we have estimated two different impacts on employment. First, a short-term effect, as a result of lower investment in the transitional period (2021 to 2025) under the "Bill scenario" - reflecting lower employment in the telecoms and related sectors, as well as multiplier effects in other sectors due to lower household spending. Second, a more permanent effect due to lower GDP, based on the SA Connect and Deloitte/GSMA approaches. The results from applying these two approaches are summarised in the table below.

[13] http://www.teleadvs.com/wp-content/uploads/South_Africa_presentation_final_version.pdf

Figure 4 GDP, tax revenue and employment impact

	SA Connect approach	Deloitte/GSMA approach
NPV of GDP impact between 2021 and 2025	RAND22bn in NPV terms over a 5 year period	RAND43bn in NPV terms over a 5 year period
Employment effect Short-term (via lower investment)	60,000 jobs during the transition period (2021 to 2025)	
Employment effect Longer-term (via GDP)	30,000	57,000
NPV of tax impact between 2021 and 2025	RAND 6bn in NPV terms over a 5 year period	RAND12bn in NPV terms over a 5 year period

Source: Frontier

1 INTRODUCTION

In November 2017, the Department of Telecommunications and Postal Services (DTPS) of the Government of South Africa published an invitation to provide comments on the draft Electronic Communications Amendment Bill (the "Bill" hereinafter).

The Bill includes a number of significant amendments to the Electronics Communications Act (ECA). These include amendments related to the use of spectrum by all mobile operators in SA and the creation of a Wireless Open Access Network (WOAN). The Bill also proposes the introduction of a number of other institutional and regulatory changes.

In light of this, Frontier Economics has been asked to provide an economic assessment of the Bill. Our assessment is composed of two parts:

- **Part I:** An assessment of the economic impact that the package of Bill amendments; and
- **Part II:** An assessment of the economic basis for the Bill amendments, which considers the extent to which the amendments**:**
  - can they achieve what they are purporting to aim to achieve;
  - do they have a reasonable analytical or economic basis; and
  - are they consistent with one another and can work practically?

This report covers Part I, but drawing on Part II where relevant.

In conducting our assessment, we have been mindful of the South African Government's guidelines on how to carry out Regulatory Impact Assessments (RIA). As Figure 5 sets out, the analysis in this report is broadly consistent with these guidelines:

Figure 5 Consistency between the analysis in this report and the guidelines on Regulatory Impact Assessment

Rationale for Regulatory Impact Assessments as set out in the Government's guidelines	Consistency with our analysis
Think through the full impact of proposals	We have considered the full range of impacts that the Bill could have, with a particular focus on the impact on investment in the telecoms sector and the efficient use of spectrum.
Identify alternative options for achieving the desired policy change	We have identified an alternative scenario without the Bill, as described in Section 2.
Assess options (regulatory and non-regulatory)	Throughout this report, we compare a scenario with the Bill's proposed ECA amendments being fully implemented ("Bill scenario") and a scenario in which the proposed ECA amendments are not fully implemented ("Amended Bill" scenario).
Ensure that consultation is meaningful and reaches the widest possible range of stakeholders	This is the Government's responsibility, so not relevant for our report.
Determine whether the benefits justify the costs	We have carried out a comprehensive qualitative and quantitative assessment of whether the potential benefits of the Bill justify the costs.
Determine whether particular sectors are disproportionately affected	The majority of our analysis is focussed on the impact on the telecoms sector. However, as other sectors also rely on a well-functioning telecoms sector, in Section 4 we have quantified the impact on the wider economy.
Determine whether the proposed measure will address the objectives of government	In Part II, we discuss the extent to which the Bill will help the Government achieve its objectives.

Source: Frontier based on "The Presidency: Republic of South Africa (2012) – Guidelines for the implementation of the regulatory impact assessment (RIA) process in South Africa."

The rest of this report:

- sets out the policy objectives related to the mobile sector that the Government is aiming to achieve;
- considers the likely evolution without the Bill being implemented in its currently proposed form;
- presents key measures of the Bill and the likely evolution of the mobile market in South Africa if the Bill is fully implemented; and
- evaluates qualitatively and quantitatively the impact of the Bill on the mobile sector and the wider economy.

2 EVOLUTION OF THE MOBILE MARKET IN SOUTH AFRICA

2.1.1 Likely evolution of the mobile market in South Africa without the Bill

To help assess the likely impact of the Bill's ECA amendments, we consider first how the market is likely to evolve in its absence. This is so that market outcomes in the two "states of the world" can be compared. In this section, we therefore look at:

- the Government's stated policy objectives for the ICT sector; and
- initiatives that are being undertaken to help the Government achieve its objectives.

We then go on to consider in the following section how the evolution of the market is likely to be affected by the implementation of the Bill in its current form.

Government policy objectives for the ICT sector

The overall objectives for the telecommunications sector, as expressed through the Government's 2012 National Development Plan (NDP) through to the 2016 White Paper (WP) and most recently in the Memorandum on the objects of the Bill, include the promotion of broadband coverage in rural and under-serviced, ensuring that as many users as possible can benefit from affordable broadband, promotion of innovation that addresses national developmental challenges and goals and transformation of the sector through enforcement of broad-based black economic empowerment.

Our report focuses on the key ECA amendments proposed by the Bill, their impact on the mobile sector in South Africa and the consistency of the proposed amendments as a whole with these policy objectives.

The role of the mobile market in delivering these objectives

SA Connect set broadband availability and speed targets, aiming to deliver broadband with minimum average download speeds of 10 Mbps to 100% of the population and speeds of 100 Mbps to 80% of the population in South Africa by 2030. SA Connect also sets a (non-binding) interim target of 5 Mbps for 90% of population and 100 Mbps for 50% of the population by 2020.

These targets are not technology specific. However, SA Connect recognises that wireless technology is vital for achieving these targets and identifies coverage obligations associated with the release of high demand spectrum as a success factor: *"The speed of deployment of a wireless network is a fundamental consideration to meet the immediate*

challenge of meeting the targets of this policy."[14] This conclusion is also partly driven by a relatively poor performance of the fixed sector in South Africa.

The White Paper identifies specific challenges to be addressed

In contrast to fixed data services, mobile data services are available to 99% of South Africa's population and are delivered through the competing infrastructures of four mobile network operators (MNOs)[15]. In addition to the four network operators, a number of virtual network operators (MVNOs) offer niche services to customers. The WP nevertheless stipulates that there are still specific challenges within the mobile sector which may prevent consumers in South Africa from enjoying the full benefits of digital technologies. In particular:

- **Availability of high speed data services, especially in rural areas**: the WP argues that "*network roll-out is skewed towards urban areas - and the prospects of providers rolling out modern broadband services in rural and less affluent areas without government intervention are minimal.*"[16] In addition, the WP notes that "*while access to voice services has increased through mobile telephony, the framework and definitions for universal service and access have not sufficiently addressed the need to extend definitions to cover access to high quality broadband*".[17]
- **Affordability of high speed data services:** The WP argues that "*the duplication of infrastructure and commercially driven rollout plans lead to expensive infrastructure deployment, which costs are passed on to consumers. In addition, the limited number of service providers are not able to adequately exert pressure on retail prices.*"[18] It also notes that those with "*limited or no income require targeted interventions to make ICTs affordable for them*"[19]
- **Market concentration**: the WP states that "*the broadband market is characterised by a few very strong and vertically integrated players*".[20]

  In relation to mobile infrastructure specifically, the WP argues that the MNOs provide network services on terms that are "*commercially favourable to them, thus skewing competition at the services level.*"[21]
- **Effectiveness of the regulatory regime**: the WP considers that the current regime "*is broadly aligned with global best practice, however, the manner in which he Act is drafted and the ensuing South African application of the practice has demonstrated obvious flaws*."[22] In particular, it argues that "*the regulator has been prevented from*

14 SA Connect: Page 44 "*Realistic coverage targets so the costs do not balloon out of control relative to any conceivable revenue stream;"*

15 Vodacom and MTN cover 99% population with their own mobile network infrastructure, while Cell C and Telkom rely on roaming agreements for full coverage.

16 The WP, p. 66

17 The WP , p. 30

18 The WP, p. 70

19 The WP, p. 35

20 The WP, p. 67

21 The WP, p. 69

22 The WP, p. 66

exercising regulatory interventions without conducting cumbersome, lengthy and expensive competition inquiries."

Where there is evidence that the market is underperforming in certain areas, the existing regulatory framework provides ICASA with tools to identify and address market failures that might be driving this underperformance.[23] The WP highlights that, despite having these powers, ICASA had only conducted two market reviews over a ten year period and sets out that possible reasons include *"lack of capacity and resources and overly burdensome legislative provisions."*[24]

Proposed policy and regulatory initiatives

A number of regulatory initiatives are already being undertaken within the framework provided by the current ECA to improve the functioning of the mobile market and, where applicable, address the key challenges stipulated by the WP.

ICASA's Invitation to Apply (ITA)

On 15 July 2016, the Independent Communications Authority of South Africa (ICASA) issued the Invitation to Apply (ITA) for a radio frequency spectrum licence to provide mobile broadband wireless services in urban and rural areas using the complementary bands 700 MHz, 800 MHz and 2.6 GHz.[25] ICASA indicated that their main intention in issuing the ITA is to enable the realisation of the broadband targets set out in SA Connect:

> *"In order to realise the Government's rollout targets for broadband services in line with SA Connect Policy, the Authority is publishing the ITA for the licensing process for International Mobile Telecommunications (IMT) spectrum bands."*[26]

The ITA includes a number of features which support these objectives:

- currently unassigned HD spectrum (2.6 GHz, 800 MHz, and 700 MHz) would be awarded via an auction of four spectrum packages for licenses of 15-20 years duration;
- around 1/5th of the unassigned spectrum would be awarded to the WOAN[27];
- all licences have universal coverage obligations which are consistent/support the SA Connect high speed broadband targets (and which can be met through either rolling out own network or relying on national roaming)[28]; and
- all licences will have an obligation to offer MVNO access to at least three new providers.[29]

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23 Section 67(4) of the ECA provides the Authority with the legislative powers to address market failure, where it exists. Further, ICASA's guidelines for conducting market reviews provide a clear framework, based on well-established economic and competition law principles, for identifying the need for pro-competitive regulation.

24 The WP, p. 40

25 This triggered a legal dispute in which the Ministry of Telecommunications and Postal Services (MOT), Cell-C and Telkom have all requested the Court to review and set aside ICASA's decision to publish the ITA. The dispute is still on-going.

26 ICASA (2016), Invitation to apply for international mobile telecommunication spectrum, para. 5, page 9

27 The ITA sets aside 2x10MHz in the 700MHz band and 25MHz in the 2.6GHz for "Lot A", which we understand is intended for the WOAN

28 In particular, licensees must provide data services across the country with an average uplink of 15Mbit/s and the downlink user experience throughput of at least 30 Mbit/s to 100% of the population of South Africa by 2020.

Our analysis of the ITA indicates that the proposed auction can be expected to lead to an efficient spectrum allocation, as it seeks to award the spectrum necessary to deliver high speed mobile broadband services in South Africa as quickly as possible:

- the ITA ensures that all operators, including the WOAN, will end up with a combination of low and high frequency spectrum, allowing delivering future demand in a cost efficient way; and
- the ITA includes packages of spectrum that are similar but not identical, providing choice to the different bidders to purchase the package of spectrum that best meets each bidders expected future demand for mobile data (without adversely affecting the ability of any operator to compete).

Furthermore, we find that the ITA is pro-competitive, in that it ensures that the smaller operators should be able to obtain one of the spectrum packages on offer, it includes spectrum caps to prevent larger operators from acquiring too high an amount of spectrum, and also includes MVNO access obligations. In summary, therefore, the ITA has a number of features that are consistent with the wider policy objectives set out above.

ICASA's Priority Markets Inquiry

On 30 June 2017, ICASA initiated its Priority Markets Inquiry. The purpose of this investigation is to identify broad markets and market segments in the electronic communications sectors and to assess which of those markets or market segments are susceptible to ex ante regulation. ICASA will identify broad markets and market segments that are generally prone to ex ante regulation and those that ICASA may prioritise for market reviews.

The inquiry is not a market review in and of itself as described in section 67(4) of the ECA. Rather, the main objective of the process is "*identifying priority markets and market segments that the Authority intends to focus on, in order to provide certainty to stakeholders in relation to the markets that the Authority intends to analyse through the market review process.*"[30] The whole process is expected to be finished by 31 March 2018.

Engagements have already occurred relating to a possible WOAN model that preserves network competition

Alongside the above initiatives, we understand that the Ministry has engaged with various players in the industry in relation to the potential principles that could apply to a competitive WOAN solution, which seeks to support the Government's main policy objectives, particularly in relation to widening participation in the mobile market, affordability and availability of high-speed data services and increasing the diversity of offers in the retail market. By competing on an equal footing with other operators, this form of WOAN[31] could improve consumer outcomes by enhancing infrastructure-based

[29] Para. 50 of the ITA sets out that "*A Licensee is required to provide open access to a minimum of three Mobile Virtual Network Operators (3 X MVNO)"* and will have a maximum of three years from the date the 700/800 MHz spectrum becomes available to provide services in line with the obligations.

[30] Government Gazette, 30th June 2017, para. 2.2, p.147, http://www.ellipsis.co.za/wp-content/uploads/2017/06/Inquiry-to-identify-priority-markets-June-2017.pdf

[31] Vodacom has set out in its submission in more detail the key features of such a hybrid/competitive WOAN.

competition. It should also make it easier for MVNOs and smaller MNOs that rely on other operators' networks to compete at the retail level, by serving as an alternative, wholesale only, provider of upstream services. Vodacom has set out within its submissions the key features that it envisages that a competitive WOAN would have. This includes the assignment of a sufficient amount of spectrum to realise economies of scale benefits and comparable unit costs to other MNOs and the keeping in place of current Chapter 10 provisions, which would allow the WOAN to access other operators' passive facilities (on non-discriminatory terms) to assist the roll-out.

Overall, we envisage that without the Bill's more problematic proposals, the likely evolution of the mobile market in South Africa would maintain the current model of network competition in the long run. At the same time, we expect the initiatives that are already underway, if fully implemented, should help address the challenges identified by the WP. We refer to this scenario as "the Amended Bill scenario" as the outcomes envisaged under this scenario would be broadly consistent with Vodacom's proposed changes to the Bill.[32] This expected market evolution under "the Amended Bill scenario" is therefore the benchmark used when evaluating the impact of the Bill on the mobile market and the wider economy of South Africa.[33]

2.1.2 Key measures of the Bill

The Bill includes a number of amendments which relate to the objectives of the WP, the award of spectrum, and the establishment of a WOAN. These amendments amongst others include:

- The Bill adds the following to the objectives of the ECA: *"promote serviced-based competition and avoid concentration and duplication of electronic communications infrastructure in urban areas";*
- All mobile and fixed operators have to provide wholesale access to their networks and facilities, which can no longer be refused on the grounds of reasonability. Furthermore "*deemed entities*"[34] must provide wholesale open access to their networks and facilities at cost-based prices;
- HD spectrum which is currently assigned to existing MNOs must be returned, following an inquiry to be conducted by ICASA. ICASA will make recommendations on the terms and conditions, as well as the timeframe of the return (with the possibility of the spectrum being returned before the expiry of the current ECNS licences);
- All assignments of HD spectrum will be subject to the principles of open access and non-exclusivity, with radio spectrum licences being renewed annually;

[32] Vodacom's submission in response to the Department of Telecommunications and Postal Service's invitation to provide written comments on the Electronic Communications Amendment Bill [Government Gazette Number: 41261 of 17 November 2017]

[33] We recognise that there may be some delays in the award of the LTE spectrum, under both the 2016 ITA or any alternative award process – when we evaluate the evolution of the mobile sector in the "Amended Bill scenario", we consider the impact from the award of the LTE spectrum from 2021 onwards.

[34] The DB defines as a "deemed entity" any licensee that: i) has more than 25% of the total electronic communication infrastructure in a relevant market; or ii) controls an essential facility or a scarce resource such as exclusively assigned radio frequency spectrum.

- The WOAN is expected to be assigned a substantial amount of HD spectrum and granted advantages that are currently unavailable to other licensees[35]; and
- The WOAN will need to be established and functional, before the award of any currently unassigned HD spectrum to the MNOs.

Below we summarise the key changes under the "Bill scenario" relative to the alternative scenario in which the Bill is not implemented in its current form – The "Amended Bill scenario". This forms the basis for our assessment of the impact of the Bill proposals.

[35] This includes potential waiver of spectrum fees, allocation of public funds to support rollout in rural areas and granting access to all electronic communications and other public infrastructure, as set out under Section 19A(4) of the Bill.

Figure 6 Comparison of scenarios with and without the Bill amendments

		The "Bill scenario"	The "Amended Bill scenario"
Spectrum	Assignment of HD spectrum	Most (or all) of unassigned HD spectrum is allocated to the WOAN following a study.	WOAN receives sufficient unassigned HD spectrum to be sustainable with the remaining HD spectrum allocated to existing operators through an auction (or other mechanism that ensures the efficient allocation of spectrum)
	Timing of HD spectrum release	HD spectrum not released to existing operators until the WOAN is functional	Release of HD spectrum to existing operators not contingent on the WOAN being functional (a deadline will be set for releasing HD spectrum to existing operators)
	Exclusivity	Principle of non-exclusive use of spectrum introduced	Exclusive use of spectrum
	Existing spectrum	Existing operators will have to return their spectrum holdings following study by ICASA	Existing operators keep existing spectrum until it expires (if not longer)
	Renewal of spectrum licences	Annual basis	Much longer time period i.e. at least 15 years
	Spectrum refarming	Potential restrictions on spectrum refarming	No restrictions on refarming
Access and pricing	Mobile access	Cost-orientated access imposed on any operator with a share of network infrastructure above 25% or who controls a scarce resource. Access cannot be refused on feasibility grounds (technical or economic)	No cost-orientation requirement Access to facilities can be refused on feasibility grounds (technical or economic) HD spectrum may also come with MVNO wholesale access obligations (as proposed by ITA process)
	International roaming	Prices for all roaming services (i.e. wholesale and retail) would be cost-based	Operators are free to set their own roaming rates based on commercial agreements

Source: Frontier analysis based on the Bill

There are still significant uncertainties around the timing and the exact form in which these proposals will be implemented in practice. Nevertheless, it is reasonable to assume that taken together, the changes as proposed in the Bill will likely have a significant impact on the future structure and functioning of the mobile market in South Africa.

In light of this, we have been asked to assess the likely impact of the Bill measures on the mobile sector and the wider South African economy ("the Bill scenario"), compared to a scenario where the Bill is not implemented in its current form, but the other initiatives set out above are implemented ("the Amended Bill scenario"). Below, we first discuss the likely evolution of the mobile sector in South Africa under the "Bill scenario", both in the long-term and during the transitional period during which time the WOAN is being established. We then assess the expected impact of the Bill on the mobile market and wider economy of South Africa.

2.1.3 Evolution of the mobile market with the Bill

Long-term

The Bill and the WP are not clear as to how they envisage the structure and functioning of the mobile market in the longer term. We consider that, under the package of the Bill proposals, the likely outcome is that **the WOAN would become a dominant network operator** – that is, it will possess a very large share of the market and face limited competition – if not by design, then as a result of an 'unintended consequence' of the measures set out in the Bill. This is for the following reasons:

- **All or most of the currently unassigned spectrum being assigned to the WOAN:**[36] under such an outcome, the WOAN would be in a position to offer higher speed mobile broadband services than the MNOs. This would make it challenging for MNOs to compete with the WOAN and could dampen their incentives to invest to upgrade their own networks.[37] Without additional spectrum, other operators will also find it difficult to expand capacity in a cost-efficient manner and may become increasingly reliant on renting capacity from the WOAN to meet demand from retail customers[38];
- **MNOs will have to return their existing spectrum:** as stated in the Bill, exclusively assigned spectrum will be returned under the Bill and henceforth be subject to principles of "*open access*"[39]. This (in combination with other proposals set out in the Bill, discussed in Section 3) will dis-incentivise MNOs from making significant further investments in their networks, particularly given that the terms

[36] Whilst the Bill does not specify how much spectrum will be allocated to the WOAN, p. 91 of the WP states that "*All currently unassigned high demand spectrum will be set aside for assignment to the Wireless Open Access Network*"

[37] This migration may free up currently used capacity which could be redeployed to offer higher speed/quality mobile services. If, however, existing mobile licensees expect the WOAN to be the main/key provider of wholesale high speed national capacity in the longer term, they will have dampened incentives to make the necessary investments to upgrade the capability of their networks using existing spectrum holdings.

[38] Further, where unassigned spectrum is made available to other operators, the onerous pre-conditions imposed by the Bill (e.g. in particular, the requirement to purchase at least 30% of the WOAN's capacity) could significantly undermine incentives to acquire it.

[39] The Bill does not provide further detail on how exactly it envisages the use of mobile spectrum under the "open access" principle.

and conditions and timeframe for the return of such spectrum will not be known until the ICASA study is complete. This would reduce the incentive of MNOs to compete with a WOAN possessing significant amounts of HD spectrum; and

- **Other measures to promote the WOAN and give it preferential treatment:** the WOAN will be provided with a number of incentives and benefits which will not be available to other licensees, as mentioned above. In practice, it seems also reasonable to assume that extensions of the proposed interventions and/or additional interventions could be implemented to allow the WOAN to attract the necessary traffic to make the network investment viable.

Overall, we would expect the Bill proposals, particularly in relation to spectrum allocation, to confer in the longer-term advantages to the WOAN that will not be possible for any rivals to match. As such, we would expect the WOAN to occupy a dominant position in the sense that it would be able to act independently of its competitors, customers and, ultimately, consumers.

In summary, we recognise that the Bill does not state as an explicit objective the creation of a dominant mobile network. Nevertheless, when assessing the *whole package* of the Bill proposals, even if not intended, we consider it is very likely to result in the competitive dynamic that currently exists in South Africa being replaced by a highly asymmetric market structure with a single dominant mobile network – the WOAN. In other words, even if some of the existing MNOs were able to maintain some of their own network infrastructure in the long run, the competitive constraint that they would exert on the WOAN under the package of the Bill amendments would be very limited.

Transitional period

The Bill proposals envisage that a comprehensive national WOAN will be established, which, according to the WP, will have the rights to all of the unassigned HD spectrum[40]. Given the complexity of establishing such a network, it is likely to take a number of years for the WOAN to become fully functional – by which we mean the WOAN being established legally and the network being built and operational and offering full national coverage. In the case of Mexico[41], this is planned to be achieved in seven years. Indeed, there is a good chance that the **WOAN in South Africa could take longer than seven years (from now) to become fully functional**, as the Bill envisages that the WOAN may ultimately be assigned all HD spectrum, the currently used spectrum by the MNOs will be returned, and there will be access obligations placed on all vertically integrated mobile operators in SA – these are not measures envisaged in Mexico.[42] Since the Bill specifies that licences for further unassigned spectrum may only be granted once the WOAN is

[40] We note that the Bill indicates that the amount of spectrum to be assigned to the WOAN will be the result of study/ ICASA assessment.

[41] For example, in Mexico, the legislation supporting the establishment of a WOAN came into force in June 2013, the contract for deploying WOAN was awarded to ALTAN consortium in November 2016, the deployment of the network started in 2017. According to the contract, the WOAN has to cover 30% of population by Q1 2018 and it has to meet the final coverage objective of 92.2% of population by 2023. For more details on international experience with WOAN, see Annex B.

[42] For the purposes of our quantitative analysis, we therefore consider that the WOAN would not become fully operational before 2025.

functional, throughout this period, existing operators will not have access to any additional spectrum.

The possibility that all existing spectrum will need to be returned before the expiry of the current licences, and the requirement to provide cost-orientated access to their networks and facilities, is also likely to increase investment uncertainty and/or reduce the return operators can expect to make.

Below, we first discuss the likely evolution of the mobile sector in South Africa with the Bill's ECA amendments, both in the long-term and during the transitional period when the WOAN is being established. We then assess the expected outcomes for consumers in South Africa under "the Bill scenario" compared with the "Amended Bill scenario".

3 QUALITATIVE ASSESSMENT OF THE ECONOMIC IMPACT OF THE BILL

In this section, we set out the economic impact of the Bill proposals. We discuss:

- The role of investment and spectrum in delivering consumer outcomes in mobile markets;
- The impact of competition between mobile networks on investment and the speed of transition to new mobile technologies;
- The expected impact of the Bill on existing operators' incentive and ability to invest into their networks during the transitional period; and
- The likely impact of the Bill in the long-term, once the WOAN gets established as a dominant provider.

Section 4 builds on the qualitative assessment presented in this section by providing a quantification of the impact of the Bill.

3.1 The role of investment and technology in delivering consumer outcomes in mobile markets

3.1.1 The role of investment

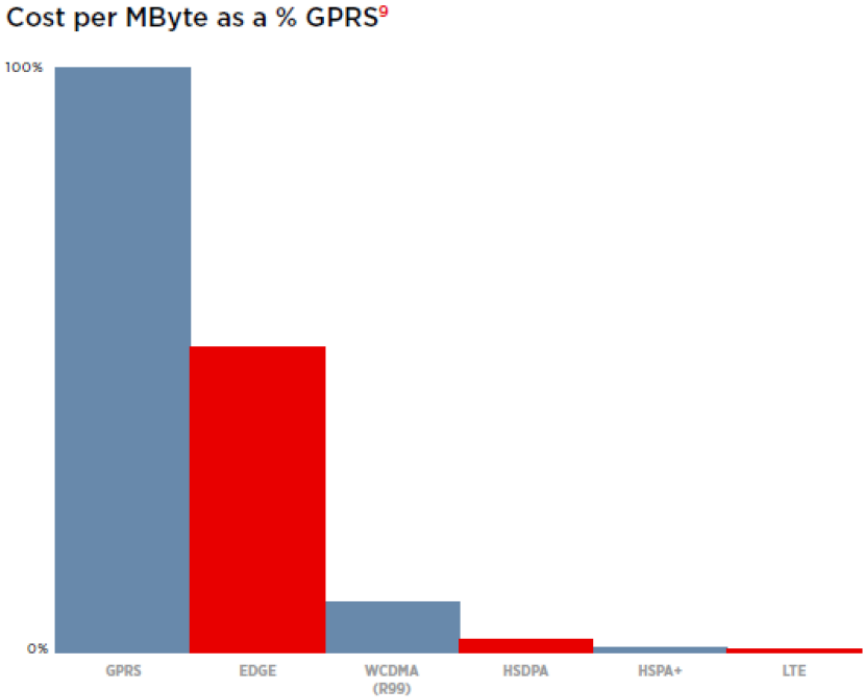
Prices

The transition to successive and more efficient network technologies is a key driver of price reductions. For instance, moving from 2G (EDGE) to 3G (HSDPA) leads to a more than 90% decrease in the unit cost for delivering mobile data services.[43] This is illustrated by Figure 7 below. In addition, investing in new technologies leads to step changes in the quality of service experienced by consumers, including higher speeds (see Figure 10), lower latency (Figure 11) and increased reliability.[44]

[43] https://www.gsma.com/spectrum/wp-content/uploads/2012/03/22092009182239.pdf

[44] For example, while the maximum download speed available under the most advanced 3G technology (HSPA+) was around 42 Mbps, currently available 4G technology (LTA-Advanced) can offer up to 1000 Mbps maximum download speed.

Figure 7 Unit costs for different technologies

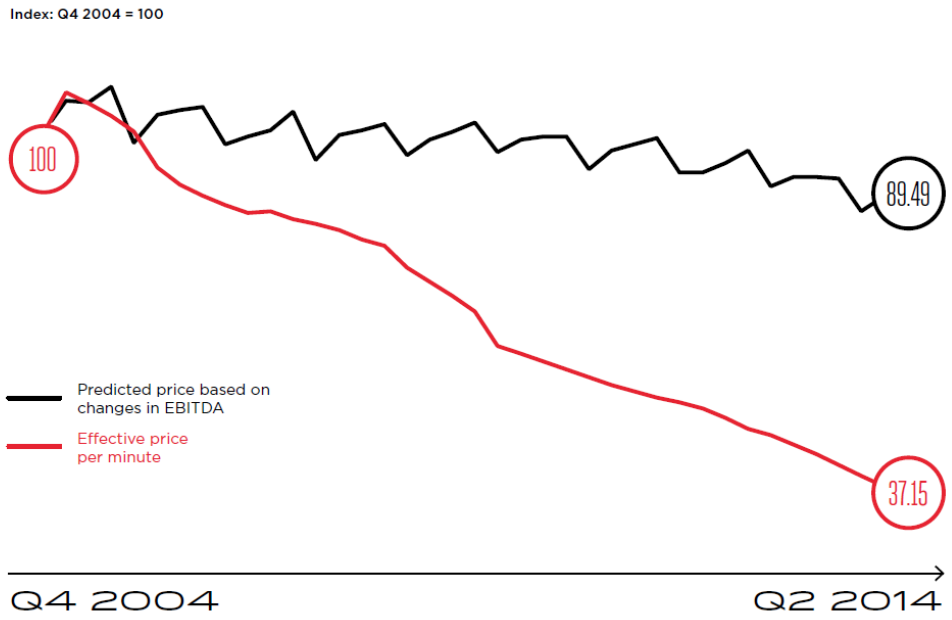


Source: *https://www.gsma.com/spectrum/wp-content/uploads/2012/03/22092009182239.pdf*

The reduction in unit costs from these dynamic efficiencies can then be passed on to consumers through lower retail prices. This effect can be seen by examining the trend in voice unit prices in Europe from 2004 to 2014 (see Figure 8 below), where voice unit prices have fallen significantly over time (63%). This significant fall in prices follows the rapid transition from 2G to 3G technology during this period. This suggests that the vast majority (around 80%) of unit price reductions arose from dynamic efficiencies due to the transition from 2G to 3G technologies during this period.[45]

[45] https://www.gsma.com/publicpolicy/wp-content/uploads/2015/05/Assessing_the_case_for_in-country_mobile_consolidation.pdf

Figure 8 Unit price reductions compared to changes in EBITDA margins in EU markets

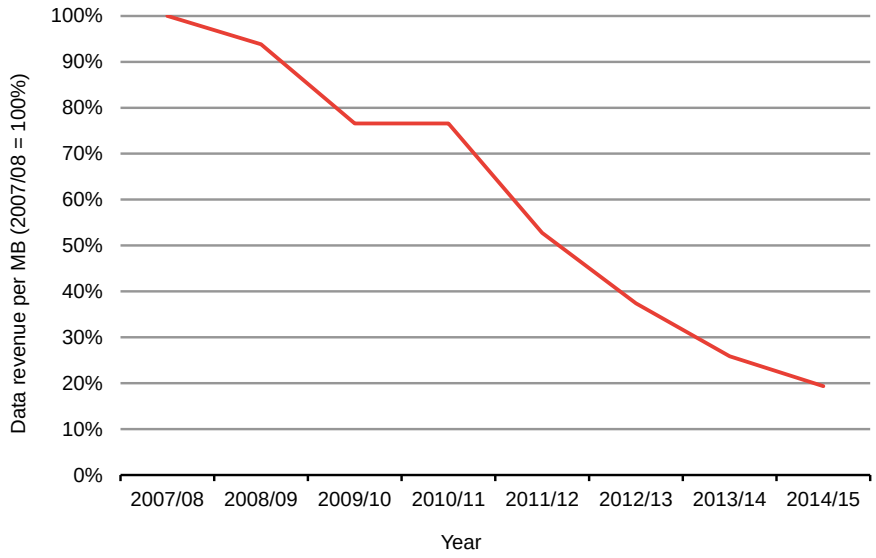


Source: GSMA

We note that similar trends can be observed in relation to mobile data prices in South Africa. For example, as Figure 9 shows, Vodacom's unit price per MB of data traffic[46] has declined approximately 80% throughout the period from 2007/08 to 2014/15. In the same period, the share of 3G subscribers within Vodacom's customer base increased from 9% to 38%.

[46] Unit data prices calculated as total data revenues divided by total data traffic in a given year.

Figure 9 Reduction in unit prices for Vodacom's mobile data services

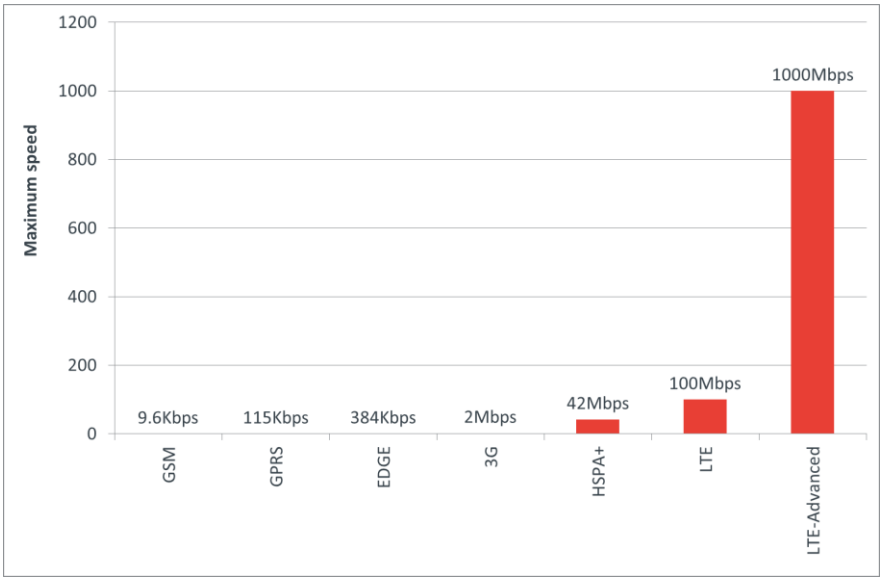


Source: Frontier calculation based on Vodacom's data

Impact on speeds

Investing in equipment offering the latest technologies helps to significantly increase both peak and average speeds. The following figure shows the increase in peak speeds offered by each successive technology generation.

Figure 10 Max speeds of different technologies



Source: http://www.itu.int/en/ITU-D/Technology/Documents/Events2013/RegionalForumIMT_ARB_Tunis_May2013/Presentations/RegForumIMT_2013_ARB_Tunis_May13_Presentation_AAlRadhi_2.pdf

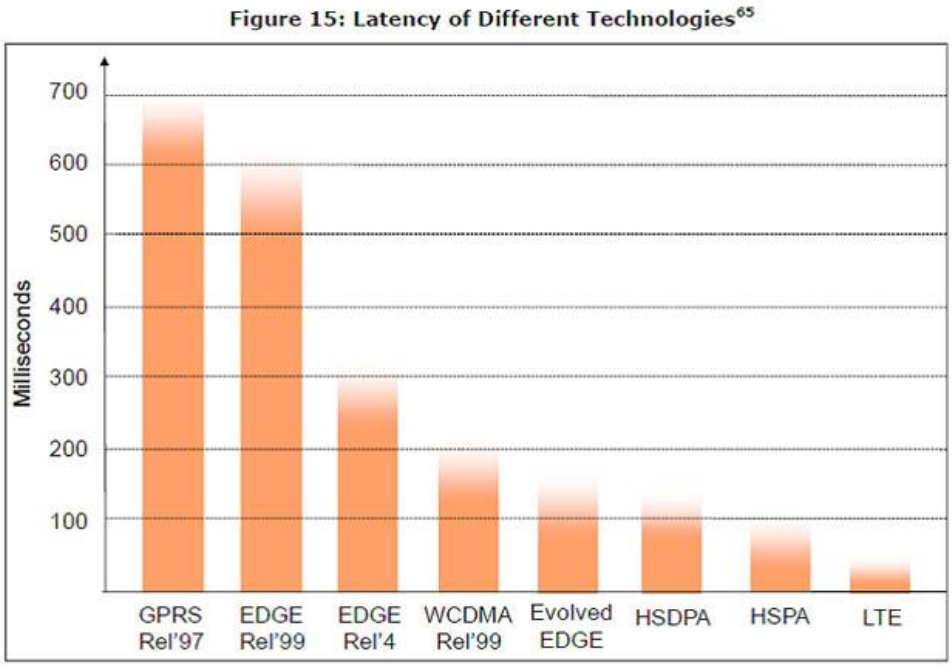
Impact on coverage

Investment in sites in areas where the operator does not currently have coverage will help to increase coverage, thus increasing the availability of mobile services to a larger number of end users, especially in rural areas. Site densification (i.e. new sites in areas where operators already have outdoor coverage) will not increase outdoor coverage, but could still increase in-building coverage (which is relevant for densely populated urban areas where indoor coverage can be an issue).

Impact on latency

Increased investment in new technologies helps to reduce latency - that is, the time taken for packets of data to be sent to/from mobile users - which tends to fall significantly with each new generation of technology, as illustrated by the figure below. Low latency is vital for applications where network responsiveness is important – for example, low latency will significantly improve the consumer experience of video calls and real-time online gaming. Latency will be particularly important when 5G becomes available, as a number of potential applications for 5G networks (e.g. virtual reality, driverless cars and remote operations) are highly dependent network responsiveness.

Figure 11 Latency of different technologies



Source: *https://delimiter.com.au/2011/03/22/will-nbn-wireless-latency-match-adsl/*

Impact on usage

Consumers' usage of mobile networks is likely to depend on a range of factors, such as unit prices, network speeds, coverage, latency and reliability. Therefore, to the extent that investment improves these other factors, investment is also likely to increase usage

3.1.2 The role of spectrum

Providing operators with adequate access to spectrum in a timely manner is key to ensuring that they are able to deliver high quality mobile services to a wide range of users in a cost-efficient manner. In particular, by:

- **Reducing coverage-related costs**. Low frequency spectrum, which has good propagation properties, reduces operators' costs of increasing coverage. In the absence of low frequency spectrum, operators require many more sites and network equipment to serve a given geographic area; and
- **Reducing capacity-related costs**. High frequency spectrum can carry more data than lower frequencies and therefore reduces operators' costs of expanding capacity, since fewer sites are required. Furthermore, trying to compensate for a lack of spectrum through network densification in densely populated areas may not be possible e.g. due to interference. Going forward, operators will need to expand capacity as data usage rapidly increases. Without additional high frequency spectrum, operators will need to invest in more sites and equipment than they would need to if this spectrum were made available. They may also face capacity constraints if densification is unable to offset the lack of spectrum. Overall, this is likely to give rise to higher unit costs and higher prices for consumers.

3.2 Network competition, investment and transition to new mobile technologies

Competition and investment - theory

Where there are competing networks, operators would typically have an incentive to differentiate their services by seeking to introduce new technologies in advance of their rivals, as there is a chance to steal competitors' customers and hence earn higher profits than before (or reduce the risk of losing profits to a competitor who innovates before oneself). This competitive dynamic encourages all operators to invest in new technologies as soon as possible, all else equal. In competitive markets, there will also be more firms who are searching for innovations and this increases the probability of an innovation being discovered.

Furthermore, under conditions of network competition, the diverse and varied needs of consumers can be met by different operators in different ways. Each may operate and run its network in slightly different ways in order to develop retail products which fulfil different needs. If one operator fails to address a particular requirement, it is likely that another

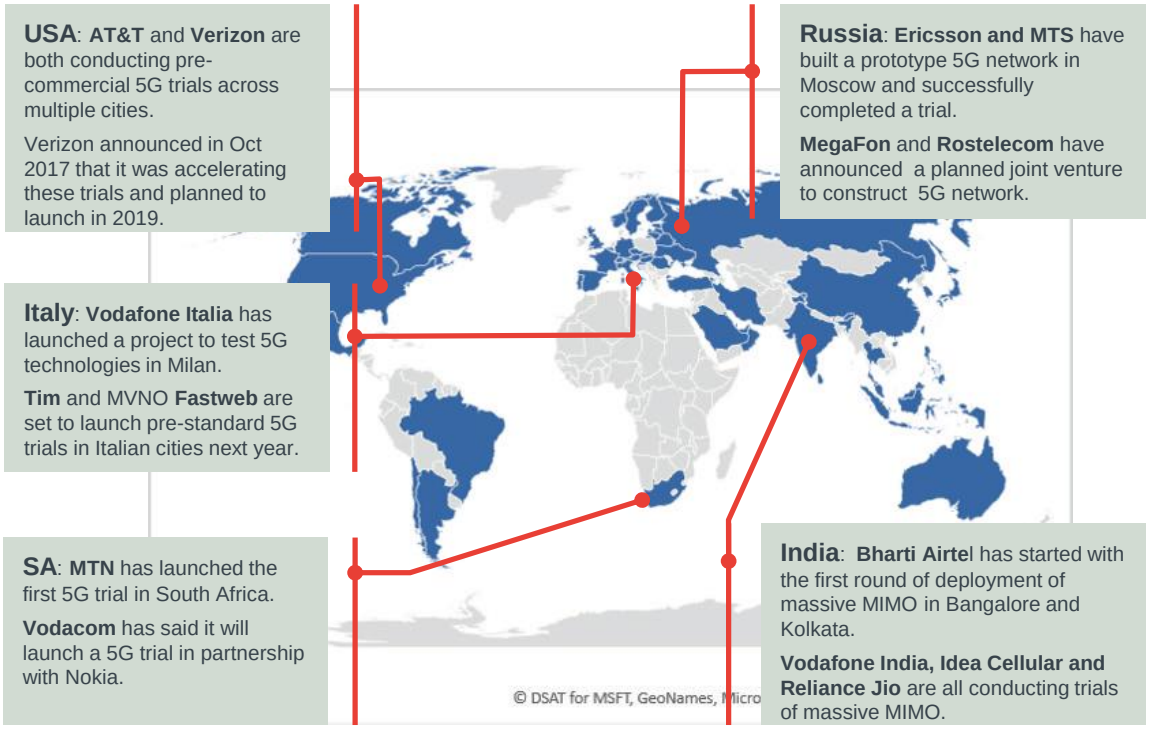
network operator will do so instead. Thus, competition encourages operators to develop innovative new products that fulfil consumers' needs.

Economists and policymakers recognise that the incentives to invest and innovate are much weaker in markets where there is a single dominant firm with an unassailable advantage. This is because the incentives for the dominant firm to introduce and develop innovative improvements to their products are limited, as the new innovation will often displace the previous technology or product. This is often referred to as the "replacement effect."

Empirical evidence

There is significant evidence of competition driving investment in next generation mobile technologies from mobile operator initiatives in competitive markets throughout the world, including South Africa, as the mobile industry is now in the process of transitioning to 5G technology. According to the Global mobile Suppliers Association (GSA), by the start of January 2018, 113 operators in 56 countries (spanning the OECD and BRICS regions) had demonstrated that they are testing, or trialling, or have been licensed to begin field trials of 5G-enabling and candidate technologies see Figure 12 below. [47]

Figure 12 Examples of 5G trials from international mobile markets



Source: GSA and various news sources

In the US, one of the global leaders in the deployment of new mobile technologies, the deployment of 5G has frequently been characterised within the press as a "race" between operators:

[47] GSA (January 2018), 5G Update – Global Market Trials, page 2

> "…*the stage is set for 5G wireless race in the U.S. telecom space. With the U.S. telecom industry continuously evolving, companies in the league are* ***fighting it out to stay abreast of competition***." – Nasdaq, January 2018"
>
> ***5G Race Accelerates*** *With AT&T Mobile 5G Plans Announced for Late 2018*" – Telecompetitior, January 2018
>
> "*Verizon* ***isn't the only company racing toward 5G****. AT&T has already tested 5G as a broadband replacement in an Intel office in Austin, Texas…*" – CNET, November 2017

In South Africa, MTN has launched the first 5G trial (in both South Africa and the broader Africa region) in January 2018 in partnership with networking equipment vendor Ericsson:

> *"MTN has tested a range of* ***5G use cases and applications in its test lab proof of concept in South Africa****, which will lead to commercial deployment in the near future,"* [48]

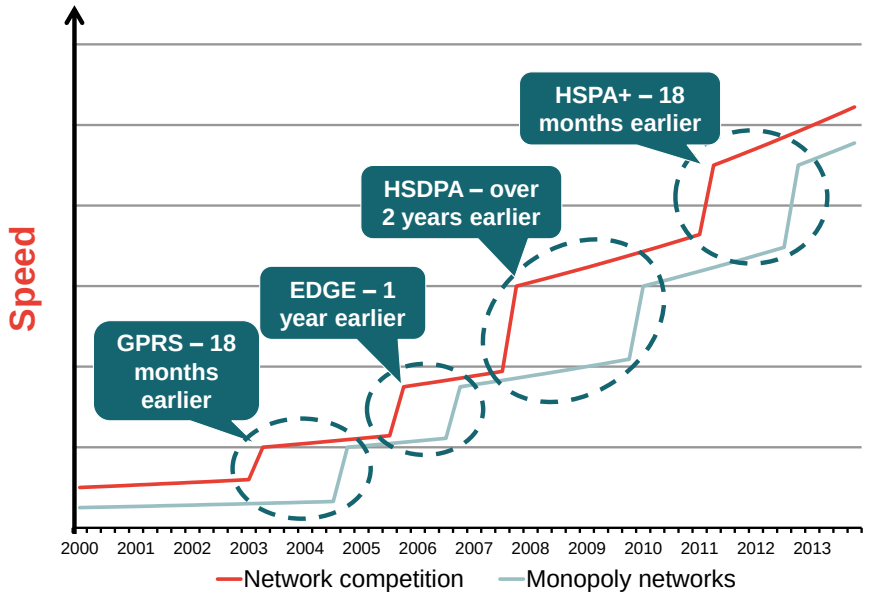
In November 2017, Vodacom stated it would launch a 5G trial in partnership with Nokia, but hasn't yet provided any further details. Working with Vodacom in a series of workshops and trials, Nokia would test "*how 5G technology could be used to meet demand in South Africa*".

Further the available empirical evidence supports the hypothesis that monopolists are slower to innovate and migrate to new mobile technologies[49]. As the chart below shows, markets with network monopolies have been markedly slower than competitive markets to transition to new technologies. For example, **HSDPA (3G) was typically launched *over two years* later in single network countries.**

[48] https://techcentral.co.za/mtn-launches-5g-trial-johannesburg-gets-20gbit-s/78938/

[49] See for instance GSMA report on Single Wholesale Networks https://www.gsma.com/publicpolicy/assessing-the-case-for-single-wholesale-networks-in-mobile-communications

Figure 13. Diagram showing timing of technology upgrades



Source: GSMA

This slower transition to new technologies also contributes to lower take-up of new services. In fact, markets with monopolistic provision of mobile services were estimated to lead to, on average, a **17 percentage points lower 3G take up** than under network competition, after controlling for other factors driving 3G take up.

A number of academic studies have also demonstrated the key role that the opening up of markets to competition has had on driving investment. These include Alesina et al. (2005)[50], Li (2008)[51] and Wallsten (2001)[52] who all find a positive relationship between competition and investment.

The success of network competition in delivering good consumer outcomes helps explain why the majority of countries now rely on network competition in mobile markets. As shown by Figure 14 below, many countries have switched from monopoly networks to network competition since 2000. The only remaining countries with monopoly networks[53] either tend to be small and/or have low GDP per capita. In addition, as far as we are

[50] Alesina A. et al. (2005) "Regulation and Investment"

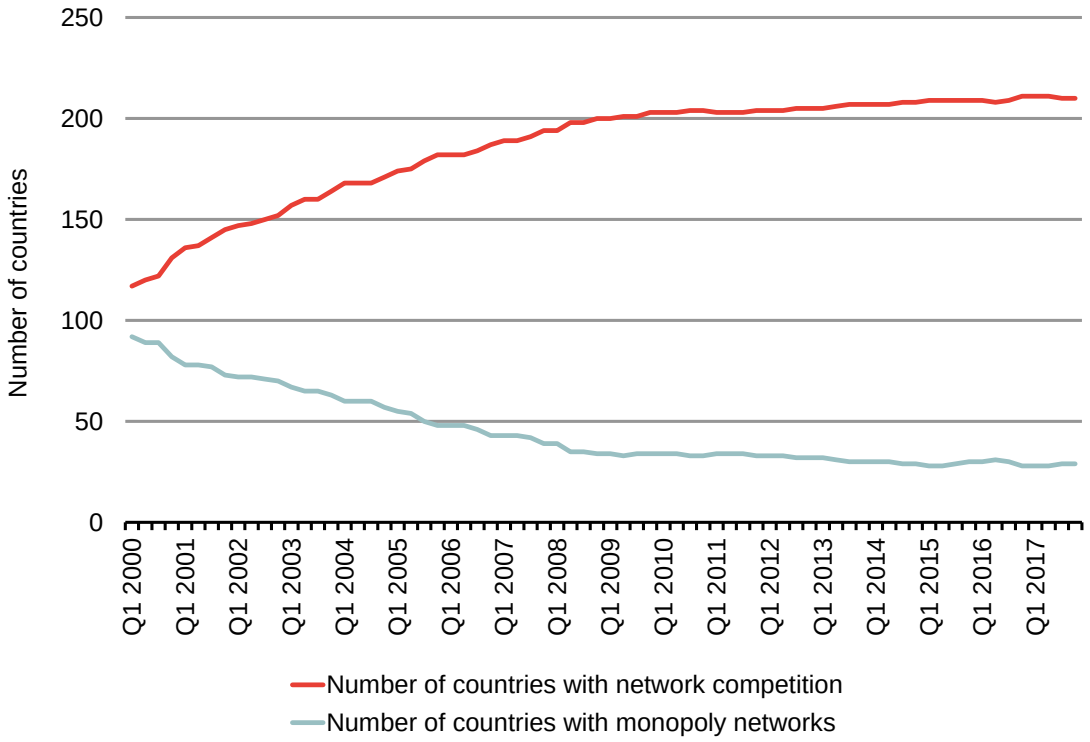
[51] Li, W. & Xu, L. C. (2004), "The impact of privatization and competition in the telecommunications sector around the world"

[52] Wallsten, S. J. (2001) "An econometric analysis of telecom competition, privatization and regulation in Africa and Latin America"

[53] Aland Islands, Andorra, Cocos (Keeling) Islands, Cook Islands, Cuba, Diego Garcia, Djibouti, Eritrea, Ethiopia, Falkland Islands, Gibraltar, Kiribati, North Korea, Marshall Islands, Micronesia, Monaco, Nauru, New Caledonia, Niue, Norfolk Island, Palau, Saint Helena Ascension and Tristan da Cunha, Saint Pierre and Miquelon, San Marino, Svalbard and Jan Mayen, Swaziland, Turkmenistan, Tuvalu, Wallis and Futuna Islands.

aware, there are **only two examples** of countries which have decided to establish a national mobile WOAN and where this project have reached the build-out phase – in Rwanda and Mexico (as discussed in more detail in Annex A).

Figure 14 Number of countries with network competition and single networks



Source: GSMA

3.3 The impact of the Bill during the transitional period of the WOAN establishment

3.3.1 The impact of spectrum constraints

The allocation and use of spectrum will be delayed

The Bill proposes that unassigned HD spectrum will first be allocated to the WOAN. Any remaining unassigned HD spectrum will only be made available to other operators once the WOAN has become functional, which is likely to take several years, as explained earlier. As such, the Bill would result in a significant delay in the release of high demand spectrum compared to the alternative scenario where the spectrum would be expected to be released imminently through an auction process, as set out by ICASA's existing ITA (or alternatively based on a new ITA following an ICASA study).

In addition:

- operators must each first commit to renting at least 30% of the WOAN's capacity before they are granted licenses to unassigned spectrum; and
- operators must meet certain USO targets for rural and under-serviced areas before they can use additional spectrum in other areas, which would mean a further delay for the deployment of additional spectrum in high-usage urban areas.

This will put pressure on mobile network capacity in South Africa, given the expected growth in demand for mobile data and relatively low amount of spectrum available to mobile operators in South Africa at present. [54]

Further, limited access to low-frequency spectrum will constrain operators' ability to expand coverage of 4G services in a cost-efficient manner; without access to sufficient low-frequency spectrum, operators require many more sites and network equipment to serve a given geographic area.

The WOAN may be given a large share of HD spectrum

As we set out earlier in Section 2, the possibility that the majority of unassigned HD spectrum could be allocated to the WOAN means that, when this spectrum is eventually released, MNOs will not be able to acquire sufficient amounts to meet their needs. An efficient allocation of spectrum would be consistent with the unassigned spectrum being allocated through an auction, where bidders that can make more productive use of the spectrum (and hence pay more for it) are allowed to obtain it. Whilst spectrum that has not been assigned to the WOAN may still be allocated through an auction process to existing operators if the Bill is implemented, it is likely that this will represent a much smaller share of the total spectrum available than in the "Amended Bill" scenario. Thus, overall, the allocation of spectrum is likely to be less efficient under the Bill.

Existing spectrum will need to be returned

The Bill sets out that all HD spectrum (including already released and as yet unreleased spectrum) is to be returned to ICASA at some point in the future, with the timeframe and terms and conditions for the transfer of this spectrum to be determined within two years of the commencement of the Bill. The return of spectrum would hamper the ability of operators to make efficient investments in their networks and risk significant asset stranding.[55]

All HD spectrum will be assigned on a non-exclusive basis

The potential non-exclusive assignment of spectrum will make it extremely difficult (or even impossible) for operators to guarantee service delivery and quality. As Vodacom

[54] Operators have to rely on using just 900 MHz, 1800 MHz and 2100 MHz, whilst in many other countries, operators already have access to 800 MHz and 2600 MHz spectrum, and in some cases also 700 MHz spectrum. Further investment is also hampered by the fact that it will be done at a premium to an investment using spectrum with characteristics allowing more cost effective rollout (e.g. using 800 MHz spectrum to roll-out networks in rural areas would be more cost effective that using 1800 MHz spectrum to achieve the same).

[55] This is reflected by the fact that many countries including Canada, New Zealand and the UK have adopted minimum terms of 20 years. Furthermore the European Commission has proposed to introduce a requirement that spectrum licences granted by Member States have a minimum term of 25 years (Proposed Directive establishing the European Electronic Communications Code, September 2016)

sets out in its response, "*until there are global standards that enable interference management and spectrum efficient optimisation under conditions of non-exclusive assignment, and widespread adoption of the technology, non-exclusive assignment of spectrum will create technical problems for any licensee, including the WOAN"* and as such "*Spectrum needs to be assigned on an exclusive basis to avoid interference, achieve effective use and allow for proper network planning and setup of device and radio equipment."*

As such, it is standard practice for high demand spectrum frequencies used by mobile networks to be assigned on an exclusive basis. Whilst there is some precedent for regulators exploring the possibility of non-exclusivity provisions relating to certain frequencies used by mobile operators (as we set out in Part II), the costs and benefits of any such potential opportunities should be carefully assessed and measures put in place to manage the risk of harmful interference.

3.3.2 The impact of other Bill amendments on the incentives of MNOs to invest

All mobile network operators with exclusive use of spectrum will be required to provide cost-orientated access to their network infrastructure which, depending on how costs are defined and determined, can reduce the potential returns that operators can make from investments if they are successful, but does not reduce the risk of failure. In addition, any competitive advantage that an investment might bring would also be made available to access seekers, whilst the risks would be borne exclusively by the host MNO. Thus, this form of regulation will discourage operators from expanding or upgrading their networks.

The Bill sets out that new licences will be renewable on an annual basis, regardless of licence duration. Making future licences subject to an annual renewals process is likely to counteract the potential dynamic efficiency benefits associated with long licence periods, by undermining certainty of tenure. The EC is moving in the opposite direction, as it has recently proposed to increase the length of spectrum licences to 25 years to ensure that mobile operators have strong incentives to invest. The Bill therefore creates uncertainty regarding the duration of spectrum licences, which is expected to undermine investment incentives. Part II considers the impact of these proposals in more detail.

3.3.3 The impact of the Bill on the speed of migration to more advanced technologies

The speed at which consumers migrate to new technologies will be determined by the availability of more advanced technologies (e.g. coverage), the relative price of more advanced technologies compared to older technologies (e.g. the relative prices between 4G and 3G) and the increased quality of service (e.g. speeds) that they can achieved by upgrading. Under the "Bill scenario":

- **Coverage of the more advanced technologies is likely to be lower**. Under the "Bill scenario", the coverage of the more advanced technologies is likely to be lower because:

- As we set out above, existing operators will have dampened incentives to invest in expanding coverage and will lack sufficient low frequency spectrum (i.e. 700 MHz and 800 MHz)[56] for use with more advanced technologies; and
- It is possible that the Bill will slow down spectrum re-farming by imposing more administrative hurdles.

- **The relative price of the more advanced technologies may be higher**. Existing operators are likely to lack 4G capacity due to their limited spectrum holdings and their low incentive to invest in measures to increase capacity. When operators set prices, they are likely to take into account how much capacity they have available. Therefore, they are likely to set higher prices for 4G relative to the "Amended Bill scenario" where they would have greater capacity to fill.
- **The increased quality of service that can be gained by upgrading may not be so great**. The lack of 4G capacity due to spectrum constraints and low investment is also likely to impact the quality of service of 4G networks, particularly in terms of speeds. Therefore, the benefit from consumers migrating to 4G will be lower as a result of the Bill, as the speed differential between 4G and 3G may be lower.

In summary, under the "Bill scenario", the migration to more advanced technologies on MNOs' networks can be expected to be significantly slower than under the "Amended Bill scenario".

3.3.4 The overall impact of the Bill on mobile users in the transitional period

Below we summarise the expected impact of the Bill on consumers in the transitional period.

- Slower migration to more advanced technologies is likely to lead to higher prices (due to higher unit costs), slower speeds and higher latency;
- **Lower incentives for existing operators to invest** in innovative new services will most likely result in **less choice for consumers;**
- Lower incentives to invest, together with **limited access to low frequency spectrum** will also most likely mean **lower 4G coverage; and**
- The combined effect of the above outcomes is likely to lead to **lower data usage.**

All of these impacts in the transitional period are likely to be negative, and will arise due to a lack of spectrum and low incentives to invest. We quantify some of these impacts (e.g. prices, data usage, coverage and speeds) in Section 4 below.

In the **long run**, existing operators are unlikely to be important players at the network-level, given that the market structure is likely to converge towards the WOAN being a

[56] At present, the only low frequency spectrum that operators have access to in South Africa is in the 900 MHz band. Since this is still required to serve 2G and 3G customers, they are unable to re-farm it for 4G and have had to rely on 1800 MHz instead. This makes providing 4G coverage more expensive, since more sites are required to compensate for the poorer propagation properties associated with higher frequencies.

dominant operator. The long-term market outcomes will therefore be largely determined by the expected performance of this dominant WOAN – we return to this below.

3.4 The longer-term impact of the Bill under a dominant WOAN

Below, we consider the main costs and benefits that a dominant WOAN would be expected to generate in the long run. These will in turn influence consumer outcomes in terms of availability, price and quality of mobile services in South Africa.

3.4.1 The costs of a dominant WOAN

Costs from establishing a dominant WOAN

Dominant operators tend to set prices above the competitive level - that is the level required for it to recover its costs (including a reasonable return on capital). This is because, without any competition in the market, customers have no viable alternatives other than to stop using the product altogether. Further, dominant operators tend to face less pressure to be efficient and minimise their costs. This is because they are not concerned about more efficient rivals who may undercut their prices and thereby steal their customers. A lack of competitive pressure, together with the "replacement effect", means that monopolists have weak incentives to invest and innovate. As such, with a dominant WOAN under the "Bill scenario", we would expect to see lower investment and a slower transition to new technologies in the long run.

For these reasons, regulation will be required to mitigate the potential harm caused by a dominant supplier. For example, The Ministry or ICASA may set wholesale prices which are intended to encourage the monopolist to improve the efficiency of its operations (e.g. through RPI-X caps), or to encourage retailers to expand their output (e.g. through 'two part' charges)[57]. The Government/ICASA could be expected to set coverage targets in an effort to accelerate or extend roll out, or require the WOAN to upgrade its network at specified dates (e.g. by benchmarking against other countries). They can also define the speeds of the services, or other aspects of the quality of the services to be provided.

However, the Government/regulators will generally not have all the relevant information to mimic competition, and this information deficit is worse in uncertain environments, such as the telecommunications sector, where there is rapid demand and technology change. This leads to what economists call "information asymmetry". Economists and policymakers generally therefore consider that regulation is an imperfect substitute for competition (even if regulators have adequate resources to apply it).

[57] Two-part charging is a pricing approach where the price for a product or service is composed of a fixed lump sum fee as well as a unit charge. This enables operators to expand their output by allowing for a degree of price discrimination.

The risk of failure

Under the Bill plan, a large share of traffic would be delivered through the WOAN and a large proportion of spectrum may be allocated to the WOAN, limiting the spectrum available to the MNOs for use on their own networks. As such, the disruption caused by the failure of the WOAN would be significantly greater than the failure of a single MNO given the alternative networks available in this case.

Since there would be limited alternatives for the provision of a large share of key mobile services under the Bill plan, the WOAN could become 'too important to fail'. Even though the Government is not intending to provide funding to the WOAN, pressures will mount if the WOAN were facing financial difficulties. This creates a further risk that a scenario may result where the WOAN is reliant on Government support[58]. There is also a concern that network resilience could be compromised if the WOAN becomes a dominant operator. In contrast, under network competition there are multiple overlapping networks that can be relied on if one operator is having network issues.

3.4.2 The benefits of the WOAN

There are also number of arguments in favour of a WOAN:

- A WOAN could reduce network duplication;
- The WOAN may benefit from spectrum aggregation; and
- A WOAN may facilitate retail competition.

Reducing network duplication

With multiple national networks, each network will incur coverage related costs and then each network will incur the traffic related costs associated with their own subscribers. In contrast, where there is only a single supplier, only one set of fixed "coverage" costs will need to be incurred and the resulting **total costs of the network should be lower**. There are reasons for which this cost saving in South Africa may well be relatively limited:

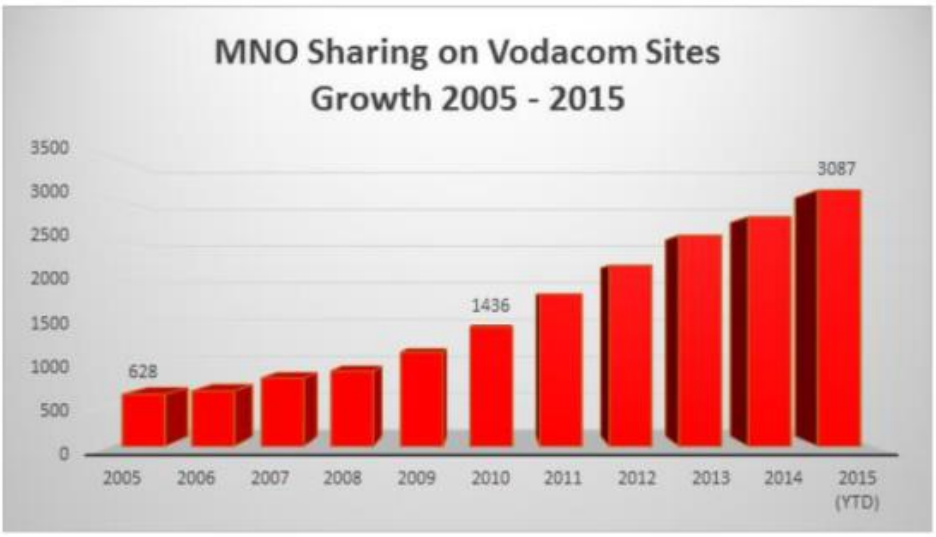
- With the "competitive WOAN", implemented under the "Amended Bill scenario", there would likely be an opportunity for reduction of duplication in rural areas. Some of the benefits from avoiding duplication are likely to be achieved by the "competitive WOAN" being focused on more rural areas. Given this, the additional benefits from avoiding duplication under a dominant WOAN in the "Bill scenario" may be limited;
- The population in South Africa is concentrated in a relatively small geographic area – around 95% of the population occupies 8% of the geographic area[59];

[58] This risk is illustrated by South Africa's electricity market, which is dominated by a single producer – Eskom. Eskom has faced significant financial difficulties in recent years and has had to rely extensively on government support (https://www.bloomberg.com/news/articles/2017-07-13/south-africa-to-deepen-support-for-eskom-in-economy-revival-plan).

[59] Vodacom

- Existing roaming agreements limit the extent of duplication. In South Africa, the two smaller operators use national roaming, hence the geographic coverage of their networks is much lower than the geographic coverage of the two larger operators; and
- There is already an extensive facility sharing in place for sites and towers in South Africa. Infrastructure sharing in the mobile sector is taking place through commercial agreements, such as electronic communications facilities leasing agreements**. Figure 15** shows how Vodacom has been sharing an increasing number of sites over time.

Figure 15 The sharing of Vodacom's sites



Source: Vodacom

In addition, there are practical and economic limitations to the number of mobile radio carriers that can be accommodated on towers, as explained in Vodacom's response.[60]

On balance, any potential benefits from reducing network duplication under the Bill scenario are likely to be modest. For the purposes of our quantitative modelling presented below, we have included a sensitivity estimate where a dominant WOAN generates up to 20% savings in network costs as a result of reduced network duplication (combined with improved spectrum aggregation, as discussed in the next section).

Spectrum aggregation

Another potential benefit of a WOAN (operating as a single network provider) would be the ability to deploy the available spectrum in a given band in one block, rather than divide this spectrum among a number of competing operators. Such aggregation can bring a number of theoretical benefits with current LTE technology. In particular, aggregation enables larger carrier bandwidths which in turn mean higher peak user bandwidths. In addition, larger carriers display marginally higher spectral efficiency – that is they can

[60] Vodacom response, Section 4.3

carry a slightly greater volume of information for a given quantum of spectrum than if the spectrum were split over two or more carriers.

In practice, however, these benefits from spectrum aggregation under the "Amended Bill scenario" are likely to be limited:

- **Benefits are less likely to apply in urban areas**. Larger high frequency carriers and techniques such as MIMO can provide greater gains in capacity and peak speeds;
- **In rural areas, use of spectrum is driven primarily by coverage requirements** and the capacity benefits of spectrum aggregation are therefore unlikely to be an important factor here; and
- **Future technologies will make spectrum fragmentation less of an issue.** For instance, by allowing the aggregation of non-contiguous carriers.

In addition, Vodacom notes in its submission that given the large amount of spectrum allocated to WOAN and the technical constraints on the volume and the type of spectrum that can be carrier aggregated, it is possible that it will not be able to fully utilise its spectrum holdings. [61]

Whilst the overall gains in spectral efficiencies from aggregation may lead to marginal increases in network capacity (i.e. less than 10%) in dense urban areas where the network is traffic constrained[62] (assuming user equipment allows this). These areas are likely to represent only a relatively small part of the total cost of the network. We note also that future developments from next generation mobile technologies, such as 'massive MIMO' could potentially increase spectral efficiency by many orders of magnitude, i.e. 100 times the potential gain from large carriers, reducing further the relative significance of spectral aggregation efficiencies.

On balance, based on the information available, it seems reasonable to consider that any efficiencies from spectrum aggregation in practice by a WOAN under the Bill scenario would be unlikely to be material. In our quantitative modelling, we have therefore incorporated these in our analysis of the impact of potential cost savings from lower network duplication under the "Bill scenario".

Enhanced retail competition[63]

The effectiveness of retail competition is strongly influenced by the network-level, as retailers' products and prices are dependent on what wholesale products are on offer.[64] A

[61] Vodacom submission, Section 4.3

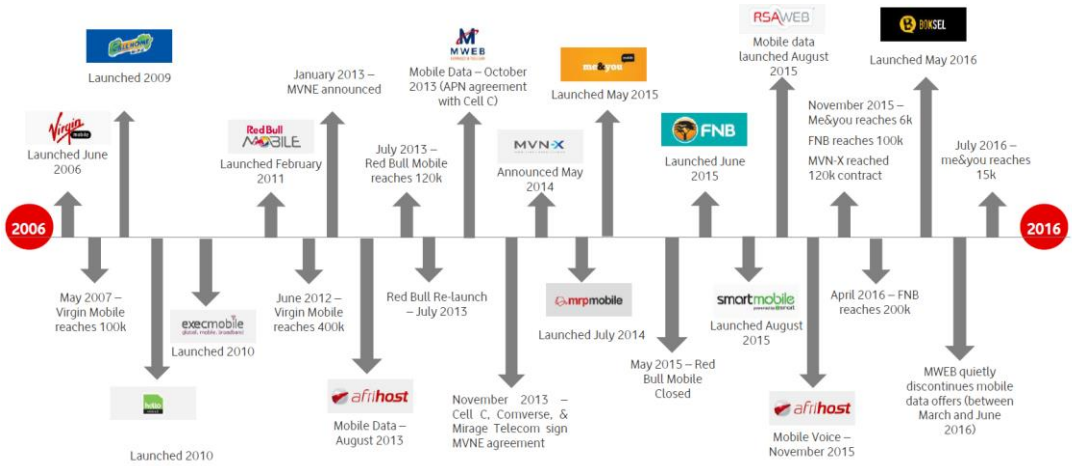
[62] Frontier Economics (2014), Assessing the case for Single Wholesale Networks in mobile communications, page 60

[63] The evidence from the mobile market in Rwanda – the only market with a national WOAN at time of writing – indicates that there is no sign that mobile broadband services have become more affordable because of Government intervention, according to data from the regulators website and advertised retail tariffs. On the contrary, operators appear to be offering 4G services, delivered over the WOAN, at a substantive premium to 3G services offered over their own networks (see ANNEX A for more detail). This contrasts with the cost of voice services, which has fallen over the same period. We note also that the WOAN in Rwanda co-exists with the other MNOs networks.

dominant WOAN should serve as an enabler of retail competition, by serving as an alternative, wholesale only, provider of upstream services. Therefore, we recognise the WOAN could increase retail competition compared to the current situation. However, going forward, retail competition is also likely to increase under the Amended Bill scenario. As a result, it is not obvious that under the Bill, there will be greater retail competition vis-à-vis this alternative scenario, as:

- There continues to be retail competition between the four vertically integrated MNOs together with the MVNOs that are hosted on their networks;
- The MVNO market continues to develop (**Figure 16** below highlights the significant developments in the MVNO landscape in South Africa in recent years);
- Retail competition could be further strengthened through MVNO obligations under the ICASA ITA, and possible additional measures following the ICASA priority markets inquiry; and
- Retail competition is promoted via a "competitive WOAN", which would compete alongside existing operators, and would also be a wholesale only provider.

Figure 16 Ten-year timeline of MVNO launches and announcements



Source: Vodacom

The benefits from increasing retail competition are also likely to be subject to diminishing returns. For example, there are likely to be much greater benefits from moving from a single player to multiple players than there is from moving from a large number of players to an even higher number of players. Further, the potential benefits of any increase in retail competition are likely to be relatively limited as downstream operators only compete across the retail section of the supply chain and, since these operators will not have

64 In theory, it may be possible for the WOAN to provide a wider range of differentiated wholesale products to competing MVNOs to meet the needs of consumers in exactly the same way. In practice however, there will be technical and practical limitations to offering every MVNO the variety of wholesale products that is conceivable: for example, it may be technically necessary not to provide another MVNO to minimise interference issues; it may be too complex/unprofitable to develop low volume scale bespoke wholesale products to meet every demand from the MVNOs.

control over the underlying network, they will be reliant on the network operator to deliver any substantive improvements in service quality. Indeed, the OECD has noted that:

"*While MVNOs may enhance retail competition, where the wholesale prices they pay provide the incentives for them to so, their contribution is limited compared to MNOs. MNOs keep control of their network investment decisions and can significantly differentiate the service quality offered to their customers driving innovation and long-term competition…*"[65]

We therefore came to the view that, on balance, we should not expect any material difference in retail intensity under the Bill scenario, if there was an effective "competitive WOAN" established under the Amended Bill scenario. As a result, we have not considered this effect explicitly in our quantitative modelling.

3.4.3 The overall impact of the Bill on mobile users in the long-term

In the long-term, consumers are likely to be impacted by the Bill in a number of different ways. The following figure summarises how the Bill is likely to impact different consumer outcomes in the long-term.

[65] OECD (2016), Digital Convergence and Beyond: Innovation, Investment, and Competition in Communication Policy and Regulation for the 21st Century, p. 41

Figure 17 Impact of the Bill on consumers in the long-term

	Positive effect on consumer outcomes	Detrimental impact on consumer outcomes
Prices	▪ Reduction in network duplication will put a downwards pressure on prices ▪ Spectrum aggregation may lead to modest cost efficiencies ▪ Increase in retail competition relevant to the current situation will reduce prices (although increase in retail competition unlikely to be higher than under the Amended Bill scenario)	▪ Slower migration to more advanced technologies is likely to lead to slower price reductions given that costs will fall less quickly ▪ Cost inefficiency due to lack of competitive pressure will result in slower price falls (regulation is imperfect way of solving this) ▪ Less pressure on margins likely to lead to slower price reductions (regulation is an imperfect way of solving this)
Speeds	▪ Spectrum aggregation may boost peak speeds	▪ Slower migration to more advanced technologies is likely to lead to slower speeds
Coverage	▪ WOAN could be subject to strict coverage obligations	▪ Coverage may temporarily disappear with network outages
Latency		▪ Slower migration to more advanced technologies is likely to lead to higher latency
Choice	▪ The number of retailers may be slightly higher under the Bill, although this need not mean there is materially more intensive retail competition	▪ Retailers will be highly reliant on the WOAN's range of wholesale products. A lack of competition at the network-level may therefore lead to less choice at the wholesale-level and hence retail level.
Data usage	▪ The impact on usage is likely to be determined by the combined effect of the above consumer outcomes	

Source: Frontier

4 QUANTITATIVE ASSESSMENT OF THE ECONOMIC IMPACTS OF THE BILL

This section considers the likely impacts of the Bill, in quantitative terms. As with the above qualitative assessment, the analysis in this section is based on a comparison of two scenarios:

- "The Bill scenario" – under this scenario the Bill gets implemented in its current form; and
- "The Amended Bill scenario" – under this scenario the Bill does not get implemented, but the other initiatives are fully applied (LTE spectrum award, Priority market review and competitive WOAN).

The effect of the Bill on the mobile sector and the wider economy can be split into two effects:

- **The detrimental impact** from:
  - the chilling of investment and lack of spectrum during the transitional period until a WOAN is fully functional; and
  - the delay in transition to new and more efficient technologies under a dominant WOAN network market structure.
- **The positive effect** of a WOAN reducing network duplication and potentially benefitting from spectrum aggregation.

We have first assessed the detrimental impact of the transition to a dominant WOAN on data prices, usage, and therefore overall mobile consumer benefits (known also as 'consumer surplus') in both the transitional period and long-term. We also consider whether the positive effect could outweigh the detrimental impact. We then consider the impact of the Bill on speeds and coverage during the transitional period. Finally, we estimate the impact of the Bill on the wider economy.

The following Figure 18 summarises the different impacts that we have modelled. Whilst we have excluded some of the detrimental impacts that may arise as a result of the Bill (in red), we have tried to include all of the possible positive effects (in green). Therefore, our approach can be considered to be conservative.

Figure 18 Effects included in modelling

	Effects included in modelling	Effects excluded from modelling
Prices (Frontier)	▪ Slower migration to more advanced technologies in both transitional period and long-term ▪ Reduction in network costs due to less duplication and/or spectrum aggregation in long-term ▪ An increase in the rate of cost pass-through to capture increased retail competition relative to the current situation (although this increase in cost pass-through applies to both the "Bill scenario" and "Amended Bill scenario" as we do consider that the "Bill scenario" will have greater retail competition than the "Amended Bill scenario")	▪ Cost inefficiency due to lack of competitive pressure will result in slower price reductions (regulation is an imperfect way of solving this) in long-term ▪ Less pressure on margins likely to lead to prices falling less quickly (regulation is an imperfect way of solving this) in long-term
Data usage (Frontier)	▪ Impact of prices on data usage in both transitional period and long-term	▪ Impact of lower speeds on data usage ▪ Impact of lower coverage on data usage ▪ Impact of less choice on data usage
Average speeds (Northstream)	The following impacts during the transitional period are modelled: ▪ Impact of lack of spectrum on speeds ▪ Impact of low incentives to invest in coverage ▪ The impact of a slower migration to more advanced technologies	▪ The long-term impact (all of the effects likely to be negative)
Coverage (Northstream)	The following impacts during the transitional period are modelled: ▪ Impact of lack of spectrum on coverage ▪ Impact of low incentives to invest in coverage	▪ The long-term impact (all of the effects likely to be negative)

Source: Frontier and Northstream

4.1 Approach to estimating the impact on data prices and data usage

We estimate the impact of a slower migration to new technologies under the "Bill scenario" on data prices and data usage. This impact arises because new technologies have significantly lower unit costs, leading to lower unit prices and increasing data usage.

In our analysis, we have assumed that the Bill does not start to have an impact until 2021 which assumes that:

- investment by existing operators is not deterred until 2021 under the "Bill scenario"; and
- the 2.6GHz does not become available until 2021 under the "Amended Bill scenario".

Note that under the Amended Bill scenario, it is possible that the 2.6 GHz spectrum could be deployed before 2021. Also, under the "Bill scenario", it is also plausible that the impact on MNO investment could also be felt before 2021. Nevertheless, we have tried, where possible, to adopt a conservative approach to our assumptions and estimation, hence we assume that there would be no difference in the evolution of the market under the two scenarios before 2021.

Below we explain our approach in five steps. In our modelling, we explicitly model the period up to 2030 and then assume that a steady state is reached up to 2040.

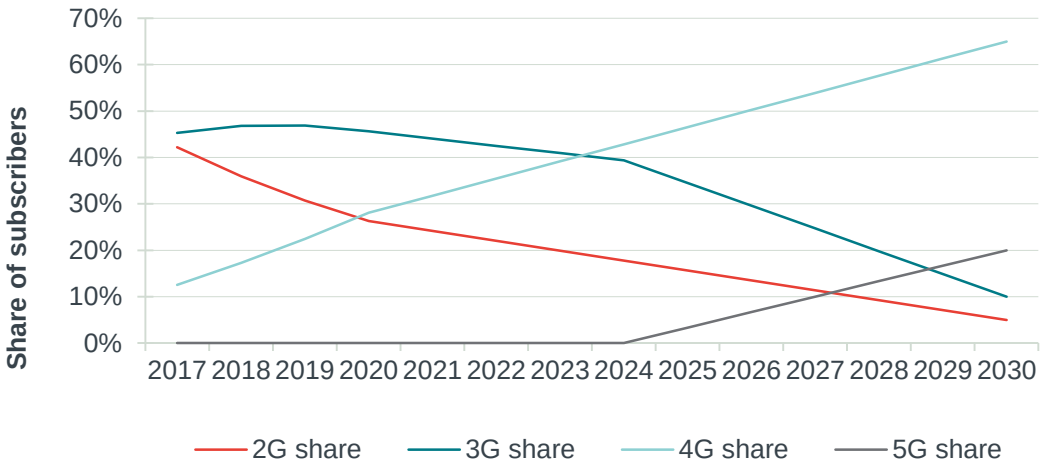
Step 1 – evolution of mobile subscribers in the "Bill scenario" and "Amended Bill scenario"

"Amended Bill scenario"

For the "Amended Bill scenario", we have taken forecasts from the GSMA (which run up to 2020) and projected these to 2030, using a linear trend. We have assumed that:

- the rate of transition to 4G continues to 2030 at a slightly slower pace than the GSMA forecasts meaning it reaches 65% by 2030;
- by 2030, only 5% of subscribers remain on 2G;
- subscribers begin moving to 5G in 2025 and 20% of subscribers have transitioned to 5G by 2030; and
- the remainder of subscribers are on 3G, meaning the share of subscribers on 3G declines with only 10% of subscribers on 3G by 2030.

Figure 19 Share of subscribers by technology under the "Amended Bill scenario"



Source: GSMA and Frontier

"Bill scenario"

We assume that migration follows the same pattern up to 2020 under the "Bill scenario". As explained above, the WOAN under the Bill scenario is unlikely to become functional before 2025; and we expect a significant slowdown in deployment (and transition to) new technologies in the period 2021-2025 as a result of MNOs not having access to additional spectrum and their investment incentives being dampened by low expected returns and uncertainty resulting from the Bill. Between 2021 and 2025, we therefore assume that migration to newer technologies under the Bill scenario takes place at a slower pace, such that it takes five years in the "Bill scenario" to achieve the same progress in terms of transition to next generation technologies as one years' worth of progress in the "Amended Bill scenario". Therefore by 2025, the "Bill scenario" resembles the "Amended Bill scenario" at the end of 2021 – this is our base case assumption. Nevertheless, we recognise that there is significant uncertainty around the period of time it would take for a WOAN under the Bill to become fully functional, and we have therefore undertaken sensitivities around this to test how the economic impact would vary if this period was shorter (or longer).

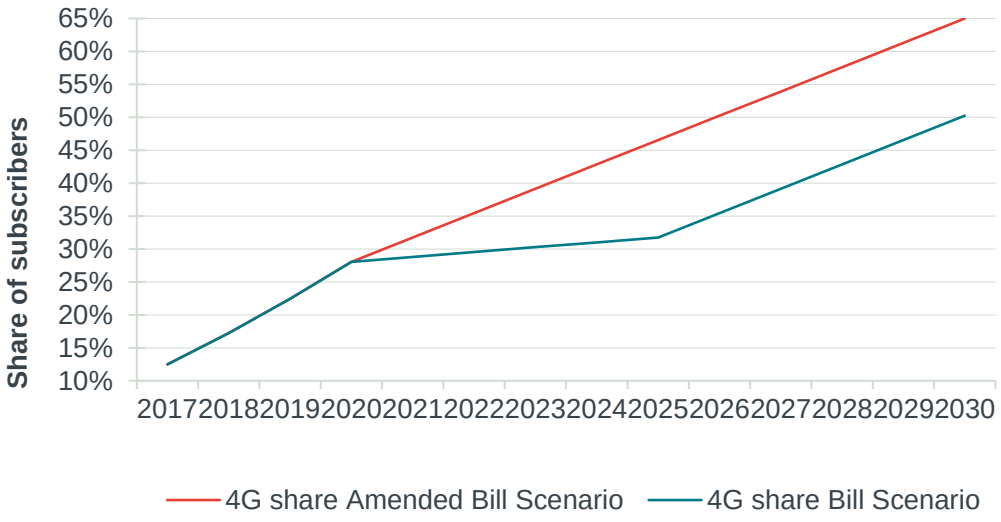
In the base case, after 2025 we have assumed that the deployment and migration to new technologies happens at the *same speed* under both the "Amended Bill scenario" and the "Bill scenario". Therefore, the difference between the "Amended Bill scenario" and the "Bill scenario" persists, but does not worsen, once the WOAN becomes fully operational. We consider that this approach is conservative, as:

- The Bill will lead to the WOAN being a dominant operator in the long run, implying that there could be a widening of the technology take-up gap between the "Amended Bill scenario" and "Bill scenario" after 2025 (we present a sensitivity where the gap worsens after the transitional period in Section 4.1.2); and
- There is also a realistic possibility of the transition to a fully functional WOAN taking longer than seven years.

Migration to 4G and 5G under the "Bill scenario" and "Amended Bill scenario"

The following figures show the evolution of 4G and 5G mobile subscriber shares under both the "Bill scenario" and "Amended Bill scenario". As per Figure 20, the share of 4G subscribers under the "Bill scenario" remains approximately 15% lower than under the "Amended Bill scenario" from 2025 onwards.

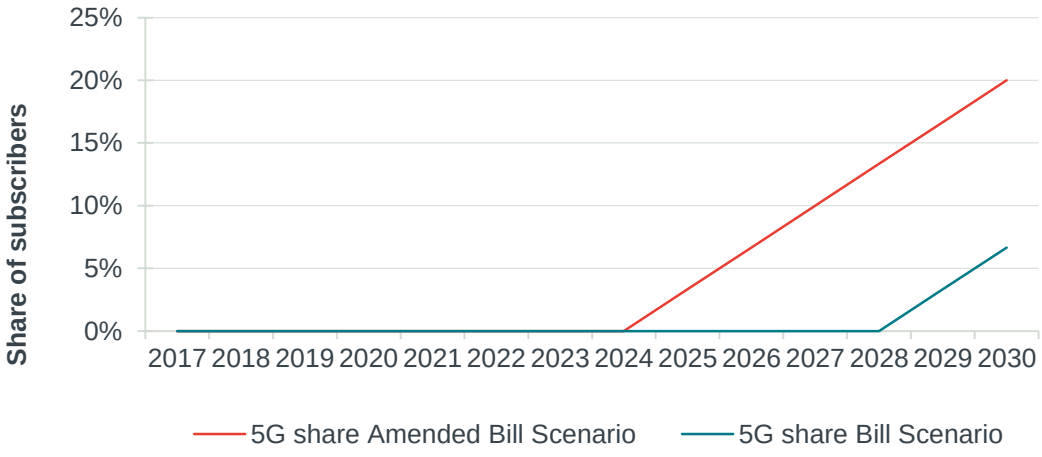
Figure 20 4G share of subscribers



Source: Frontier

Similarly, Figure 21 shows the share of 5G subscribers stays approximately 13% lower in the "Bill scenario" than in the "Amended Bill scenario" throughout the period 2025-2030.

Figure 21 5G share of subscribers



Source: Frontier

To calculate how the slower migration to new technologies will impact the average unit network costs in the "Bill scenario", we need to convert the forecasts for the subscriber mix into a traffic mix, given that the average usage per subscriber will typically be higher for more advanced technologies e.g. the average 4G subscriber consumes more data than the average 3G subscriber.

Step 2 - estimating unit costs under the "Bill scenario" and "Amended Bill scenario"

Unit costs consist of both network and non-network costs. We model how both of these will change going forwards. Based on data from Vodacom, we assume that in 2016, network costs represent 50% of total costs with non-network costs representing 50% of costs. This ratio changes over time as total traffic increases and the cost allocation evolves as described below.

Step 2a – estimating network unit costs

We estimate network unit costs by combining the traffic mix from step 1 (under both the "Bill scenario" and "Amended Bill scenario") with the estimated unit costs of each technology. We have used Ofcom's 2015 MTR model to estimate the unit costs of different technologies and then calibrated these to South Africa based on its 2016 unit price for data[66].

Step 2b – estimating non-network costs

We estimate how non-network unit costs will evolve over time by taking into account that, based on historic trends, a greater proportion of non-network costs will be recovered from data services: we estimate, using information on the historic evolution of this share for Vodacom, that 92% of total non-network costs will be recovered from data services by 2030. Overall non-network costs are also likely to increase over time as the number of subscriptions increases[67].

Increases in data usage will allow operators to recover their non-network costs over an ever increasing volume of data (we have assumed that total data usage will increase by 25% per year up to 2040 – we explain the reasons underlying this assumption in the next step). As a result of the growth in data, non-network unit costs fall over the period of our modelling. We have assumed that they fall by the same amount under the "Bill scenario" and "Amended Bill scenario". This is conservative, as in reality non-network costs should fall quicker under the "Amended Bill scenario" due to there being higher data usage thereby leading to greater economies of scale.

Step 3 - estimating unit prices under the "Bill scenario" and "Amended Bill scenario"

We assume that unit prices are closely related to unit costs. However, in the first year of our modelling (2018), we assume that the cost pass-through is high, but incomplete. In particular, we assume a cost pass-through rate of 90%, which means that if costs fall by 1RAND, then prices will fall by 0.9RAND.

Under both the "Amended Bill scenario" and "Bill scenario", there are a number of measures promoting retail competition, particularly from 2021 onwards (see Section 2). Therefore, we assume that the cost pass-through rate increases over time from 2021, such that the cost pass-through rate reaches 100% by 2025. This implies a fall in the

[66] We have estimated South Africa's unit price for data based on information on data revenues and data usage from ICASA's "2nd report on the state of ICT Sector in South Africa" (March 2017)

[67] We projected an increase of c. 3% per annum.

profitability of the industry over time, consistent with the achievement of the Government objective of intensifying service based competition.

Step 4 - estimating data usage under the "Bill scenario" and "Amended Bill scenario"

Estimating data usage under the "Amended Bill scenario"

We have assumed that data usage grows by 25% per year under the "Amended Bill scenario". Cisco estimates that data usage will increase by 50% per year up to 2021 in South Africa, and this is consistent with data growth in SA in recent years. As our aim is to forecast the longer-term evolution of the SA mobile market under the Bill and Amended Bill scenarios (up to 2040), it is reasonable to expect that demand growth will eventually level off.

We have therefore been conservative, and assumed a lower rate of increase of 25% per annum.

Estimating data usage under the "Bill scenario"

We use the percentage difference in unit prices between the "Amended Bill scenario" and "Bill scenario" to estimate how much lower data usage will be in the "Bill scenario" compared to the "Amended Bill scenario". To work out how responsive data usage is to differences in unit prices (i.e. the demand price elasticity), we used ICASA information on data usage and data prices in South Africa in 2015 and 2016 as a starting point. This suggests that a 1% fall in data prices is likely to lead to a 2.1% increase in data usage (a demand elasticity of -2.1). However, this is likely to overstate the impact of prices on volumes given that data usage is also likely to be increasing for non-price reasons e.g. more applications becoming available.

There is relatively limited evidence on the price elasticity of demand for mobile broadband usage. There is some evidence for price elasticities for demand for fixed broadband.[68] These estimates suggest that demand is price elastic in the earlier period of adoption of broadband, and tends to become more price inelastic as penetration of broadband reaches 'saturation'. Further, a 2009 empirical analysis of demand for mobile services in South Africa found:

[68] See Galperin and Ruzzier 2013 "Price elasticity of demand for broadband: Evidence from Latin America and the Caribbean", Telecommunications policy *"In this study the authors analyze fixed broadband retail prices in Latin America and the Caribbean (LAC), and provide estimates about the effect of price changes on broadband adoption. The analysis is based on a survey of plans and tariffs conducted by the authors during Q2 2010. Their findings show that broadband demand is relatively elastic to price in LAC but not in the OECD. They estimate that an average price reduction of 10% would result in an increase of almost 22% in the penetration rate in LAC, equivalent to almost 8.5 million additional broadband connections."*

See also https://www.ofcom.org.uk/__data/assets/pdf_file/0024/74076/talk_talk_group_appendix_d.pdf
"In analysis undertaken by Frontier economic consultants for Carphone Warehouse and submitted in response to the Ofcom First Consultation, it is reported that own-price elasticities for retail broadband lie in a range -0.14 through to -2.62. Taking the midpoint of this range suggests an own price elasticity of demand for broadband connectivity of approximately -1.25.
However, some caution needs to be exercised with respect to the -1.25 mid-point estimate. As it is extracted from statistical studies based on (recent) historical data, it is likely to overstate the sensitivity of connectivity with respect to price for customers already subscribing to a broadband connection. I therefore assume a more conservative and realistic estimate of the own-price elasticity of demand value is lower and likely to be around -0.40."

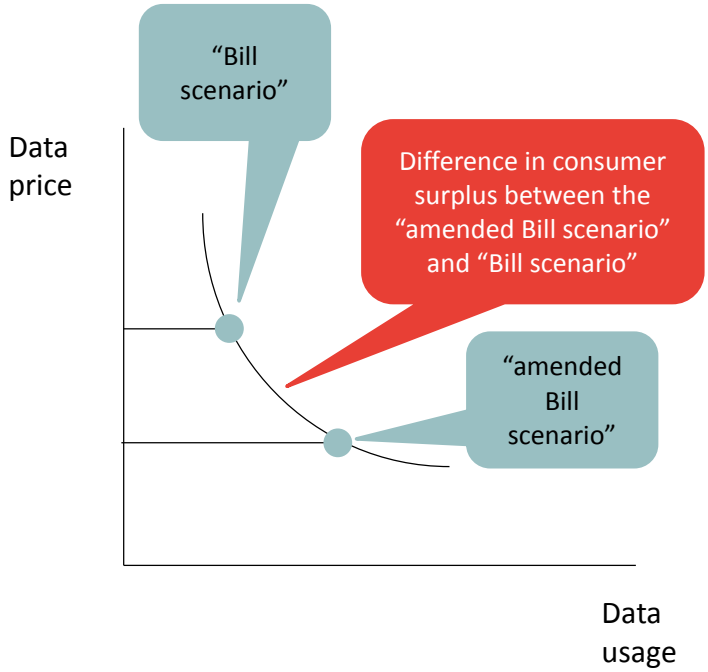
"demand for cellular services is elastic, with price elasticities higher than those typically found in developed countries. Cellular consumers in South Africa are found to be very sensitive to changes in prices with own-price demand elasticities most commonly between 1.3 and 3.8 for voice and between 1.2 and 3.2 for SMS"[69]

In view of the current state of take-up of broadband in South Africa and our projections for the transition to 4G (and 5G) we have undertaken the economic impact assessment under the assumption of a price elasticity of -1 for mobile data usage. This means that a 1% increase in data prices between the "Amended Bill scenario" and "Bill scenario" will lead to data usage being 1% lower in the "Bill scenario" relative to the "Amended Bill scenario".

Step 5 – estimating the difference in consumer benefits ('consumer surplus')

We then combine the estimates of i) the reductions in unit prices and ii) the difference in data usage due to the price reductions to estimate how much lower overall consumer benefits (proxied by consumer surplus) will be in the "Bill scenario" compared to the "Amended Bill scenario".

Figure 22 Illustrative diagram of consumer surplus in a given year



Source: Frontier

To arrive at a single estimate of the detriment to consumer benefit, we take the Net Present Value (NPV) of the reduction in consumer surplus over the period of time of our modelling (up to 204. As mentioned earlier, we have found that the Bill proposals are very likely to lead to a fundamental restructuring of the mobile sector in South Africa, very likely resulting in a dominant WOAN. This implies that, were a future Government to consider a

[69] Gasmi F. et al., An Empirical Analysis of Cellular Demand in South Africa, page 34

new intervention in the mobile sector in order to re-introduce network competition, this would likely take a period of time to be fully implemented. We have therefore considered that it seems reasonable to 'truncate' the impact under the Bill scenario in the year 2040, as we expect that by that time, a future Government would take measures necessary to reverse negative impacts of the Bill[70]. We note however that as we apply a relatively high discount rate (see below, bringing forward (or pushing back) the truncation year does not have a material impact on our overall estimates.

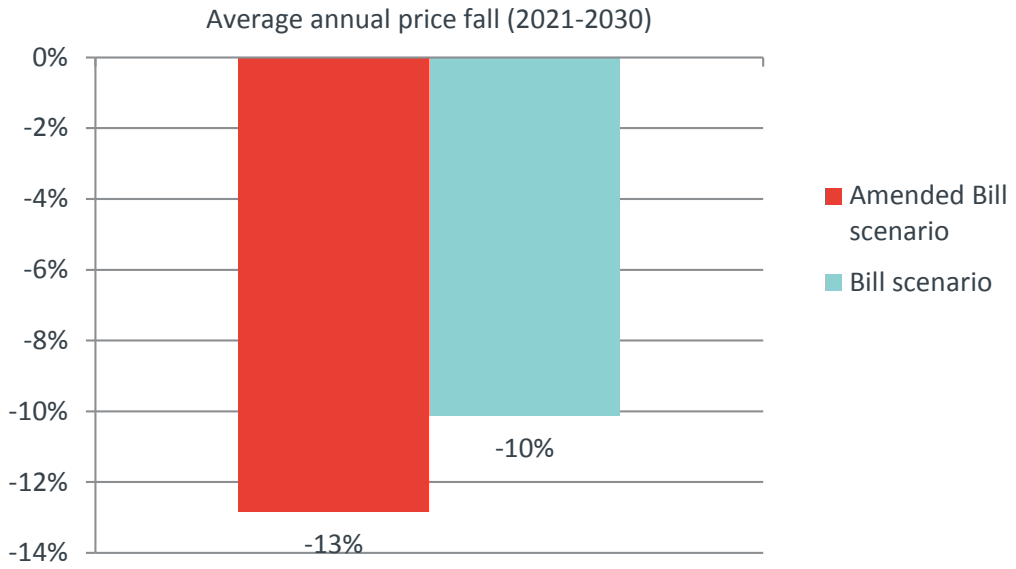
We use a social discount rate of 8.6% which is based on a 10 year Government bond yield for South Africa, although we test sensitivities around this.

4.2 Impact of slower speed of transition to new technologies and creation of a dominant WOAN

Unit prices

The figures below show the weighted average unit price falls less quickly under the "Bill scenario" (10% per year on average) than under the "Amended Bill scenario" (13% per year on average) from 2021 to 2030, with unit prices being approximately 36% higher by 2030 under the "Bill scenario" compared to the "Amended Bill scenario". These changes in unit prices reflect significant falls in both non-network unit costs and network unit costs.

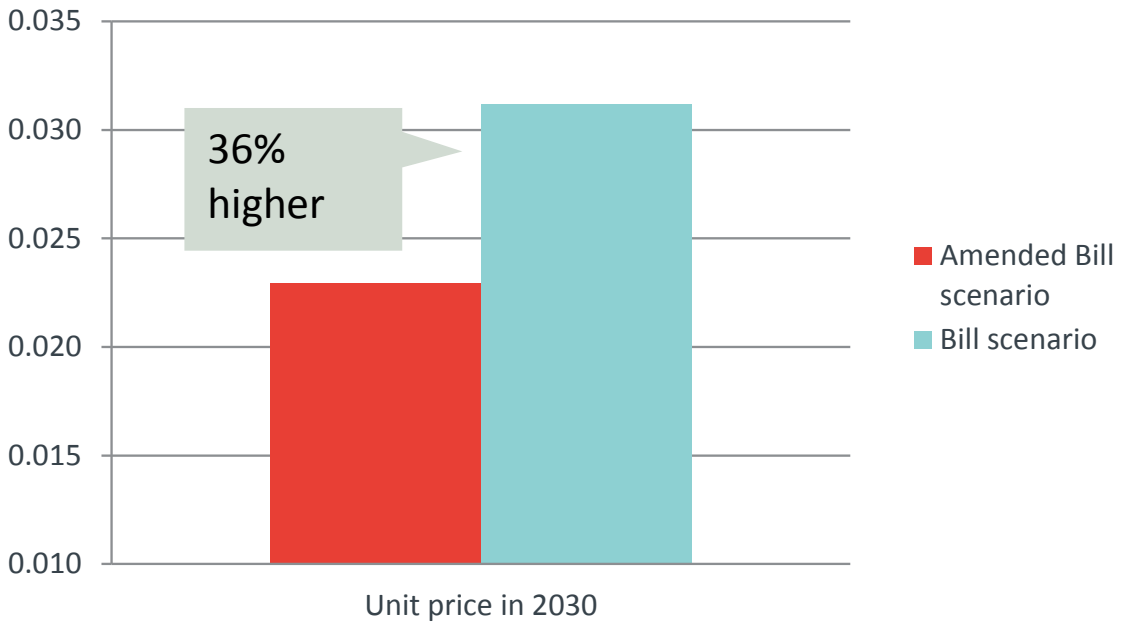
Figure 23 Average annual price fall (2021-2030)



Source: Frontier

[70] We assume that the magnitude of the impact on consumer benefits under the "Bill scenario" in 2030 continues in every year until 2040.

Figure 24 Difference in the "Bill" scenario (unit) price and "Amended bill" (unit) price in 2030

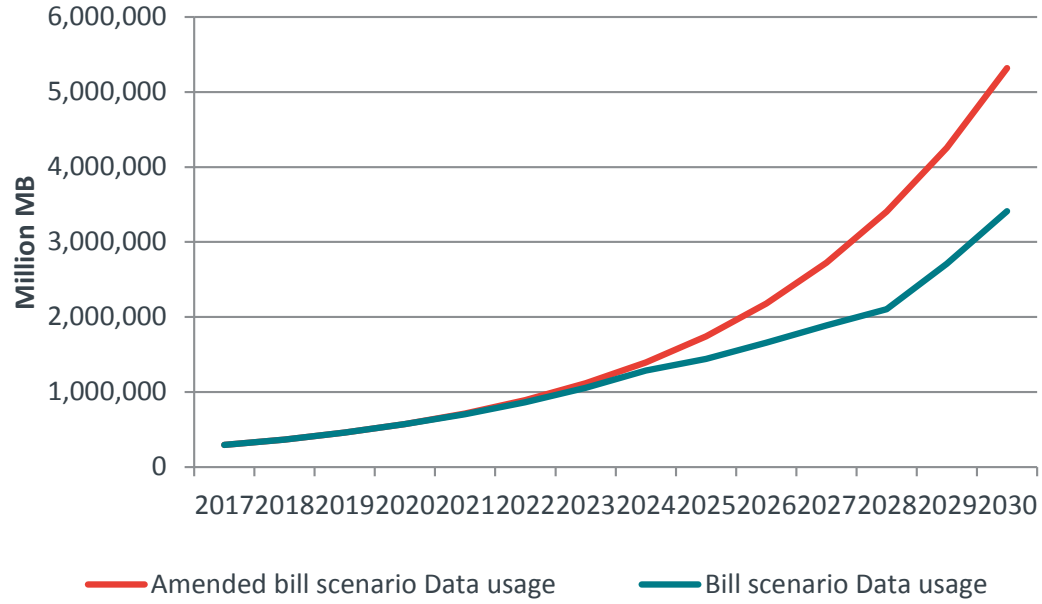


Source: Frontier

Data usage

The figure below shows that data usage increases at a slower rate under the "Bill scenario" compared to the "Amended Bill scenario" as unit prices fall less quickly under the "Bill scenario" (as network unit costs fall less quickly under the "Bill scenario"). Our approach is conservative as we ignore any differences in data usage due to non-price factors between the "Bill scenario" and "Amended Bill scenario". For example, a lack of investment in coverage and lower speeds due to a lack of spectrum may further limit demand growth under the "Bill scenario".

Figure 25 Evolution of data usage due to price changes

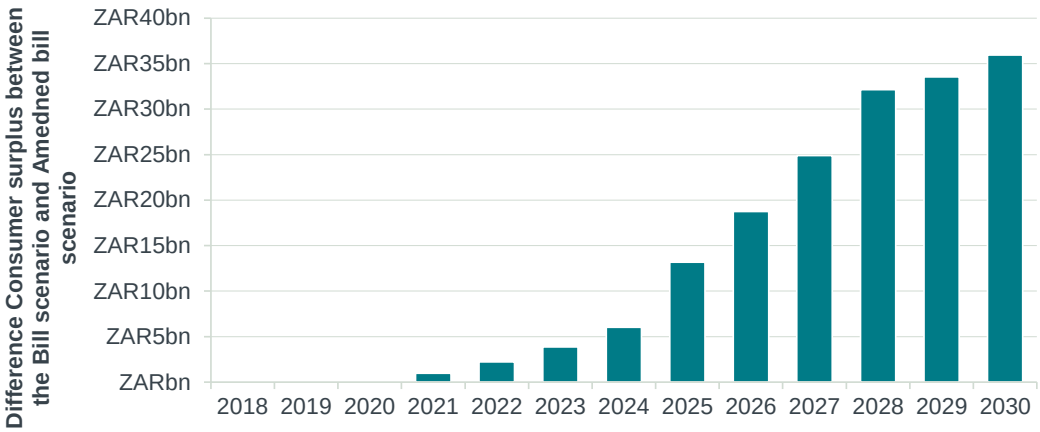


Source: Frontier

Consumer benefits (surplus)

We estimate that the loss in consumer benefits (surplus) due to the Bill is ZAR153bn in net present value terms.

Figure 26 Difference in consumer surplus as a result of price changes in the "Bill scenario" and "Amended Bill scenario"



Source: Frontier

4.3 Estimating the potential benefits from the Bill and the 'net' effect

As discussed in Section 2, it is possible that the Bill could have benefits in terms of reducing network duplication (and increasing spectrum aggregation). To reflect these possible benefits, we have extended our analysis so that the network unit costs under the "Bill scenario" are reduced by a given percentage in each year following 2025 (to be consistent with our analysis where we assume that the full impact of the Bill comes into effect by 2025) to reflect these benefits under the Bill scenario. This therefore combines the detrimental effects from the Bill (slower migration to new technologies/transition to a dominant WOAN) on prices and usage, with the possible benefits from the Bill.

To come to a view on the potential benefits we have considered what would be a reasonable assumption about the (unit) cost savings that could be achieved under the Bill[71]. We have considered estimates from the GSMA of potential unit cost network savings from network sharing as a starting point – these were estimated to be in the region of 30% network cost savings, where networks have no sharing of infrastructure. In view of the existing level of infrastructure sharing, national roaming, and the existence of a competitive WOAN in the Amended Bill scenario, this means that in reality, the potential savings are likely to be significantly lower than this. In light of this, and considering that we do not take into account the lack of pressure on costs and margins at the network-level under the Bill scenario, it seems reasonable to assume that the potential network cost savings form lower duplication of infrastructure in rural/remote areas - combined with marginal increases in spectrum efficiency - could lead to potential network cost savings of up to 20%.

Figure 27 below shows a range of scenarios for the reduction in the costs after 2025 and the impact on the NPV of Consumer Surplus. The table shows that a potential reduction in unit network costs due to lower network duplication (and/or spectrum aggregation) does lead to some consumer benefits, compared to if there are no additional cost savings. Nevertheless, even under the maximum possible reduction of 20% in total network unit costs in the "Bill scenario", our analysis indicates that there would still be a significant detrimental consumer impact compared to the "Amended Bill scenario".

[71] Note that we do not take into account the likelihood that a dominant WOAN would not be expected to be as efficient as a competitive network: it is widely recognised that whereas regulation of prices of utility like providers can be designed to achieve cost efficiencies (for example through multi-year price controls), the resulting outcome would still not be as efficient as what would be expected to be observed in competitive markets – where competition is feasible. Our approach is therefore conservative – i.e. it is likely to overestimate the benefits that would result from lower duplication in the Bill scenario.

Figure 27 Impact of avoiding duplication and increasing spectrum aggregation

Reduction in unit network costs from 2025 under the "Bill scenario"	NPV difference in CS
0%	ZAR 153bn
10%	ZAR 123bn
15%	ZAR 107bn
20%	ZAR 90bn

Source: Frontier

Sensitivity analysis

As there is some uncertainty around the assumptions used to derive the estimates of the detrimental impact under the "Bill scenario", we have conducted a number of sensitivity tests around the base case shown in Figure 26. We present the main sensitivities below.

The progress in the "Bill scenario" versus the "Amended Bill scenario"

In our base case, we have assumed that between 2021 and 2025, migration to newer technologies takes place at a slower pace, such that it takes five years in the "Bill scenario" to achieve the same progress in terms of transition to next generation technologies as one years' worth of progress in the "Amended Bill scenario". Therefore by 2025, the "Bill scenario" resembles the "Amended Bill scenario" at the end of 2021.

In view of the significant uncertainty around the timing for the WOAN to begin to have an impact on take up of newer technologies under the Bill scenario, we also consider a sensitivity where it takes five years in the "Bill scenario" to achieve the same progress in terms of transition to next generation technologies as 2 years' worth of progress in the "Amended Bill scenario" (i.e. by 2025, the "Bill scenario" resembles the "Amended Bill scenario" in 2022). Under this scenario the impact on the NPV of Consumer Surplus would be ZAR 116bn (compared to ZAR 153bn under our base case). This is not surprising, given the key role that the speed of transition to next generation technologies plays to the delivery of consumer benefits in mobile.

As the effects of a dominant network provider compared to network competition may have an impact beyond the first five years, we also test a sensitivity on the impact of assuming that transition to newer technologies is slower between 2026-2030 under the "Bill scenario" compared to the "Amended Bill scenario". We test a sensitivity where an additional two years of progress are lost. Therefore by 2030, the "Bill scenario" resembles the "Amended Bill scenario" in 2024 (compared to 2026 under our base case). Under this approach, the impact on the NPV of Consumer Surplus would be ZAR 206bn.

The impact after 2030

As described above, in our base case we 'truncate' the impact under the Bill scenario in the year 2040, as we expect that by that time, a future Government would take measures

necessary to reverse negative impacts of the Bill[72]. The table below shows the impact of a shorter and longer period in our analysis.

Figure 28 Sensitivity on truncation point

Truncation point	NPV difference in CS
2035	ZAR 127bn
2040	ZAR 153bn
2045	ZAR 167bn

Source: Frontier

Social discount rate

In our base case, we used a social discount rate of 8.6% (using a 10 year South Africa government bond). The table below shows the impact of changing the social discount rate on the consumer harm by using different lengths of government bonds.

Figure 29 Sensitivity on social discount rate

Social discount rate	NPV difference in CS
7.9% (SA 5yr bond)	ZAR 121bn
8.6% (SA 10yr bond)	ZAR 153bn
10% (SA 15yr bond)	ZAR 174bn

Source: Frontier

The growth rate of data usage

We have assumed that data usage grows by 25% per year when calculating non-network cases under our base case. This is based on a more conservative assumption of data usage growth from extrapolating Cisco forecasts (which indicated 50% per year). Given there is some uncertainty around how quickly data will grow, we show a number of sensitivities below.

Figure 6 Sensitivity on share of network and non-network costs

Data usage growth per year	NPV difference in CS
20%	ZAR 99bn
25%	ZAR 153bn
30%	ZAR 232bn
35%	ZAR 349bn

Source: Frontier

[72] We assume that the magnitude of the impact on consumer benefits under the "Bill scenario" in 2030 continues in every year until 2040.

4.4 Impact on speeds and coverage

In addition to the analysis of the impact of the Bill on mobile data prices and usage, Vodacom also instructed Northstream, a mobile technology consultancy, to estimate the impact of the Bill scenario on average speeds and coverage.[73] In this section, we explain Northstream's approach and then present the results of its analysis. Further details of Northstream's approach and results are contained in their report, which is attached as a separate Annexe.

4.4.1 Approach

Overarching approach

Northstream's modelling approach relies on the following overarching assumptions:

- The modelling covers the period from 2017 to 2025;
- An analysis of South African towns is used, with the number of data subscribers being distributed across towns based on the population shares of the towns. The national average speed is calculated as a weighted average of the speeds across towns;
- Operators' market shares do not change over time (as the focus is on the impact on the sector as a whole rather than the impact on individual operators);
- The 2G, 3G and 4G grids are all modelled separately;
- Within a town, there are likely to be multiple sectors. The number of sectors in a town is determined by the surface area of the town divided by the surface area of a sector;
- All additional spectrum (i.e. the spectrum that is part of the ITA process) is used for 4G; and
- One possible lot allocation is modelled (the ITA process sets out different lots that operators can bid for), as the overall impact on the sector is unlikely to vary significantly across different lot allocations.

Differences between the Bill scenario and Amended Bill scenario

The key differences between the "Bill scenario" and "Amended Bill scenario", is that operators will lack spectrum and have a lower incentive to invest under the "Bill Scenario". The key differences between the two scenarios are summarised in the table below.

[73] Northstream (2018), Bill Impact: Modelling the Impacts on Speed and Coverage

Figure 30 Key differences between the "Bill scenario" and "Amended Bill scenario" in Northstream's modelling

	Amended Bill scenario	Bill scenario
Spectrum release	2.6 GHz released in 2019, 700 MHz/800 MHz released in 2021	700 MHz/800 Mhz/2.6 GHz spectrum not deployed until 2026 (after the modelling period) given the WOAN needs to be fully functional first
Spectrum re-farming	Some spectrum re-farming, with the timing varying by operator	Spectrum refarming occurs two years later than under the "Amended Bill scenario"
4G coverage investment	Investment in coverage sites between 2018 and 2025	No investment in coverage sites between 2021 and 2025. Same level of coverage investment as the "Amended Bill Scenario" between 2018 and 2020.
Subscriber technology mix	Consistent with Figure 19	Only one years' worth of progress is made in five years (consistent with Frontier approach)
Subscriber growth	2.04% per year (consistent with the modelling of non-network costs in Section 4.1)	

Source: Frontier based on Northstream

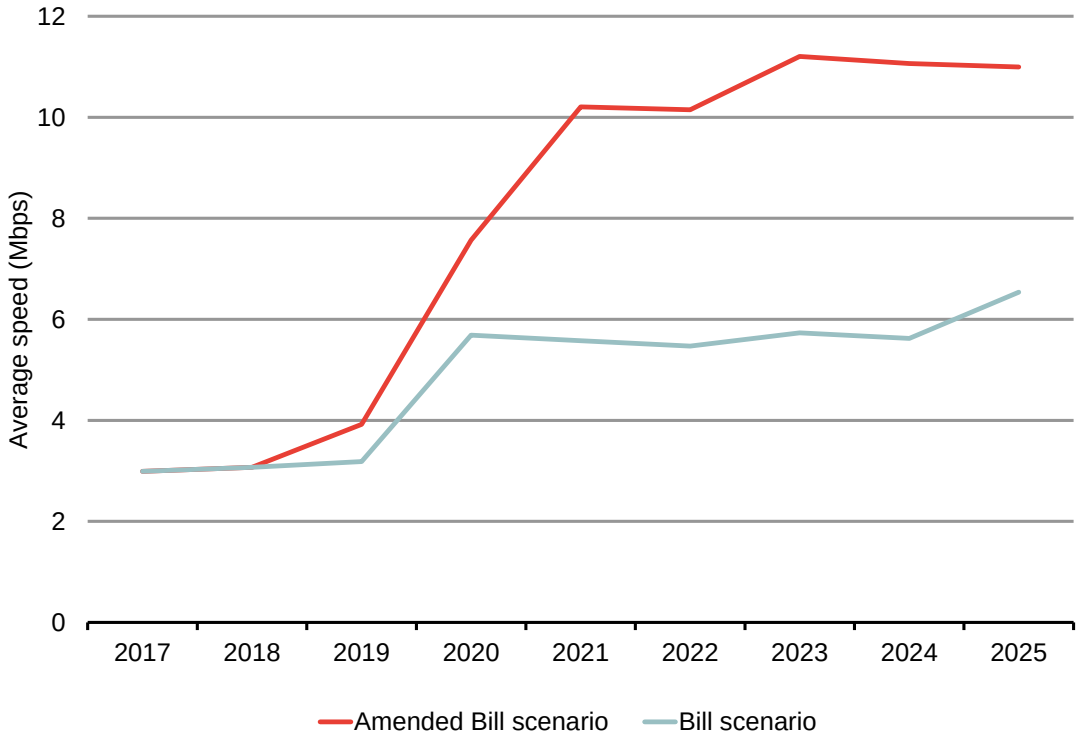
4.4.2 Results

Average speeds

As shown by the following figure, due to a combination of operators lacking spectrum under the Bill scenario and operators' having a low incentive to invest, Northstream estimates that average speeds[74] are significantly higher under the "Amended Bill Scenario". For example, by 2025, the average speed is 68% higher under the "Amended Bill scenario".

[74] These average speeds have been estimated by weighting the individual operators' average speeds by their market shares.

Figure 31 Average speeds under the Bill scenario and Amended Bill scenario

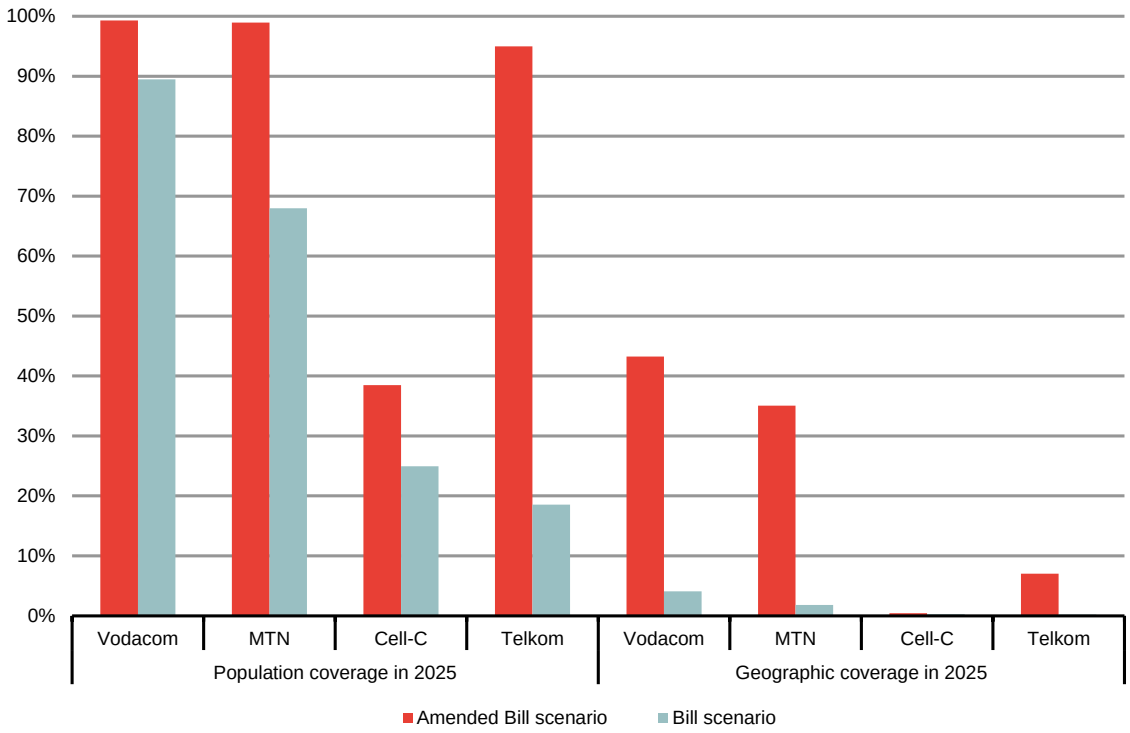


Source: Northstream

Coverage

The Bill also has a significant impact on coverage. As a result of the dampening of investment incentives under the Bill, by 2025 Vodacom's 4G population coverage is 10 percentage points lower and its 4G area coverage is 39 percentage points lower compared to the "Amended Bill scenario". The impact of the Bill on the other operators is even greater because they are less advanced with their 4G roll-out relative to Vodacom.

Figure 32 Impact of the Bill on coverage in 2025



Source: Northstream

4.5 Impact on wider economy

4.5.1 Approach

It is widely recognised that the development of the telecoms sector can have a significant impact on the wider economy. South Africa Connect (2013) itself recognised the role the telecoms sector can play for the South African economy: it estimated that, if the broadband targets in South Africa Connect were achieved, this could create 400,000 jobs and contribute over ZAR130bn to GDP over a 10 year period. This is because investment and spending in the telecoms sector can have a multiplier effect on other sectors. More importantly, telecoms can help improve productivity in other sectors, for example, by reducing time spent travelling, enhancing the speed and quality of information flows, improving access to suppliers, facilitating job search, improving the management of firms due to better communication and enhancing the diffusion of innovation.

In light of this, and the significant impact on mobile consumers under the Bill scenario, we considered it appropriate to estimate also the possible wider economic impact under this scenario.

Impact on GDP

There have been a number of studies estimating the impact of the mobile sector on the wider economy. These are summarised in the table below. The Katz et.al. (2012) and Bohlin et.al. (2012) studies were used to estimate the impact on the wider economy for South Africa Connect.

Figure 33 Studies looking at the impact of the mobile sector on the wider economy

Impact channel	Paper	Size of impact
Overall take-up	Qiang et.al. (2009)	A 10% increase in mobile penetration yielded an additional 0.81 percentage points in GDP growth
	Czernich et.al. (2009)	A 10% increase in broadband penetration raises per-capita GDP growth by 0.9-1.5 percentage points
	Koutroumpis (2009)	An increase in broadband penetration of 10% yields 0.25% increase in GDP growth
Move from 2G to 3G	Deloitte (2012)	A 10 percentage point substitution from 2G to 3G penetration increases GDP per capita growth by 0.15 percentage points
Digitization (index incorporating a range of factors)	Katz et.al. (2012)	One point increase in the Digitization Index has approximately a 0.08% impact on GDP
Average speeds	Bohlin et.al. (2012)	A doubling of average speeds increases GDP per capita growth by 0.3 percentage points
Data usage	Deloitte/ GSMA (2012)	A doubling of mobile data usage increases GDP per capita growth by 0.5 percentage points per year

Source: Various

Given the results of the economic impact on data usage and speeds under the Bill scenario, we have used two approaches to estimate the impact of the "Bill scenario" on GDP:

- The SA Connect approach[75] – we combine the Katz et.al. (2012) study on the link between digitisation and GDP, and the Bohlin (2012) study on the link between speeds and GDP. This approach translates the reduction in broadband speeds and digitisation in SA under the Bill scenario, into a wider impact on the GDP of SA, and has been used to assess the wider economic impact of SA Connect; and
- The Deloitte/GSMA approach – we use the Deloitte study (2012)[2] to estimate the impact of higher data usage on GDP. This approach is based on the empirical estimation of a relation between the level of mobile data consumption, as a proxy for the ways in which the increased use of broadband data can support economic

[75] http://www.teleadvs.com/wp-content/uploads/South_Africa_presentation_final_version.pdf

development, and the level of GDP. We have used this relationship together with the estimation of the impact of the Bill on data consumption in SA, to arrive at a GDP impact estimate.

Under both approaches, in order to estimate the impact on GDP we forecast GDP per capita growth relying on:

- a forecast of GDP growth of approx. 4% per year[76]; and
- a forecast of population growth of approx. 1% per year[77].

This gives a forecast of GDP per capita growth of approximately 3.5% per year. Consistent with our overall approach of being conservative where possible, we have assumed a GDP per capita growth rate of 2.5% (all else the same this would reduce the size of any negative effect).

The SA Connect approach

As shown by the following table, Katz estimates the impact on GDP from meeting the SA Connect targets by estimating the impact of higher digitisation and higher speeds on GDP.

Figure 34 Impact on GDP in SA Connect

SOUTH AFRICA: DIGITIZATION CUMMULATIVE ECONOMIC IMPACT (2013-2020)

Impact		2015	2020
Digitization	GDP (ZAR M)	69,055	90,397
	Employment	306,000	400,000
Speed	GDP (ZAR M)	2,163	20,907
	Employment	-	-
Total	GDP (ZAR M)	71,218	111,304
	Employment	306,000	400,000

Source: http://www.teleadvs.com/wp-content/uploads/South_Africa_presentation_final_version.pdf

We have used a similar approach that Katz used for SA Connect. In particular, we estimate the combined impact of:

- **Higher digitisation**. Katz estimates that, on average, the digitisation index will increase by 3.20 points per year between 2012 and 2020 in South Africa. We assume that 55% of this increase is due to improvements in the mobile sector (55% represents the mobile sectors share of total telecoms revenue[78]). Therefore, the implied increase

[76] Based on projections by the US Department of Agriculture (see https://businesstech.co.za/news/business/84973/what-south-africas-economy-will-look-like-in-2030/)

[77] Based on Ifs projection http://www.ifs.du.edu/ifs/frm_CountryProfile.aspx?Country=ZA

[78] Source: ICASA – 2nd report on the state of the ICT sector in South Africa (31st March 2017)

in the digitisation index due to the mobile sector is 1.77 per year in SA Connect. This should therefore reflect how much progress can be made in a 'good' year for the mobile sector. Therefore, for the "Amended Bill scenario" we assume that the digitisation index increases by 1.77 points per year between 2021 and 2025 as a result of progress made in the mobile sector. In contrast, for the "Bill scenario" we have assumed that only one years' worth of progress is made in five years. Therefore, the digitisation index increases by 0.35 points per year between 2020 and 2025 due to progress made in the mobile sector[79]. We can then estimate the difference in GDP between the two scenarios using Katz's (2012) result that a 1 point increase in the digitisation index increase GDP by 0.08%.

- **Higher speeds**. The Bohlin study showed that on average, BRICS countries which doubled their mobile network speeds experienced a GDP per capita growth rate that was 0.204 percentage points higher. Using the Northstream results, in the "Amended Bill scenario", network speeds increase by 45% between 2020 and 2025. In the "Bill scenario", network speeds increase by 15% over the same period. This difference in speeds between the two scenarios therefore allows us to estimate how much lower GDP will be in each year between 2020 and 2025 as a result of the Bill's impact on speeds.

The Deloitte/GSMA approach

The Deloitte/GSMA study showed that on average across the countries it considered, countries which doubled their data usage over a five year period experienced a GDP growth rate that was 0.5 percentage points higher in each year during the period. Since the Deloitte/GSMA study only considered a five year period (2005-2010), we therefore we consider the same length of time, i.e. the period 2020-2025.

In the "Amended Bill scenario", data usage more than doubles between 2020 and 2025, thereby increasing data usage by 205%. In the "Bill scenario", data usage increases by 152% over the period 2020 to 2025. Therefore, by applying the Deloitte/GSMA study to our estimates of data demand growth in both the "Bill scenario" and "Amended Bill scenario" and comparing the difference, we have estimated the impact on GDP.

Impact on government

Any reduction in GDP relative to the factual would also be expected to result in lower tax revenues. We have quantified this effect, based on data from the World Bank: tax revenue represents 27% of GDP in South Africa, so we have combined this with our estimates of the GDP impacts to calculate the impact of the Bill on tax revenues.

Impact on employment

Katz (2013)[80] quantifies two different types of employment effects from reaching the broadband roll-out targets in SA Connect:

[79] We ignore any progress made in the fixed sector under both scenarios.

[80] http://www.teleadvs.com/wp-content/uploads/South_Africa_presentation_final_version.pdf

- **A short-term effect due to higher investment**. This effect arises because the investment required to meet the targets will help create jobs. As well as boosting jobs within the telecoms sector, Katz (2013) also includes multiplier effects that arise due to increased employment in related sectors (e.g. suppliers of electrical equipment and metals) and due to increased household spending boosting jobs in other sectors. This effect is shown in the table below.

Figure 35 Estimated jobs created due to the higher investment required to meet the SA Connect targets

SOUTH AFRICA CONNECT: IMPACT OF NBN ON JOBS

			INVESTMENT
Investment (Rand in millions)			**65,000**
Employment creation	Direct effect	Jobs in equipment manufacturing, construction and telecoms	227,024
	Indirect effect	Jobs in other sectors	102,161
	Induced effect	Household spending induced from direct/indirect effects	106,701
	Total effect	**Jobs in all sectors**	**435,886**
Multipliers	Type I Multiplier	(Direct + indirect)/direct	1.45
	Type II Multiplier	(Direct + indirect + induced)/ direct	1.92

Sector	Effect
Electronics equipment	47,989
Construction	131,360
Communications	47,675
Total	227,024

Sector	Effect
Distribution	15,396
Finance	4,461
Metal products	6,907
Electrical Eq.	4,604
Other services	24,461
Other	46,332
Total	102,161

Source: Methodology reviewed in Katz (2012)
Note: The estimation was made using the input/output matrix of United States. Then the results are corrected using the added value of South Africa in relation to the United States (32.42% vs 56.17%)

Source: *http://www.teleadvs.com/wp-content/uploads/South_Africa_presentation_final_version.pdf*

- **An increase in employment due to an increase in the overall size of the economy**. Katz (2013) quantifies how increases in productivity and innovation as a result of reaching the SA Connect targets are likely to impact GDP and therefore employment. Katz does this by estimating how the increase in GDP due to higher digitisation will increase employment.

To estimate the impact of the "Bill scenario" on employment, we have adopted a similar approach to that used by Katz (2013) for SA Connect. In particular, we also model two different effects,

- **A short-term effect due to lower investment**. As discussed, our modelling assumes that the "Bill scenario" will result in a significantly slower migration to more advanced technologies due to lower investment and a lack of spectrum. We assume that only one years' worth of growth is achieved in five years. Therefore, we assume that investment into new technologies is 80% lower in each year of the transitional period (2021 to 2025). To work out the absolute reduction in investment, we have split total annual investment in the South African mobile sector into network and non-network investment (using an 80:20 split) and then into replacement investment and investment into new technologies (using a 50:50 split). We have then used the ratio

between investment and jobs in Katz (2013) to estimate the reduction in employment in both the mobile sector, as well as other sectors as a result of the multiplier effects. In reality, the reduction in jobs in the telecoms sector could manifest itself as:

- Existing operators using less outsourcing;
- Existing operators not replacing employees that leave; and/or
- Existing operators making existing staff redundant.

  In the short-term, the WOAN will not be fully functional, so is unlikely to have a significant impact on employment.

- **A reduction in employment due to a lower overall size of the economy relative to the "Amended Bill scenario"**. Under the Deloitte/GSMA approach and the SA connect approach, the "Amended Bill scenario" GDP grows quicker than under than under the "Bill scenario". To estimate the long-term employment impact of this, we rely on the ratio between GDP and employment in South Africa in 2016 (a GDP to jobs ratio of 3.73 jobs per RAND 1m of GDP) to estimate the impact on employment.).

We note that if the impact of the "Bill scenario" is to create less network duplication, then this could reduce further the number of jobs at the network-level, when a dominant WOAN is functional. We have not quantified this effect.

4.5.2 Results

GDP

The following table shows the Bill could have an impact on GDP in the region of ZAR22bn to ZAR43bn over a five year period depending on which approach is used.

Figure 36 The Bill's impact on GDP

	SA Connect approach	Deloitte/GSMA approach
Undiscounted in 2025	Katz = ZAR7bn Bohlin = ZAR1bn Total = ZAR 8bn	ZAR15bn
NPV between 2021 and 2025	Katz = ZAR 20bn Bohlin = ZAR2bn Total = ZAR 22bn	ZAR43bn

Source: Frontier

Our estimates of the GDP impact of the Bill using the "SA Connect approach" are lower than the GDP impact estimated in SA Connect by Katz (2013). This is primarily because:

- SA Connect covers an eight year period whereas our estimate only covers a 5 year period;
- We are only estimating the impact of the mobile sector on GDP, whereas SA Connect considers the impact of the telecoms sector as a whole on GDP; and
- We still have one years' worth of progress in the "Bill scenario".

Government

The following table shows the Bill could have an impact on tax revenues in the region of ZAR6bn to ZAR12bn over a five year period depending on which approach is used.

Figure 37 The Bill's impact on tax revenues

	SA connect approach	Deloitte/GSMA approach
Undiscounted in 2025	ZAR2bn	ZAR4bn
NPV between 2021 and 2025	ZAR6bn	ZAR12bn

Source: Frontier

Employment

Short-term

Using the relationship between investment and employment in Katz (2013), we estimate that, as a result of lower investment in the "Bill scenario", there will be 60,000 fewer jobs in each year between 2021 and 2025 (a short-term Keynesian effect). The following table summarises how this reduction in jobs will impact different sectors.

Figure 38 Short-term Keynesian impact on employment

Sector	Data used from Katz (2013)	Jobs lost under "Bill scenario"
Equipment manufacturing, construction and telecoms	RAND1m investment equates to 3.5 jobs in equipment manufacturing, construction and telecoms	31,000
Indirect jobs in other sectors	Multiplier effect of 1.45 for (direct+indirect)/direct	14,000
Fewer induced jobs in the wider economy due to lower household spending	Multiplier effect of 1.92 for (direct+indirect+induced)/direct	15,000
Total		60,000

Source: Frontier using http://www.teleadvs.com/wp-content/uploads/South_Africa_presentation_final_version.pdf

Long-term

The following table shows that in the long-term, jobs could be between 30,000-57,000 lower in a given year depending on which approach is used.

Figure 39 The Bill's impact on employment in the long-term

	SA connect approach	Deloitte/GSMA approach
Jobs lost in a given year (based on 2025)	30,000	57,000

Source: Frontier

ANNEX A IMPLEMENTING A WOAN: INTERNATIONAL EVIDENCE

A.1 Introduction

As we highlight in the body of the report, whilst the WP and Bill provide little detail on how the WOAN will be implemented in practice, establishing the WOAN is likely to be a complex and time-consuming process. This is illustrated by evidence from similar projects in other countries, covering the fixed as well as mobile sector, which we summarise below.

A.1.1 Mexico and Rwanda

As far as we are aware, there are two examples of national mobile wholesale networks internationally that have reached the build-out phase – in Rwanda and Mexico. We summarise the key insights from these projects below.

Rwanda

To our knowledge, Rwanda has the only functioning mobile WOAN at present. It is based on a public-private partnership with a new entrant in the Rwandan mobile market (KT). The Rwandan Government originally announced the project in 2013, with a coverage target of 95% by June 2017, and production began in 2014.[81]

We understand that network coverage has reached 95% as of 2018[82] – just over three years after its inauguration. Thus, the roll-out took just under five years from the date of the initial announcement to completion.

However, the deployment of a national WOAN, offering a full range of services, is likely to be significantly more challenging in South Africa for the following reasons:

- The Rwandan WOAN does not directly involve existing MNOs and is focused solely on the provision of 4G services, whilst the Bill appears to envisage a WOAN that offers a full range of services and require significant involvement from existing MNOs;
- Rwanda is much smaller geographically and has a population size that is 20% less than that of South Africa;
- South Africa is more affluent and urbanised than Rwanda, which means that it is likely that demand and hence capacity requirements will be higher; and
- Mobile penetration in Rwanda is less than half that of South Africa (c.70% compared to 160% in SA)[83].

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[81] National Broadband Policy for Rwanda (October 2013), p.23

[82] TeleGeography

[83] TeleGeography

Mexico

The Mexican Government announced plans to deploy a national, wholesale-only wireless network in December 2012[84]. The initial plan was for the roll-out to begin in 2014 and for the WOAN to be operational by 2018. However, the project has faced a series of delays:

- The legislation supporting the establishment of a WOAN came into force in **June 2013;**
- The contract for deploying WOAN was awarded to ALTAN consortium in **November 2016;**
- Deployment of the network started in **2017**; and
- According to the contract, the WOAN has to cover 30% of the population by **Q1 2018** and it has to meet the final coverage objective of 92.2% of population by **2023.**

Hence it will have taken **10 years** from conception and **seven years** from the start of the roll-out to reach the final coverage target. It is also worth noting that the Mexican model is less ambitious than that being pursued in South Africa – the Mexican WOAN has been assigned only 90 MHz of the 700 MHz band whereas the WOAN is expected to be allocated the majority of unassigned HD spectrum (i.e. 800 MHz, 2600 MHz and 700 MHz) and there is scope for it to acquire further spectrum once currently assigned spectrum has been returned to ICASA.

A.1.1 Evidence from other proposed projects

As set out above, one of the key challenges faced when establishing a WOAN is negotiating a mutually acceptable agreement between stakeholders, particularly where the network relies on significant private sector involvement (as is likely to be the case in South Africa). This is illustrated by similar projects in Kenya and Russia that have failed to get off the ground due to unsuccessful stakeholder negotiations.

- **Kenya:** A WOAN was proposed in Kenya through a public-private partnership in order to 'fast track' the roll-out of LTE services. Under the original proposals, the Government and private partners would build, own and operate the networks which would offer wholesale capacity to new and existing service providers.[85] Initial plans suggested that the LTE consortium would cover 98 per cent of the population.[86] Whilst no official announcement has been made, it appears that the plan has been

[84] http://www.cullen-international.com/asset/?location=/content/assets/regulatory-intelligence/regulatory-news/cullen-international---a-reflection-on-the-mexican-telecoms-and-audiovisual-reform.pdf/cullen-international---a-reflection-on-the-mexican-telecoms-and-audiovisual-reform.pdf

[85] Humanipo article "open-access best model for kenyas LTE deployment" (see http://www.humanipo.com/news/30829/open-access-best-model-for-kenyas-lte-deploymentericsson/)

[86] Capital FM article "Consortium model best for Kenya's LTE deployment" (see http://www.capitalfm.co.ke/business/2013/05/consortium-model-best-for-kenyas-ltedeployment/)

abandoned[87] following complicated negotiations involving a number of stakeholders.

- **Russia:** In 2011, Russian network operator, Scartel (brand Yota), was allocated 40 MHz of spectrum in the 2.6 GHz band and awarded the first licence to offer LTE services with conditions that wholesale access must be provided to other mobile operators.[88] However, this initiative failed as carriers were not able to reach an agreement. However, according to a recent GSMA report, this initiative failed as carriers were not able to reach an agreement and went their own way on LTE, after reportedly insisting on choosing their own vendors.[89]

A.1.2 Evidence from the fixed sector

Evidence from a **fixed national broadband network project in Australia**, which is of a similarly ambitious scale to the WOAN envisaged by the Bill, illustrates the significant challenges involved. In April 2009, the National Broadband Network Company (NBNCo) was established in Australia as a new national, wholesale-only next generation broadband platform. As with the proposed WOAN in South Africa, the key objectives of the NBN are to improve the availability and affordability of broadband services in Australia.[90] The NBN is also intended as a vehicle for market reform by facilitating the structural separation of the incumbent operator (Telstra) by migrating its customers to the NBN and by encouraging more retail competition.

However, the roll-out of the NBN has faced **significant delays -** by June 2016, the NBN had connected 2.9 million customers, 3.6 million fewer than 2011 expectations.[91] Key factors in this appear to be:

- **Complex negotiations with the incumbent:** Before roll-out could begin, NBN had to agree key terms with Telstra. [92] This was a complex process taking over a year[93]; and
- **Shift in deployment strategy:** In April 2014, three years into the deployment phase, the project was switched from FTTP to a multi-technology mix (including FTTN and hybrid fibre-coaxial), in order to cut costs, following a change of Government in 2013. The transition to a mixed strategy, which requires access to Telstra's copper network, meant agreement with Telstra had to be renegotiated – this lead to a further delay of a year.

According to the latest corporate plan, NBN is aiming for a 2021 completion, which is in line with the initial plan, but with a significant downgrade in quality – FTTP is expected to comprise only 17% of the network, with the remainder made up from inferior technologies – FTTN/B/C, HFC and fixed wireless and satellite

87 GSMA (2017), Wholesale Open Access Networks

88 Telecoms.com, http://telecoms.com/25099/yota-scores-deal-as-russias-lte-network-operator/

89 GSMA (2017), Wholesale Open Access Networks

90 https://www.nbnco.com.au/content/dam/nbnco2/documents/soe-shareholder-minister-letter.pdf

91 Sorensen L. and Medina A. (June 2016) , The End of Australia's National Broadband Network

92 https://blog.telegeography.com/the-politics-of-broadband-in-australia

93 Terms of engagement for negotiations were agreed in December 2009 (https://www.telstra.com.au/content/dam/tcom/about-us/investors/pdf%20C/prospectus_supplement_10.pdf)

Thus far, the project appears to be struggling to meet its objectives:

- **Speeds below expectations:** The NBN aimed to connect 93%of Australian premises to a minimum speed of 25 Mbps and up to 100 Mbps by 2016. However, by the end of 2015, the average connection speed in Australia was 8.2 Mbps, partly due to the slower than expected deployment rate[94];
- **Customer satisfaction is low:** Complaints doubled in the six months up to the end of December 2016.[95] Further, ISPs Optus and Telstra, who deliver retail services over the NBN, were recently forced to refund over 50,000 customers due to speeds falling well below the advertised maximum[96]; and
- **The retail market is still highly concentrated:** The three largest service providers accounted for around 83% of active NBN connections as of September 2016.[97]

The deployment of a national fibre network in New Zealand, initiated around the same time as in Australia, appears to have been more successful - roll-out commenced in 2011 and as of August 2017, was on track to reach its initial coverage target of 75% by the end of 2019, with plans to extend this to around 85% by the end of 2024.[98]

However, NBNCo has highlighted a number of reasons why the deployment in Australia has proven more challenging[99]. Factors that are particularly relevant in the context of the SA WOAN include:

- **Delivery model**: In NZ, the deployment was led by the incumbent infrastructure operator, Chorus, who retained ownership of infrastructure assets. In contrast, NBNCo was created as a start-up and therefore had to lease or buy assets from Telstra – reaching a commercial agreement was a complex and lengthy process ; and
- **Scale:** Australia is around 30 times the size of New Zealand.

Given that the WOAN in South Africa is likely to be much more closely aligned with Australia on these factors, Australia's NBN is therefore a more relevant comparator within the context of our assessment of the Draft Bill.

4.5.3 Implications for South Africa

Evidence from the few examples of attempts to establish a national wholesale network in other countries demonstrates that it is a challenging and typically lengthy process, that is vulnerable to delays. These difficulties are particularly acute for projects that rely heavily on the involvement of privately owned networks (as is likely to be the case in South Africa). In particular, the projects in

94 Ibid

95 https://www.ft.com/content/b0b3c2fc-9d32-11e7-8cd4-932067fbf946

96 http://www.abc.net.au/news/2017-12-11/optus-to-compensate-8700-customers-for-slow-nbn-speeds/9245968

97 https://www.itnews.com.au/news/three-isps-take-83-percent-of-nbn-market-437927

98 https://company.chorus.co.nz/file/80026/Annual-Report-2017.pdf

99 https://www.nbnco.com.au/blog/the-nbn-project/australia-and-new-zealand-broadband-comparing-apples-with-oranges.html

Russia and Kenya appear to have failed to get beyond the negotiation stages due to the complexities involved in reaching a mutually acceptable agreement between multiple parties. Similarly, the experience from Australia demonstrates the difficulties associated with negotiating terms for the use/transfer of existing privately owned assets.

In terms of the likely timeframe, the WOAN in Mexico is set to take seven - ten years, whilst deployment of the WOAN in Rwanda appears to have taken around five years. Given that the scope of the WOAN in South Africa is significantly more ambitious than those in Rwanda and Mexico, and that it will likely require substantial involvement from at least four existing MNOs, it is reasonable to expect that it would take **at least seven years** to become fully functional.

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