GA-Courtenay Special Situations fund

GA-Courtenay Special Situations Fund is managed within Green Ash Partners LLP
11 Albemarle Street, London, W1S 4HH, UK. Green Ash Partners is regulated by the FCA.

COMCAST & CHARTER COMMUNICATIONS,
A BROADBAND ALLIANCE: TO XFINITY AND BEYOND

August 7, 2023

Two business deals, in 2011 and 2017, have enhanced the growth plans of the two US cable market leaders: not only to operating in alliance, but thereon to enter, and prospectively re-shape, the US wireless industry

<u>Comcast and Charter Communications have appeared to be appraising alliance structures for a number of years; in 2015 a proposed merger between the two companies was blocked by antitrust regulators</u>

Comcast and Charter, two companies which, combined, dominate the US broadband industry yet across a series of distinct and non-overlapping regions of the country, appear to have been considering the structure under which they can achieve an alliance for a number of years.

However, achieving this alliance has been challenging in light of antitrust scrutiny: the combined cable network from the two companies passes 84% of US homes[1]. Comcast and Charter each connect a roughly equal number of these homes (Comcast 32.3 million[2], Charter 32.2 million[3]) and achieve a similar penetration ratio (homes connected / homes passed) of 55%[4]. The closest competitor in terms of homes connected is AT&T with 8.8m homes served[5], although the overlap with Comcast and Charter is less than 3 million homes[6].

Comcast and Charter no longer derive their primary economics from cable television (in decline[7], having contributed marginal economics for several years[8]) and which competes with other linear broadcast transmissions. Instead, Comcast and Charter today achieve the vast majority of their economics from the provision of internet broadband "cable broadband", which has considerably less competition (and for 55% of homes connected, no competition[9]), and represents close to two thirds of the revenue of the two companies and almost all of their profitability[10].

In 2015, US regulators blocked a proposed merger between Comcast and Time Warner Cable[11] (the latter in 2015 was then acquired by the then considerably smaller peer, Charter[12]). The proposed Comcast / Time Warner Cable merger would have controlled more than 60% of US broadband customers[13] and have made "*Comcast an unavoidable gatekeeper for internet-based services*"[14], according to a statement by the antitrust department of the US Department of Justice at the time.

However, in two astute steps, the first being a critical "Mobile Virtual Network Operator" MVNO transaction in 2011, Comcast and Charter have today not only achieved alliance without regulatory intervention, but also the commencement of a path to penetrate the wireless industry

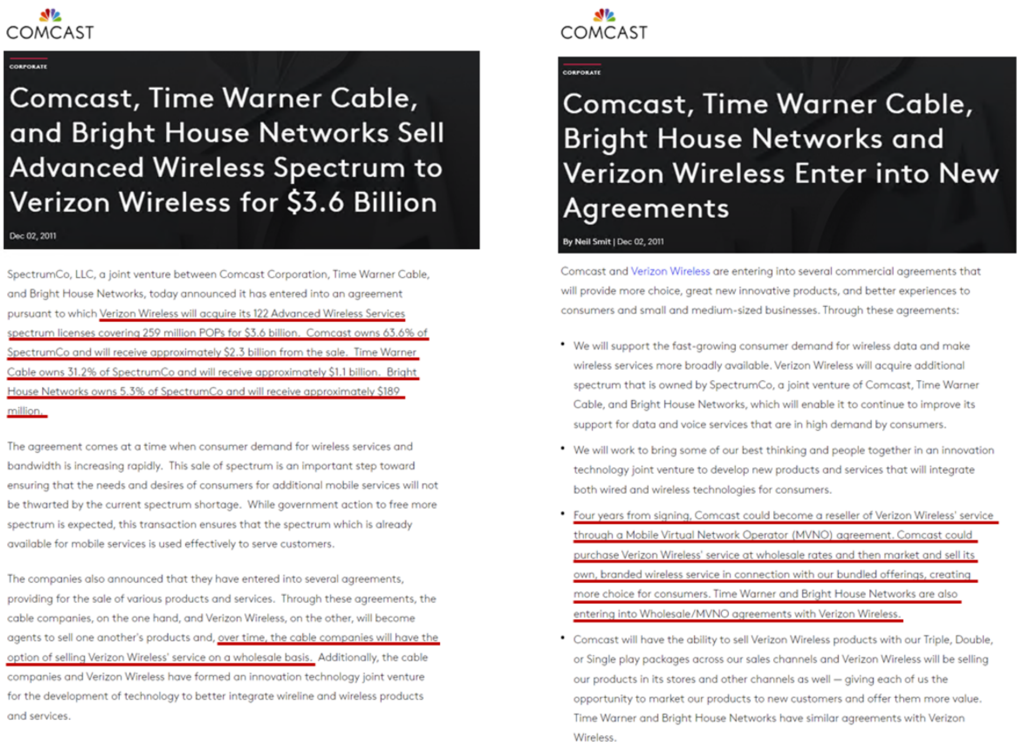
2011: Comcast and Charter's precursor companies sold mobile spectrum holdings to Verizon in return for a ubiquitous, and permanent Mobile Virtual Network Operator "MVNO" agreement with Verizon, fixed at wholesale prices

What followed from Comcast and Charter in response to the DoJ's antitrust stoppage – however – we appraise as capturing one of the most astute series of steps in recent US business history, in that it has allowed both near-monopoly companies today to act in alliance, yet without antitrust intervention.

To understand its genesis, we need to go back to 2011, when Comcast and Charter's precursor companies sold their mobile spectrum holdings to Verizon in return for a permanent Mobile Virtual Network Operator "MVNO" agreement fixed at wholesale prices, as detailed in Figure 1.

The premise for the deal, as noted by in Figure 2 by Lowell McAdam, Verizon's CEO at the time, was that if the cable companies, led by Comcast, were to agree to lose their mobile spectrum holdings, they demanded a fall back path that would still allow them to offer mobile services at some point in the future, so that the cable companies were not "*blocked out of wireless*" forever. However, as an analyst noted to the Verizon CEO at the time, also as per Figure 2, the perpetuity MVNO provision at wholesale prices to the cable companies also presented a danger to Verizon, "*in providing them [the cable companies with] what might be attractive prices on the wholesale side [in] that you may be enabling a new competitor.*"

Figure 1: Dec 2nd, 2011: Comcast and Charter's precursor companies sell spectrum to Verizon in return for a permanent Mobile Virtual Network Operator "MVNO" agreement with Verizon at wholesale prices[15]



COMCAST

CORPORATE

Comcast, Time Warner Cable, and Bright House Networks Sell Advanced Wireless Spectrum to Verizon Wireless for $3.6 Billion

Dec 02, 2011

SpectrumCo, LLC, a joint venture between Comcast Corporation, Time Warner Cable, and Bright House Networks, today announced it has entered into an agreement pursuant to which Verizon Wireless will acquire its 122 Advanced Wireless Services spectrum licenses covering 259 million POPs for $3.6 billion. Comcast owns 63.6% of SpectrumCo and will receive approximately $2.3 billion from the sale. Time Warner Cable owns 31.2% of SpectrumCo and will receive approximately $1.1 billion. Bright House Networks owns 5.3% of SpectrumCo and will receive approximately $189 million.

The agreement comes at a time when consumer demand for wireless services and bandwidth is increasing rapidly. This sale of spectrum is an important step toward ensuring that the needs and desires of consumers for additional mobile services will not be thwarted by the current spectrum shortage. While government action to free more spectrum is expected, this transaction ensures that the spectrum which is already available for mobile services is used effectively to serve customers.

The companies also announced that they have entered into several agreements, providing for the sale of various products and services. Through these agreements, the cable companies, on the one hand, and Verizon Wireless, on the other, will become agents to sell one another's products and, over time, the cable companies will have the option of selling Verizon Wireless' service on a wholesale basis. Additionally, the cable companies and Verizon Wireless have formed an innovation technology joint venture for the development of technology to better integrate wireline and wireless products and services.

COMCAST

CORPORATE

Comcast, Time Warner Cable, Bright House Networks and Verizon Wireless Enter into New Agreements

By Neil Smit | Dec 02, 2011

Comcast and Verizon Wireless are entering into several commercial agreements that will provide more choice, great new innovative products, and better experiences to consumers and small and medium-sized businesses. Through these agreements:

- We will support the fast-growing consumer demand for wireless data and make wireless services more broadly available. Verizon Wireless will acquire additional spectrum that is owned by SpectrumCo, a joint venture of Comcast, Time Warner Cable, and Bright House Networks, which will enable it to continue to improve its support for data and voice services that are in high demand by consumers.
- We will work to bring some of our best thinking and people together in an innovation technology joint venture to develop new products and services that will integrate both wired and wireless technologies for consumers.
- Four years from signing, Comcast could become a reseller of Verizon Wireless' service through a Mobile Virtual Network Operator (MVNO) agreement. Comcast could purchase Verizon Wireless' service at wholesale rates and then market and sell its own, branded wireless service in connection with our bundled offerings, creating more choice for consumers. Time Warner and Bright House Networks are also entering into Wholesale/MVNO agreements with Verizon Wireless.
- Comcast will have the ability to sell Verizon Wireless products with our Triple, Double, or Single play packages across our sales channels and Verizon Wireless will be selling our products in its stores and other channels as well — giving each of us the opportunity to market our products to new customers and offer them more value. Time Warner and Bright House Networks have similar agreements with Verizon Wireless.

Figure 2: Dec 7th, 2011: Verizon CEO notes that Comcast CEO made it a condition of spectrum sale – permanent access to wireless at wholesale prices must be provided by the MVNO agreement[16]

Dec. 07. 2011 / 1:00PM, VZ - Verizon Communications Inc at UBS Media and Communications Conference

John Hodulik - *UBS - Analyst*

Then just lastly on the topic, is there any concern that -- again, as far as the agreement was concerned there is some cooperation on the wireless side. The cable companies are now rolling out WiFi in a lot of their major areas. It looks like after four years there could be an MVNO that the cable companies have.

Is there any danger that in providing them what might be attractive prices on the wholesale side that you may be enabling a new competitor in the 4G space?

Lowell McAdam - *Verizon Communications - President & CEO*

I think that is the reality of the situation we are in. As I talked with Brian he said, look, if I sell you this spectrum that puts me on a particular path. I need to have a fallback that if this doesn't work as well as we had hoped that I am not blocked out of wireless. And I had to respect that as a partner.

Figure 3: 2022/23 conference calls – Charter and Comcast control shareholders reiterate that their ubiquitous MVNO access to Verizon network at wholesale prices is for perpetuity[17]

CHARTER COMMUNICATIONS, INC. ANALYST/INVESTOR DAY NOV 17, 2022

Gregory B. Maffei
CEO, President & Director

But the good news is we have a ubiquitous permanent MVNO deal. And we're not required to build out in the unattractive places, only as Tom said, Charter gets to way and say in what markets, does this make sent to be an owner and pursue those CBRS owner economics? And what markets do we want to let the other guy, generally the less densely populated markets where it's relatively low traffic compared to the cost of the rollout, that carrier handle the cost and let us ride on him.

COMCAST CORPORATION COMPANY CONFERENCE PRESENTATION MAY 16, 2023

Brian L. Roberts
Chairman & CEO

Well, I think it's very strategic. And we're very focused on it. We're having great early success. It's early days. We've been at it for a few years, so it's not first year. We've got 6 million lines. We're 10% penetrated, 10. We have the best deal in the market because you're getting Verizon Wireless and our WiFi converged and our broadband network and all of our out-of-home hotspots, all for something less, 20%, 30%, 40%, depending on what package you're in, if you take our broadband and you take our wireless.

So it is the best deal, the best product and we have a good relationship with Verizon. And we're free to build our own towers and cells and things if we choose to. And the deal goes in perpetuity. So we are a capital-light model, and we have an exceptional consumer experience, and we're just getting started.

Regardless, the MVNO deal went ahead, and today both Comcast and Charter benefit from ubiquitous, perpetuity[18] access to the Verizon mobile network at wholesale prices. Importantly, this relationship is not reciprocated, no US wireless operator has access to the cable broadband networks[19]. As such, the deal created a one-way bundling opportunity in favour of the cable companies: Comcast and Charter can profitably bundle mobile services with their core broadband offering, yet the wireless companies cannot bundle cable broadband services from Comcast and Charter with their core mobile offering.

2017: Comcast and Charter merged their mobile activities the revenues of which were below the regulatory threshold for review. Today, as mobile and broadband converge, Comcast and Charter, through their merged mobile operations, operate in alliance

It was not until 2017, two years after US regulators blocked the proposed merger between Comcast and Time Warner Cable, however, that the second astute step was conducted by Comcast and Charter. The two companies merged their nascent mobile activities[20]. As part of the deal, Comcast and Charter also agreed not to compete against each other in mobile[21]. Today, because both companies gain customers by bundling cable broadband with mobile, the agreement to not compete against each other in mobile also dictates by logic, albeit indirectly, that the companies have also agreed, de facto, not to compete against each other in cable broadband, and as such, achieved an alliance able to target the same gatekeeper role that would have been achieved by a full merger.

Figure 4: In 2017 Comcast and Charter agreed a merger – but only of their nascent mobile operations whose revenues were below the antitrust threshold for review[22]

COMCAST

Comcast and Charter to Explore Operational Efficiencies to Speed Entry Into Wireless Market

May 08, 2017

PHILADELPHIA, PA AND STAMFORD, CT

The efficiencies are expected to provide more choice, innovative products and competitive prices for customers in each of their respective footprints.

Comcast and Charter, both regional cable operators, today announced an agreement to explore potential opportunities for operational cooperation in their respective wireless businesses to accelerate and enhance each company's ability to participate in the national wireless marketplace. The companies, which have each separately activated a mobile virtual network operator ("MVNO") reseller agreement with Verizon Wireless, have agreed to explore working together in a number of potential operational areas in the wireless space, including: creating common operating platforms; technical standards development and harmonization; device forward and reverse logistics; and emerging wireless technology platforms. The efficiencies created are expected to provide more choice, innovative products and competitive prices for customers in each of their respective footprints. Additionally, the companies have agreed to work only together with respect to national mobile network operators, through potential commercial arrangements, including MVNOs and other material transactions in the wireless industry, for a period of one year.

May 5, 2017

Charter Communications, Inc.
400 Atlantic Street
Stamford, Connecticut 06901
Attention: Christopher L. Winfrey

Re: Wireless Operational Cooperation

Agreement Ladies and Gentlemen:

Comcast Corporation and Charter Communications, Inc. are each regional cable companies that have from time to time cooperated on business strategies and initiatives in an effort to better compete against our mutual competitors. We each have planned or have nascent regional wireless operations that are currently limited to our respective cable distribution footprints conducted through MVNO agreements, but in order to compete with national wireless operators and to respond to changes in technology and the marketplace, including possible further consolidation among national wireless competitors, our strategies may need to evolve. The potential of future technologies presents an opportunity to innovate and compete by increasing choices for, and delivering better value to, American consumers and businesses, which can be only enhanced by the optimization of our regional network assets to compete and better provide certain services in a national marketplace.

The parties intend to explore potential areas for operational cooperation in the Cooperation Field. Potential areas will include operational cooperation (including through MVNOs and other licensed and unlicensed spectrum) to facilitate competitiveness for the benefit of consumers through common billing and operating platforms, technical standards development and harmonization, handset and tablet device life cycle management including forward and reverse logistics, and emerging wireless technology platforms.

Therefore, the parties agree that, during the Term (as defined below):

(a) The parties will explore potential areas for operational cooperation in the Cooperation Field as described above.

(b) Except with the prior consent of the other party, each party will not, and will not permit its respective controlled affiliates to, (i) discuss with third parties (except such party's professional advisors) or negotiate any Covered Transaction, regardless of whether such Covered Transaction would take effect during or after the Term, or (ii) agree to or enter into any Covered Transaction. For purposes of this letter agreement (this "Letter Agreement"), (i) "Covered Transaction" means (w) any acquisition, merger or other transaction (or series of transactions) with a Covered Person (or any of its controlled affiliates) that contemplates (or would result in) the acquisition (directly or indirectly) of at least 50% of the voting power or consolidated assets of any party hereto or a Covered Person, (x) any material transaction in the Cooperation Field (*e.g.*, investments, acquisitions, mergers, partnerships, joint ventures or similar transactions) with a transaction value in excess of $50 million with any Covered Person, (y) any material commercial arrangement in the Cooperation Field (including those relating to MVNO (or similar) agreements or arrangements) with any Covered Person or (z) any material transaction (*e.g.*, investments, acquisitions, mergers, partnerships, joint ventures or similar transactions) with a transaction value in excess of $200 million in which the direct or indirect purchase by a party hereto (or one of its controlled affiliates) of wireless spectrum constitutes at least a majority of the transaction value, and (ii) "Covered Person" means a national mobile wireless carrier or any person or entity that has a material ownership interest therein.

Comcast and Charter's critical insight in 2017 was to conduct the mobile merger before their wireless services formally commenced in 2018[23] at which point Comcast launched its mobile service, named Xfinity, and Charter correspondingly launched its Spectrum Mobile service. In the US, the primary tool of antitrust enforcement held by regulators is the blocking of mergers, but the enforcement right only applies to those mergers that have revenues exceeding a $100m threshold[24]. As such, in 2017 – despite having an asset worth billions, possibly tens of billions, from the existence of the ubiquitous and perpetuity Verizon MVNO at wholesale prices – Comcast and Charter had yet to launch their mobile business, had no mobile revenue, and therefore the DoJ lacked an intervention ability. Today these mobile operations are not only bundled with cable broadband but lead the US market in net customer additions, a path that is now positioned to accelerate further.

Comcast and Charter are advantageously using their combined ubiquitous, and near-monopoly cable broadband position, combined with the Verizon MVNO agreement, to profitably bundle mobile and broadband together

Bundling strategies achieve optimal outcomes when implemented from the position of a ubiquitous monopoly, and which has access to the bundled product at wholesale pricing or equivalent

An instructive example of a bundling strategy leading to an optimal business result from the point of view of the bundler is Microsoft's bundling of its Internet Explorer web browser in 1995-2001 to successfully displace the then leading independent web browser, Netscape Navigator[25]. Microsoft conducted its bundling strategy from the position of a ubiquitous monopoly, and with access to the bundled product at wholesale pricing or equivalent.

Microsoft bundled Internet Explorer with Windows (which had an over 90% share of the desktop operating system market[26]) for free[27], and, by having one sales touchpoint for the monopoly product – Windows – steadily displaced Netscape from its trailing 80% market share[28]. By comparison, whilst Netscape was free for home and educational use it required a paid license for business use[29]. By 2001, the browser war had ended with Internet Explorer having no remaining competition for its market share[30], and thereon no serious competition until Google launched Chrome in 2008[31] (at which point Internet Explorer's market share was still over 70%[32]).

The critical variables were that Microsoft operated from a monopoly position and bundled the discounted ancillary product automatically with no friction cost for the purchaser of Windows. The strategy was profitable for Microsoft, because it had built Internet Explorer organically and as such its cost for bundling the product was equivalent to wholesale pricing.

Figure 5: Bundling by a monopoly leads to increased profitability when the monopolist's production cost for the bundled and discounted product is still below its bundled, discounted price.

Comcast and Charter operate from a ubiquitous, near-monopoly positions in US broadband

Comcast and Charter's combined leadership of the US broadband industry is across a series of non-overlapping regions of the country illustrated by Figures 6, & 7. Each company oversees a non-overlapping set of regions, broadly mapped to the US population. Combined, the two companies cover over 84% of US homes[33].

As per Figure 7, as a percent of all US broadband subscribers, the combined market share of Comcast and Charter has moderated recently to 53%[34]. However, because the companies cover only 84% of US homes, their coverage-adjusted market share is still 63% (i.e. 53% / 0.84). As such, their position retains the characteristics of a near monopoly, in that we would define optimal monopoly market share in line with Lanchester Strategy theory at 74% or more[35]; the theory contends that a monopoly maximises its economics not at 100% market share, which would require operating at suboptimal economics simply to extinguish all remaining competitors.

Figure 6: Comcast and Charter's cable coverage map: each company is a US cable market leader across a series of non-overlapping regions of the country, and combined the companies cover over 84% of US homes[36]

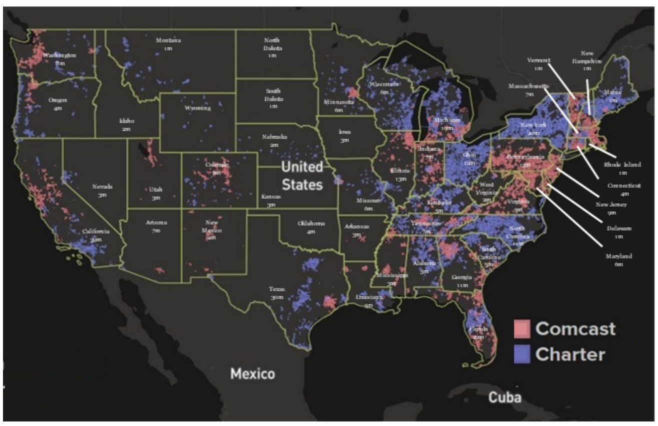


Figure 7: As a percent of all US broadband subscribers, the combined share of Comcast and Charter is moderating, and currently is 53%. However, because the companies cover only 84% of US homes, their coverage-adjusted market share is 63%[37]

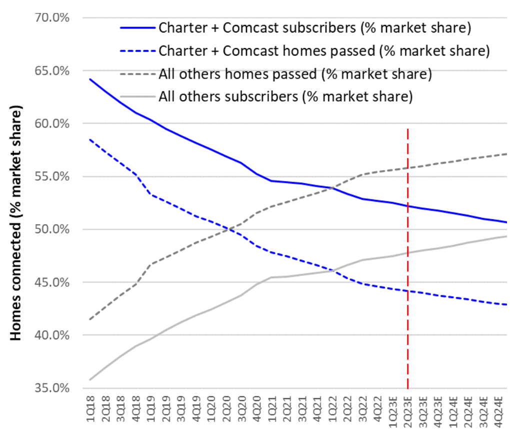
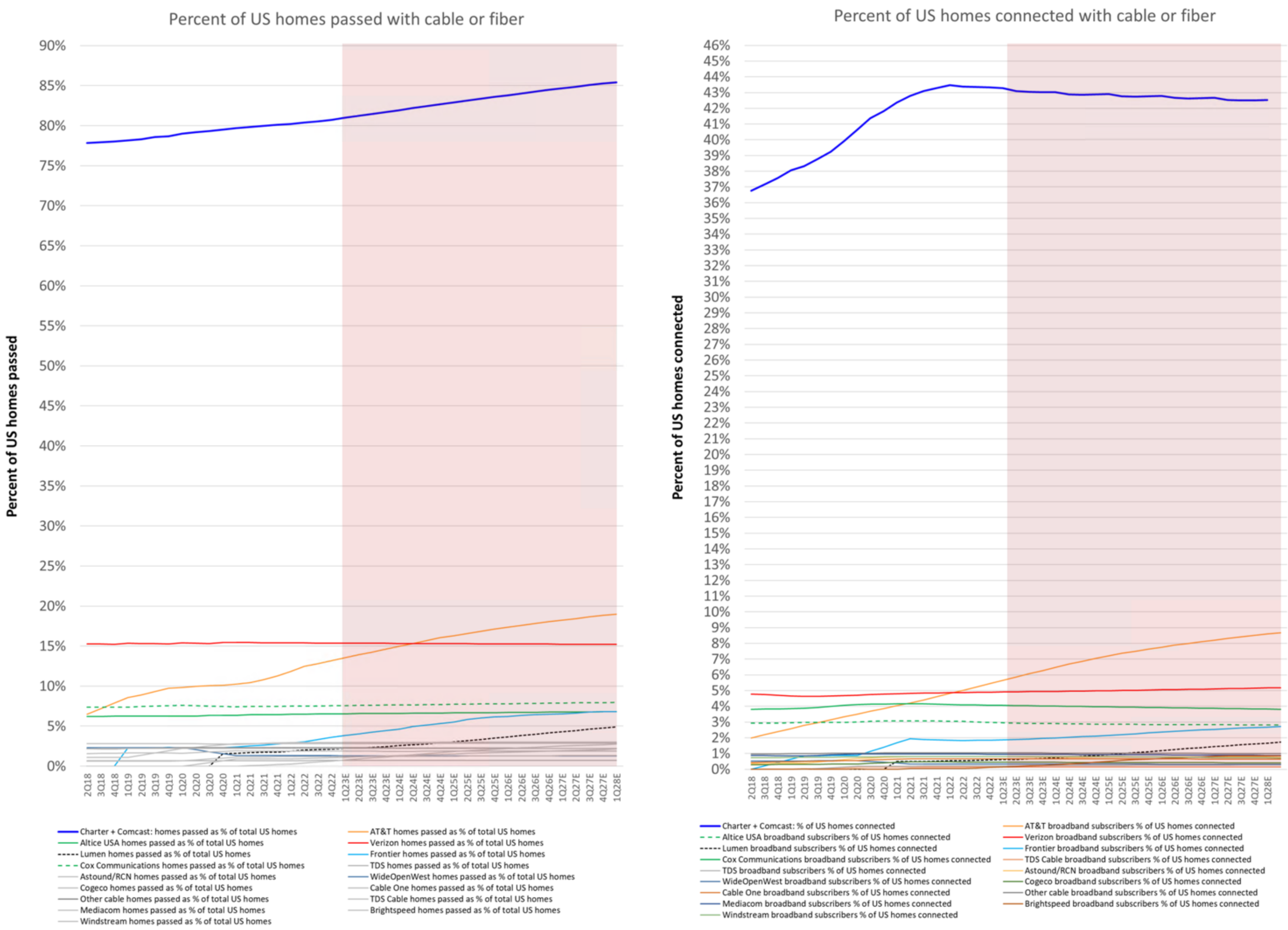


Figure 8: Comcast and Charter combined connect 8x as many homes as any of their nearest competitors[38]



A higher resolution look at Comcast and Charter's near monopoly position in Figure 8 reveals an additional strength – the atomised nature of their competitor set, with Comcast and Charter combined connecting 8x as many homes as their next largest peer.

It is notable that very few "physical plant" companies achieve comparable market dominance. However, cable broadband infrastructure lends to a natural monopoly-type outcome by its property of geographic density network effect. Comcast and Charter pass, with cable, in the region of 1.8x as many homes as they connect (put differently, Comcast and Charter achieve an average penetration ratio of 55%[39]), and as such, the cost of connecting a new home that has already been passed with cable is close to zero, the new home simply needs to be "switched on". It is very difficult for a new entrant to design a business plan to displace the incumbent from the market when the incumbent can elect to compete with the new entrant at close to zero economics.

This competitive position of Comcast and Charter is also in the context of the comparably low population density of the US, at just 27% of the population density of Europe[40]. This results in the up-front fixed cost for a new entrant in the US at up to 3.7x higher than in Europe, further disincentivising new broadband competitors.

Comcast and Charter, by bundling, are today achieving industry leading net additions in mobile

As per Figure 9, Comcast and Charter not only sell broadband and mobile as one bundle, but price the mobile component at a more than 25% discount to incumbents Verizon, AT&T and T-Mobile[41]. This strategy, as per Figure 10, by bundling mobile from a ubiquitous and monopolistic broadband position, has resulted in Charter and Comcast's mobile net adds now leading the US wireless industry[42].

The bundling of mobile services by the two cable companies appears to meet the business criteria for success. Not only do the cable companies operate from a position of near monopoly, they also have access to the bundled product at wholesale pricing[43], and in perpetuity, allowing a profitable bundle rather than market share gains at an economic loss. As such, the cable companies have a route to gaining market share in mobile that does not require significant up front capital nor result in capital destruction. Furthermore, as per Figure 11, the incremental revenue opportunity for the cable sector in penetrating the mobile industry is large: the mobile sector offers Comcast and Charter within footprint revenue potential at 2.5x their current cable broadband revenues[44].

Figure 9: Today, Charter and Comcast sell broadband and mobile as one bundle, and the mobile component at a more than 25% discount to incumbents Verizon, AT&T and T-Mobile[45]

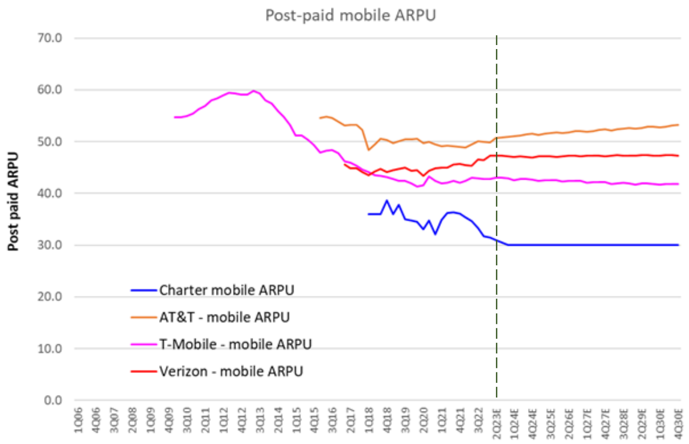


Figure 10: By bundling mobile from a ubiquitous and monopolistic broadband position, Charter and Comcast's mobile net adds are now leading the US wireless industry[46]

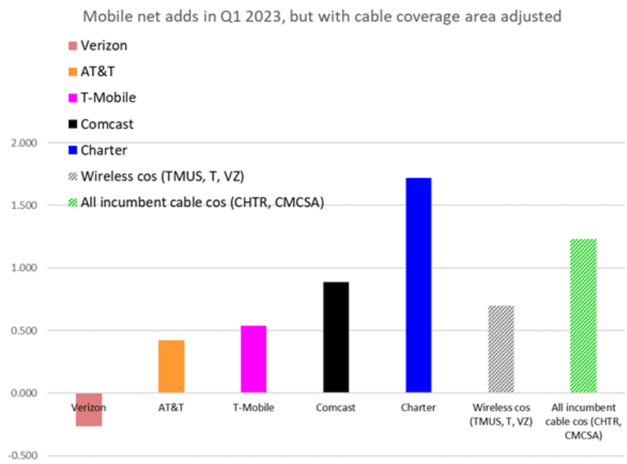
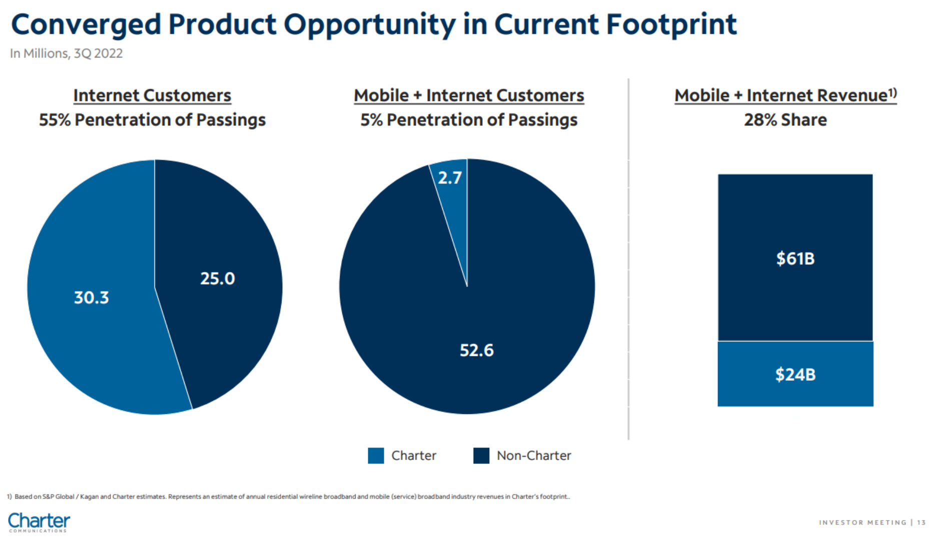


Figure 11: The incremental revenue opportunity for the cable sector in penetrating the wireless industry is large: within footprint revenue potential at 2.5x current cable sector revenues[47]



Comcast and Charter's mobile operations appear on course to be more profitable than the incumbents

It is instructive to note that Comcast and Charter's business advantage appears superior to a three-way merger scenario with Verizon. In the latter scenario, the converged company could not justify aggressive bundling policies, because they would result in a re-pricing down of the mobile back book that was contributed by Verizon, impairing post-merger profitability.

However, in the case of Comcast and Charter, the two cable companies have no economic exposure to the equity of their Mobile Virtual Network Operator partner Verizon. Therefore, whilst their price-aggressive bundling strategy may ultimately result in a pricing down of the mobile back book of Verizon, and ultimately, of the other wireless industry players, this will not result in a direct scenario of harm to the equity value of the cable companies. As such, Comcast and Charter are in a unique position possessing the ability to be more aggressive with a bundling-at-a-discount strategy than would a hypothetical converged mobile operator.

Similar to Microsoft/Internet Explorer/Netscape, because Microsoft did not own Netscape, it could bundle Internet Explorer for free without being exposed to Netscape's equity impairment. As such it permitted Microsoft to pursue a far more price-aggressive bundling approach than would otherwise have been the case.

Furthermore, despite Comcast and Charter's price aggressive bundling their economics still appear to be more than compensated by the wholesale pricing of the MVNO agreement with Verizon.

Whilst the cable companies do not directly disclose their mobile service margins, the information can be derived from the difference between the mobile revenues of Comcast and Charter less Verizon's MVNO wholesale revenues[48]. The output is that the aggregate mobile service margin of Comcast and Charter is already in the region of 40%, and as such reaching competitiveness with the mobile service margins of T-Mobile at 42% and Verizon at 58%, as per Figure 12.

Figure 12: Comcast and Charter's mobile service margin can be derived from the difference between their mobile revenues less Verizon's wholesale revenues, and, at above 40%, it is already competitive with incumbent mobile service margins[49]

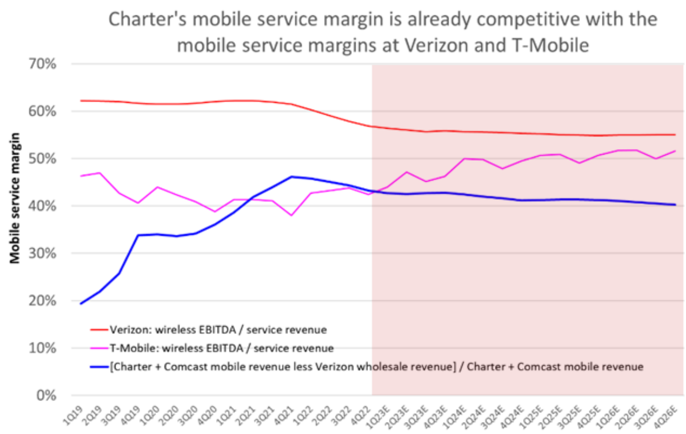
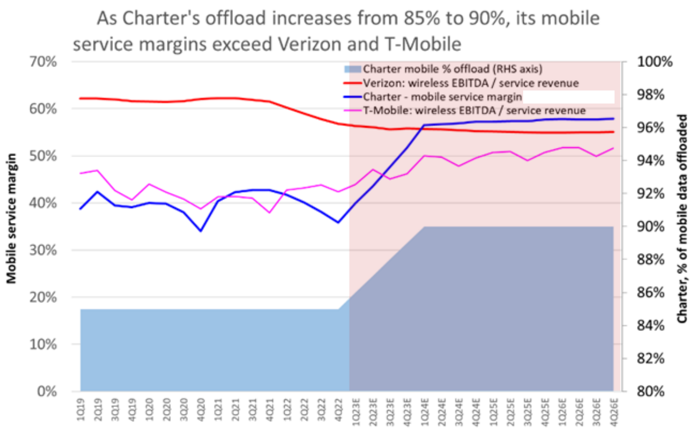


Figure 13: Charter has disclosed targets to increase the proportion of data offloaded to its own network, such that the proportion that goes through the Verizon MVNO reduces from 15% to 10%[50]



These attractive margins are also being achieved in part because Comcast and Charter, on a trailing basis, uniquely offload 85% of their mobile data to their own cable networks, as per Figure 14, and from which bandwidth can be provided at just 5% of the cost of a mobile wholesale agreement[51], as per Figure 29.

The cable companies have also disclosed targets to further increase the proportion of data offloaded to their own networks such that the proportion that goes through the Verizon MVNO reduces from 15% to 10%[52]. In line with this target, in Q1 2023, Charter disclosed[53] that the proportion of data going through the Verizon MVNO had already reduced from 15% to 13% of total data.

If the analysis assumes, as per Figure 15, that the cable companies do succeed in reducing the Verizon MVNO usage to 10% of mobile data, then their cost per unit of data correspondingly drops by one third, and their mobile service margin rises to close to 60%[54], as per Figure 13. At this point their mobile service margin exceeds that of both T-Mobile and Verizon, despite the 25% discounted pricing of Comcast and Charter's mobile service relative to their incumbent competitors.

Figure 14: US wireless customers already receive 85% of their data through Comcast and Charter's broadband networks; as such, when the cable companies provide mobile service through the Verizon MVNO only 15% of the data goes through the MVNO[55]

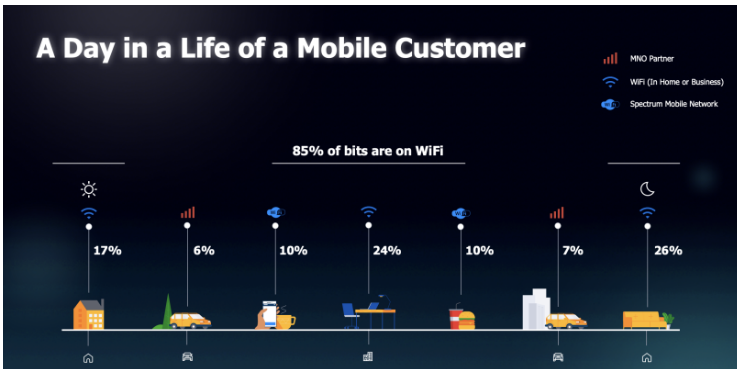
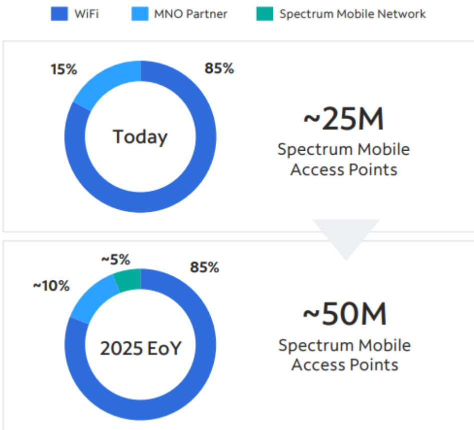


Figure 15: Charter has disclosed targets to increase the proportion of data offloaded to its own network, such that the proportion that goes through the Verizon MVNO reduces from 15% to 10%[56]



As such, Comcast and Charter appear to be progressing on a path of both displacing the mobile incumbents by bundling at a discount, and growing their US mobile penetration at supernormal profits due to their unique ability to offload data at extremely low cost to their existing cable networks (on which, as part of their alliance, they also grant each other nationwide reciprocal roaming rights).

Because the incumbent US wireless operators cannot replicate the same path, this potentially leads to the cable companies becoming not only a participant in the US wireless market, but instead achieving the dominant position (matching their leadership position already achieved in both cable broadband subscribers and in net mobile additions). To the extent this outcome is achieved, there are potentially valuation implications – mobile companies subject to atomised competition typically trade at low PE ratings (AT&T trades at just 5.6x consensus PE estimates for 2024, Verizon 7.0x), whereas converged mobile operators achieving leadership positions may achieve premium ratings (Swisscom trades at 18x PE, BCE of Canada 20x PE, and Telstra of Australia 26x PE)[57].

The provision of high bandwidth mobile services is more efficient when combined with cable backhaul: mobile service combined with a cable broadband footprint gains strategic advantage as mobile networks densify

As demand for mobile bandwidth increases, wireless operators are increasingly recognising the need for cable backhaul, combined with small cell radios, rather than adding to their traditional macro tower infrastructure.

In 2017, recognising this need, Verizon made a takeover proposal to Charter[58], which was rejected by John Malone. Media coverage at the time quoted deal sources who indicated that Verizon sought "*a big cable acquisition to help it launch its high-speed 5G wireless plans, which require the kind of fiber-optic networks operated by cable.*"[59] A second article added that Verizon "*need it [cable backhaul] for 5G, said a second source, confirming [Verizon CEO Lowell] McAdam's interest.*" The article added, "*the most likely targets would be Charter or Comcast*".[60]

In general, wireless networks can add more throughput either by acquiring additional spectrum, which in most cases is either not available or prohibitively expensive, or by adding more transmission radios per each unit of geographic area covered, a process known as densification. However, for higher levels of densification a cable backhaul network is required to connect each new radio, and yet such a cable network would also be prohibitively expensive to build from new. As such, as mobile networks densify, the strategic value of Comcast and Charter's nationwide cable network alliance increases.

Comcast and Charter are also achieving a greater offload ratio to their networks both by adding their own radios in areas where they have the highest population densities, and also because they have acquired up to 150MHz of CBRS or Citizens Broadband Radio Service spectrum in selected regions[61]. CBRS spectrum is regulated with propagation limitations[62], and whilst this makes it less suitable for traditional macro towers, it also significantly lowers its acquisition cost. And the spectrum does remain highly suitable for lower distance propagation from a cable network[63].

Charter for example has 800,000 miles of cable, and 56 million passings, therefore average distance between each passing is 25 meters[64], suitable for CBRS spectrum propagation. By contrast the average distance between the macro towers used by the incumbent telco providers is often as high as 1 mile, and sometimes 5 miles[65], disallowing them utilisation of a low-cost spectrum such as CBRS.

An additional advantage of the penetration path of the cable companies in mobile is that their approach will naturally achieve location specificity, because they only offer their mobile service – bundled with cable – to customers in the specific location of their cable network. So, whereas a traditional mobile business model requires a highly expensive, ubiquitous nationwide build of macro towers (because the company cannot predict where each new customer will be located), the cable approach to mobile specifically targets mobile customers in the location of their existing cable network, and hence the additional radio build out to serve these customers is highly cost efficient.

Comcast and Charter have also agreed reciprocal roaming agreements, meaning the Verizon MVNO usage can ultimately be restricted to the limited areas of the country not covered by the Comcast and Charter networks, and at Verizon's wholesale pricing, further increasing business model efficiency.

Outside of Comcast and Charter's shift into the wireless industry, their underlying cable broadband economics are also positioned for financial uplift

"We have the opportunity, with this very large platform, 56 million passings, to be able to do what I think is probably the largest physical upgrade of the cable network since the 1990s. We're doing that at a really low cost at $100 per passing and we can do it fast. And at the same time, to build more new network passings than probably have been built in a single period of time, since, as you mentioned, the '80s.

Chris Winfrey, Charter Communications CEO, March 2023[66]

Comcast and Charter's cable broadband speed increase provides for additional uplift, as well as delivering unmatched speeds for prospectively 90% of their mobile data throughput (offloaded to cable broadband)

Concurrent with Comcast and Charter's penetration of the wireless sector, the two companies are also upgrading their broadband networks from 1 Gbps to 5 Gbps speeds, by year end 2025[67], and at a combined cost of $12bn[68]. To put the upgrade into perspective, were it to be achieved by acquiring traditional mobile spectrum, the cost of the required 1,000 Mhz of spectrum would be $450bn[69], or 1.8x Comcast and Charter's combined market capitalisations.

As per Figure 16, the speed increase is also large, relative to the cable companies' average rate of speed increase over the trailing period. The prospective speed increase, at 5x in 2.5 years, is a more than two-fold acceleration in the prior gradient of bandwidth increase over the trailing decade[70].

There is also an economic implication: when broadband speeds increase from 1 Gbps to 5 Gbps, ARPU increases from $80 to $180[71] (for the purposes of this white paper we define average revenue per user, or ARPU, as each home defining one user). Comcast and Charter combined connect 64.5 million homes, and as such the speed increase represents a revenue opportunity of $77bn (i.e., $100 x 12 x 64.5m), at potentially high margins given the $12bn cost would be amortised over 5 or more years.

Figure 16: Comcast and Charter are both upgrading their broadband networks from 1 Gbps speeds to 5 Gbps, by year end 2025, and at a combined cost of $12bn. The increase, at 5x in 2.5 years, is a more than two fold acceleration in the prior gradient of increase over the trailing decade[72]

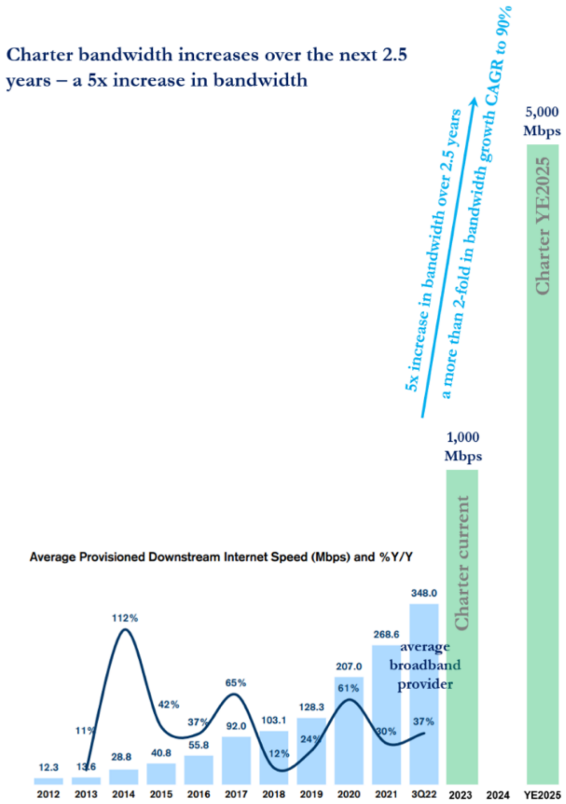
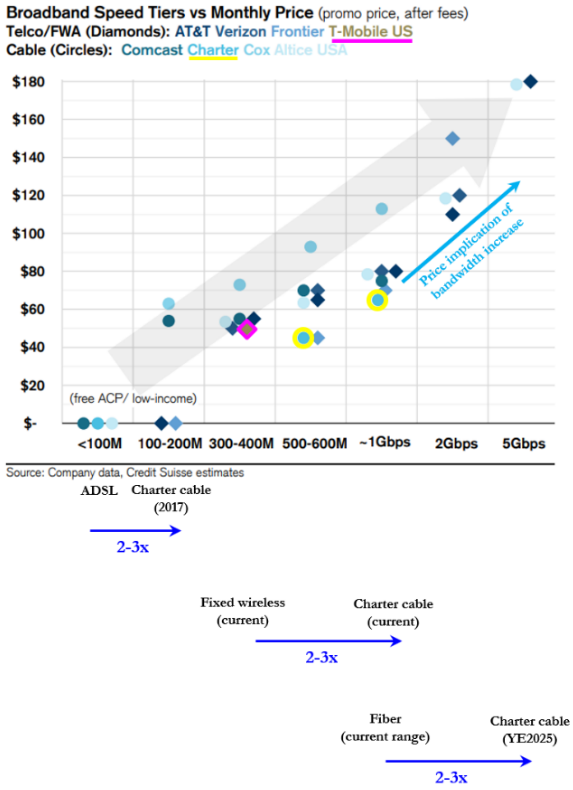


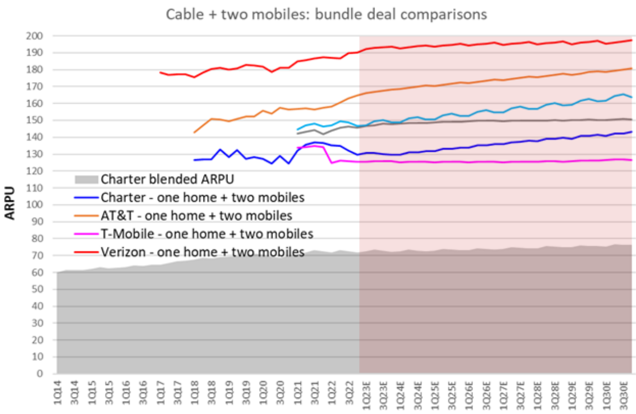
Figure 17: When broadband speeds increase from 1 Gbps to 5 Gbps, ARPU increases from $80 to $180[73]



Of course, only a proportion of Comcast and Charter's customers may be willing to pay for the increased speeds. For an illustrative scenario, let's assume this proportion is one third. As such, the upgrade offers incremental profits of $23bn, assuming the upgrade costs are amortised over 5 years (i.e. 33% x $77bn less $12bn/5).

However, the cable companies are also positioned to benefit from bundling mobile with cable broadband, which, assuming two mobiles per home[74], offers a further $60 uplift in ARPU. At the 60% service margins of Figure 13, and assuming one third incremental penetration of Comcast and Charter's customers, the profit uplift potential from this assumption in mobile is $9.2bn (i.e. $60 x 12 x 64.5m x 60% x 33%).

Figure 18: In the case of Charter, bundling two mobiles per home increases the per home ARPU to from $70 to $130. The speed increase would then increase that to $230. The result is up to a 220% increase in ARPU[75]



The consensus for Comcast and Charter's combined net income in FY2024 is $23bn[76] – as such, the combined speed upgrade and mobile penetration path, assuming an incremental one third customer penetration in each (the companies have so far penetrated 10.5% of their cable broadband customers with their mobile offer[77]), offers a path to a more than double in the combined net income of Comcast and Charter to $55bn. Alternatively, assuming an incremental two thirds customer penetration, the combined net income more than triples.

It is notable that progress on this penetration path should be subject to self-reinforcement. The self-reinforcement occurs because when Comcast and Charter upgrade the speed on their cable broadband networks, they also gain competitive advantage regarding the speed at which approximately 90% of the data will thereon be delivered to their mobile customers, who can uniquely and automatically roam across the Comcast and Charter network at these speeds whenever their mobile is in proximity of a Comcast or Charter WiFi or CBRS modem. This allows for an unmatched service, attracting new customers to both their cable broadband service which is only 55% penetrated[78] at current, and to their mobile service[79], and with both sold together as a discounted bundle.

<u>Over time, by maintaining the fastest broadband networks in the US, from both near monopoly positions and in alliance, additional business opportunities may be captured by Comcast and Charter</u>

As outlined, the Comcast/Charter alliance today appears to be achieving not only in cable broadband but also prospectively in mobile, the position of "*an unavoidable gatekeeper for internet-based services*" – the wording that the US Department of Justice used in 2015 to block the Comcast / Time Warner Cable merger[80].

That such a level of market share might lead to scenarios of above average economic gain by the cable companies was further accreted in December 2017, when the FCC repealed the so called "net neutrality" regulations[81] that prohibited broadband providers from blocking third party websites or charging them for higher-quality service or certain content. The implication from the rule-change is meaningful in the scenario that near-monopolistic entities, such as the combined Comcast and Charter, entrench their position in broadband, as well as begin to achieve a dominant position in mobile, they would be able to block or throttle users from independent internet-based services, such as Netflix[82].

In 2022, the probability of this scenario appeared to further increase, when Comcast and Charter announced a joint venture to develop their next generation streaming platform[83]. Again, by acting in alliance, yet merging pre-revenue operations, the companies are able to combine activities without antitrust intervention.

The cable economic model – dominant, predictable and growing businesses with low capex requirements, whose cashflows are suitable for financial leverage – has historically achieved strong financial progress

Cable companies have historically been suited to John Malone's investment approach and have delivered robust business performance through diverse market conditions

Comcast and Charter's penetration of the mobile sector, combined with their cable broadband speed upgrade, provides for a robust economic outlook for the two companies. In this context it is notable that when the cable business model has such an outlook it has also been compatible with the accretive investment approach of John Malone.

Malone's strategy has been to find stable and predictable businesses, with dominant business positions and low capex requirements, and, due to their stability, which have leverageable cashflows at the same time as benefitting from structural growth.

Figure 19: Under John Malone's control, Tele-Communications Inc "TCI", produced a shareholder return averaging 30% per annum from 1973 to 1998, when TCI was sold to AT&T[84]

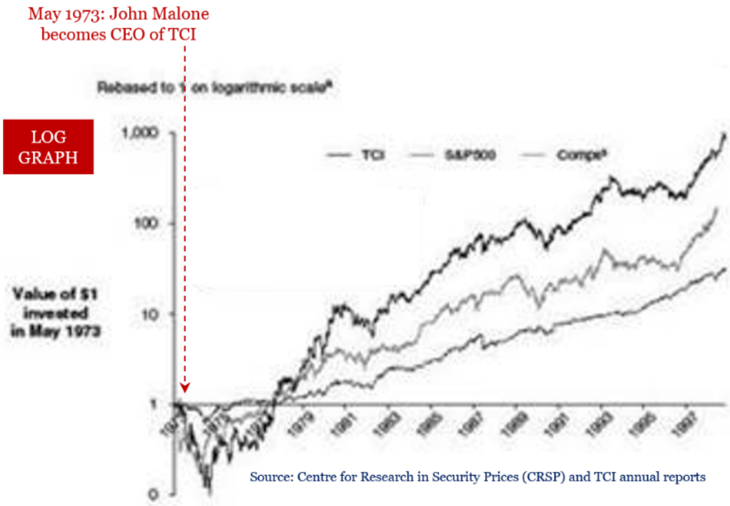
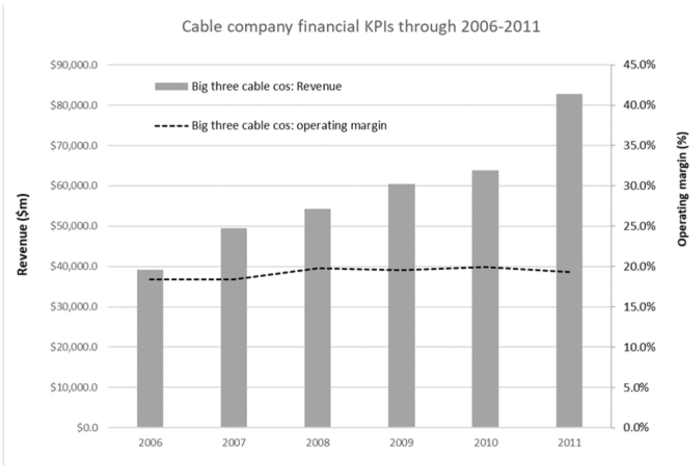


Figure 20: The big three cable companies – then Comcast, Time Warner Cable, and Charter – achieved robust economic progress through the 2007-2009 financial crisis, maintaining profit margins and growing revenue by 20%[85]



This "Maloneian" investment model, applied by Malone to cable company Tele-Communications Inc or "TCI", produced a shareholder return averaging 30% per annum from 1973 to 1998[86], when TCI was sold to AT&T. The only stock whose returns exceeded TCI over the same period was Berkshire Hathaway, which achieved a CAGR 1973-1999 of 34.2%[87].

In 2002, AT&T sold TCI to Comcast[88], and the TCI assets thereon comprised the majority of Comcast's economics. Comcast, since acquiring TCI, has delivered shareholder returns averaging until end July 2023, at 10.1% annualised[89]. In the case of Charter, the business was listed in 1999[90] and in 2013 John Malone acquired a 27% in its equity, in a joint-control shareholder agreement with the Newhouse family[91]. From 2010 until end July 2023, Charter has produced a shareholder return averaging 24% per annum[92].

In general, Comcast and Charter appear to be well run, and with good standards in governance. This is perhaps because they are both controlled by owner-managers, with Comcast controlled by the Roberts family[93] and Charter controlled by the Newhouse family and Malone[94]. It is notable that the track records of both companies are indicative of consistent progress rates in both profitability growth and share buybacks (Figures 21 & 22).

Figure 21: Over the last seven years, Comcast increased its EBIT per share by 80%, and Charter has increased its EBIT per share by 440%[95]

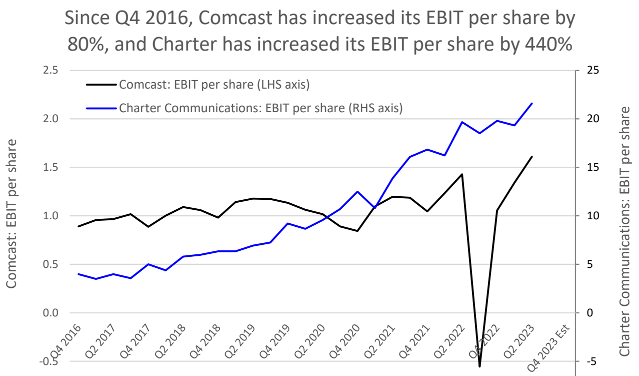
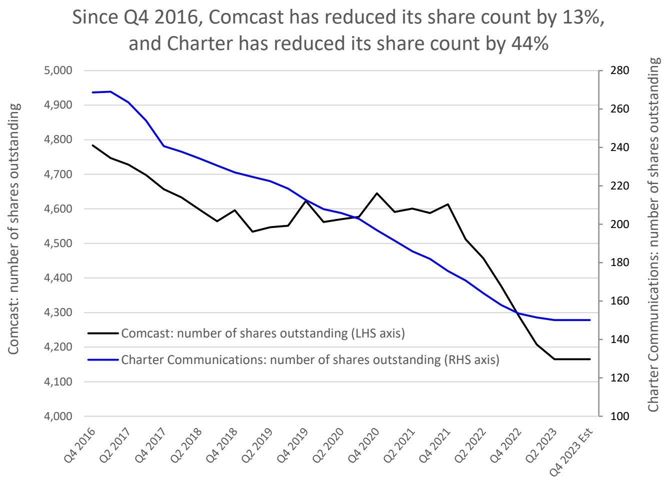


Figure 22: Over the last seven years, Comcast has reduced its share count by 13%, and Charter has reduced its share count by 44%[96]



Market implied scepticism as to the outlook for Comcast and Charter appears rejected both by insider stock buying behaviour, and by analysis of the business performance disclosures across the cable sector

Whilst the cable companies continue to be priced by the market at large at discounted levels, this contrasts with the signalling from insider stock buying behaviour

The discounted pricing of the cable companies is readily observable from their PE ratios, with Comcast and Charter both priced at 10.9x consensus earnings for 2024[97]. By comparison, the S&P500 trades at close to 20x PE for the same period[98].

Also of note is that in March 2013, when John Malone acquired 27% of Charter, he paid 3.1x EV/Sales[99], and in August 2014, Berkshire Hathaway also acquired a stake in Charter, paying 3.7x EV/Sales[100]. By contrast Comcast and Charter's multiple of sales for consensus 2024 are below both valuation multiples, at 2.3x[101] and 3.0x[102], respectively.

Indicating comparable market scepticism, Charter's market capitalisation today, at $73bn, is also at an at least 37% discount to the "well over $100bn" that Verizon was reported to have offered in an acquisition proposal for Charter in 2017[103]. Notably, two years later, Malone made public that his reasoning for rejecting the offer was based on value rather than strategic rationale: "*Verizon would have had to get more aggressive on price for that deal to have any chance*"[104]. Charter itself paid $79bn[12] for Time Warner Cable in 2015, a nominal amount almost 10% higher than Charter's market capitalisation today and prior to any adjustment for inflation.

As per Figure 22, Comcast and Charter have consistently bought back shares over recent years and including over the last 12 months, and this is also an indirect way by which their respective owner managers are increasing their stakes in both companies, and as such has the normal signalling value of insider appraisal as to attractive equity pricing.

However, it is instructive to review at higher resolution the share repurchase activity that has occurred at Liberty Broadband, which is the listed John Malone-controlled entity that holds Malone's voting stake in Charter. Since Q2 2021, Liberty Broadband has repurchased 25% of its outstanding stock. By comparison, over the same period, Charter has repurchased 19% of its outstanding stock[105]. The signal from Malone is that his appraisal of the undervaluation of Charter's equity exceeds that made by Charter's board of directors, despite the public statements by Charter's board of directors also indicating their appraisal as to the unreasonably low valuation levels of the company's equity.

> *"The market is pricing in a no-growth scenario for our shares today, and it just isn't reasonable."*
>
> Charter CEO, conference call December 13th 2022[105]

Perhaps more interestingly, over the last 18 months Liberty Broadband has switched its buyback behaviour away from the non-voting K shares and to the super-voting B shares, and in doing so, increased Malone's voting right in Liberty Broadband from 37% to 48%[106]. The switch suggests Malone wishes to neutralise the risk that Liberty Broadband – and therefore his voting interest in Charter – might otherwise be subject to a takeover offer from a third party.

It is not just the scenario of a new takeover offer from Verizon that Malone may be concerned about. T-Mobile's CEO publicly stated in January this year "*we're interested in convergence [mobile + cable].. we have a lot to offer.*"[107]

Of course, it is conceivable that the discounted pricing of the securities of Comcast and Charter exists because most market participants – unlike insiders – are still only beginning to reflect that Comcast and Charter now operate from dominance and in alliance, that their penetration path into the mobile industry has a high probability of success, and that their speed upgrade to their cable broadband network is also economically significant.

However, a lack of recognition of these upside scenarios would still fail fully to explain why Comcast and Charter trade at the *discounted* levels observed. This is partly because the valuation discount is also in the context of some readily ascertainable positives benefiting the cable sector: for example it is widely appreciated that the demand for internet bandwidth will continue to grow far into the future, with research boutiques such as Thunder Said Energy, a consultancy for energy transition, estimating that the energy demand for the internet will quadruple to 3,000 TWh by 2050, a figure equivalent to 13% of global energy usage in 2019[108]. The same contention is observed in popular culture, for example the future-facing movie by Steven Spielberg, Ready Player One, had as part of its plot that demand for bandwidth reaches such extremes as to precipitate "bandwidth riots"[109] – and yet the two companies that possess an enduring royalty on US bandwidth usage, which in general will also accelerate proportionate to AI usage[108], trade at a significant discount – close to 50% – to the S&P500.

As an explanation, we must therefore look in more detail at the counter-thesis contentions that are market talking points relating to Comcast and Charter– which the white paper reviews in its final section– and assess the extent to which such counter-thesis contentions appear at odds with the evidence from thorough analysis.

The business performance disclosures from Comcast and Charter reject the contention that the US cable companies are subject to competitive displacement from new builders of cable networks

In the context of counter-case commentary relating to Comcast and Charter, the first area of market concern appears to be the prospect of new builders of cable broadband networks introducing competitive threat.

At the time of writing, increasing evidence is already accumulating against this counter thesis – including as laid out so far in the white paper. New builders cannot offer comparably attractive bundling economics with mobile, are absent also a prospective speed advantage[112], and are also handicapped relative to the natural monopoly economics already possessed by Comcast and Charter. In this context it is notable that in recent months new builders including Lumen, Frontier and AT&T all have disclosed they are now reducing their cable broadband growth plans[113].

Figure 23: The bundled plans from Comcast and Charter at double digit percentage pricing below the pricing from new overbuilders Lumen and Frontier. Only T-Mobile, which offers a significantly slower broadband service through their wireless tower network rather than cabled connection, is competitive[110]

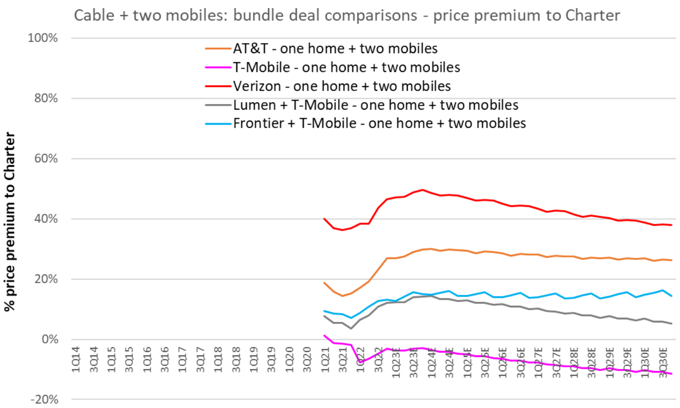
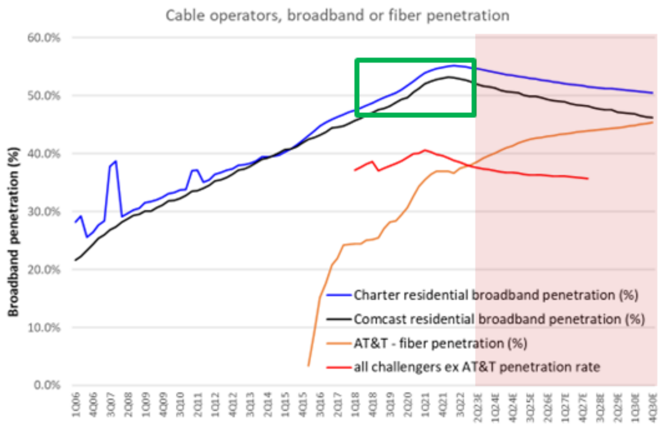


Figure 24: Comcast and Charter are both increasing their penetration, relative to home passed, of regions covered; challenger penetration is both lower and not growing[111]



As per Figure 23, it is only T-Mobile, which offers a significantly slower, and therefore uncompetitive "fixed wireless" broadband service through its mobile tower network rather than cabled connection, that is competitive with Comcast or Charter on the bundled price with mobile[114].

However, in order to examine more closely the thesis that Comcast and Charter's cable assets are subject to competitive harm from companies such as Lumen, Frontier, AT&T and several others, a comprehensive review of the disclosures from all new cable building companies is demanded.

As Figure 6 revealed, over the last four years, the combined market share of Comcast and Charter has moderated when measured as a percent of total homes receiving a cable broadband connection. And it is perhaps this observation that has seeded the market scepticism relating to the future market share progress by the two companies.

Figure 25: over the last four years, Comcast has reported improving KPIs: EBITDA margins held constant, and Comcast's penetration gap versus all challengers increased by 4.5%

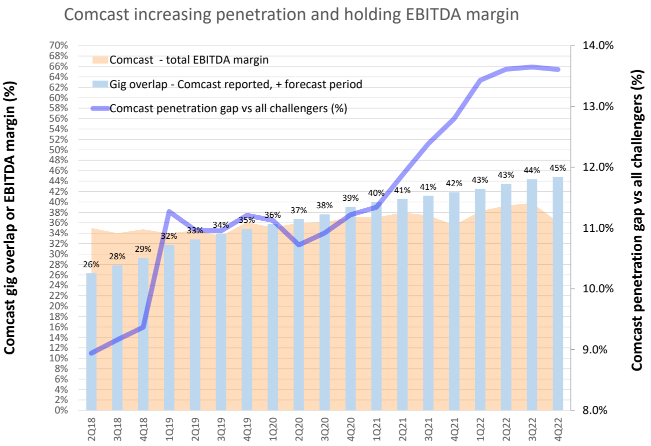
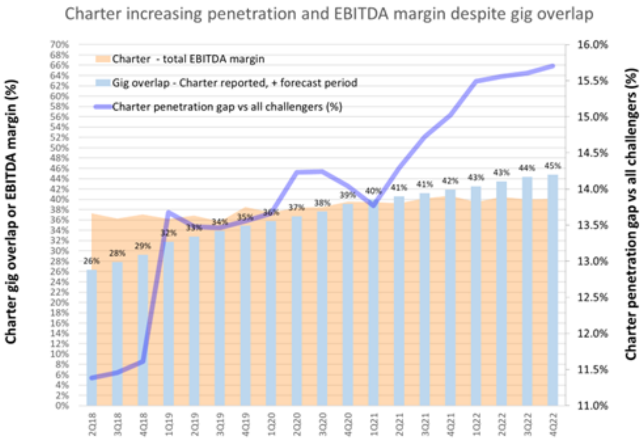


Figure 26: over the last four years, Charter has reported improving KPIs: EBITDA margins increased by 3%, and Charter's penetration gap vs all challengers increased by 4.3%



Even so, it is too simplistic to contend that Comcast and Charter are therefore losing share within the regions they serve. An alternative explanation of the data is that either that regions not served by Comcast nor Charter have achieved cable broadband buildouts, or that cable broadband continues to take share from slower copper wire connections, and as such both new builders of cable connections, and Comcast and Charter, continue to gain market share relative to copper wire connections.

"In our gig overlap areas, despite new build coming in, we're actually slightly gaining, despite new competition coming in, in the gig overbuild footprint."

Charter CEO, conference call March 8th 2023[115]

Looking at this question in more detail, as per Figure 24, it is notable that Comcast and Charter continue to increase penetration with market share gain in their regions[116]. Over the last four years, Comcast and Charter have increased the penetration of homes connected within their coverage area from 48% to approximately 55%.

An even closer look reveals that Comcast and Charter have achieved this increasing penetration of their regions over the last four years at the same time as holding or improving their EBITDA margins, in other words, discounting has not been necessary in order to grow market penetration. As per Figure 25, Comcast has reported improving penetration whilst EBITDA margins held constant, and Comcast's penetration gap versus all challengers increased by 4.5%[117]. And at Charter, Figure 26, penetration has improved whilst EBITDA margins have increased by 3%, and Charter's penetration gap versus all challengers increased by 4.3%[118].

The blue bars within Figures 25 & 26 also include the percentage "gig overlap" disclosures[119] from Comcast and Charter, by which the companies disclose the percent of their footprint that competitors are offering broadband connections at speeds of at least 1 gigabit, in other words, at competitive speeds to Comcast and Charter.

Whilst it is true that the gig overlap data does reveal an increasing level of new competitor *build* within the regions of Comcast and Charter, this in isolation does not mean there has been successful *capture* of new customers by the competitive build. In other words, when a competitor enters a region, offers gigabit speeds, yet does not slow down the market leader's pace of penetrating the market, this is capital wastage from the point of view of the new market entrant rather than successful competitive displacement.

Figure 27: Whilst Comcast's footprint covers c. 44% of US homes, the percent of new build that is occurring within Comcast's footprint is just 12%, and declining[120]

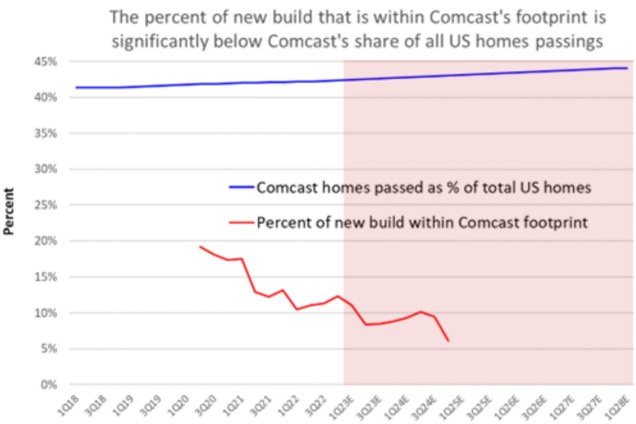
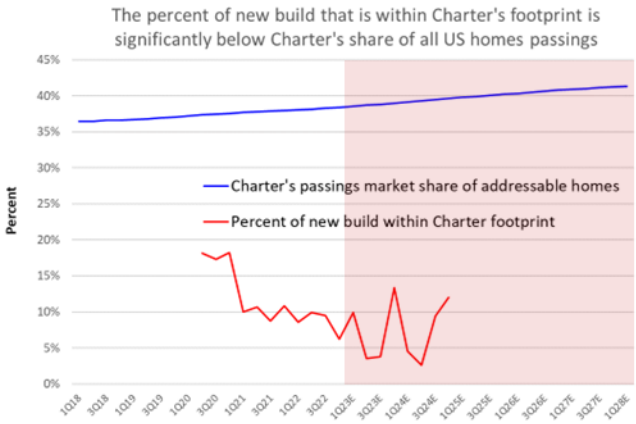


Figure 28: Whilst Charter's footprint covers c. 40% of US homes, the percent of new build that is occurring within Charter's footprint is just 10%, and declining[121]



The gig overlap disclosures from Comcast and Charter also have high utility in comparison to the total number of new broadband connections in the US market, where comprehensive data from all new builders is available, and as such, the proportion of new connections, as a percent of total new connections that are occurring within the geographic regions of Comcast and Charter, can be derived.

The output from the analysis implies that whilst new cable is being laid by competitors, the new builders are also broadly electing to avoid Comcast and Charter's regions. As per figures 27 & 28, the percent of new build that is occurring within Comcast's footprint is just 12% and declining, and the percent of new build that is occurring within Charter's footprint is just 10% and declining.

To put this data another way, despite Comcast and Charter's combined passing 84% of US homes, new fiber builders are electing to construct an average 79% of their build outside of Comcast and Charter's coverage. In other words, the new building of fiber that is occurring can be read as not a statement by the new builders that Comcast and Charter can be displaced, but instead a statement of appreciation as to the Comcast and Charter business models, and the attempt to replicate of their business model in the remaining regions that Charter and Comcast have not yet achieved coverage.

<u>The market concern that Comcast and Charter will lose meaningful customers as a result of the build out of "fixed wireless" broadband by the incumbent wireless companies is also rejected by thorough analysis</u>

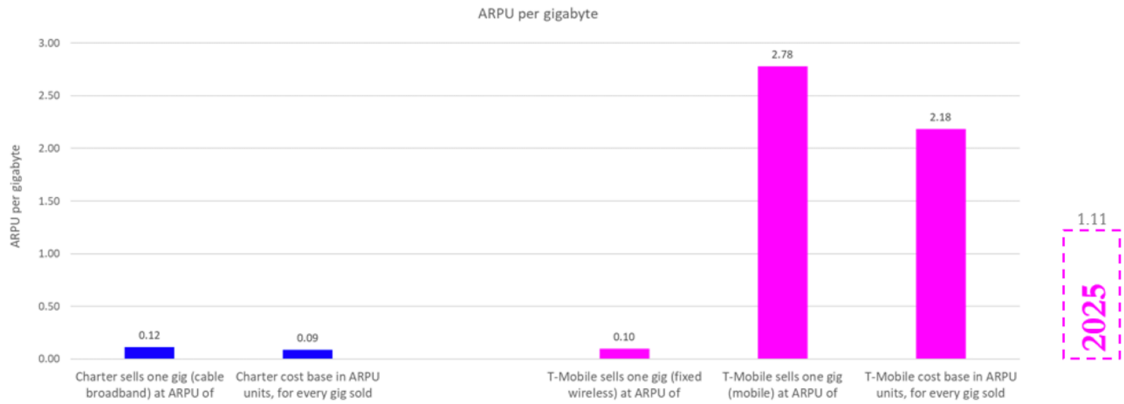
A second concern that can be picked up in reviewing market commentary relating to Comcast and Charter is that so called "fixed wireless" providers, which means the US incumbent mobile companies – led by T-Mobile – by offering a type of wireless broadband service through their telco towers, may displace customers from cable broadband services[122].

> *"If he doesn't do our deal, we'll [AT&T will] overbuild him in fixed wireless.. Mike [Armstrong, the A&T CEO] pissed the whole [cable] industry off, threatening to overbuild with fixed wireless."*

Source: Cable Cowboy by Mark Robichaux, reference year 1999[123]

As we have observed, signalling from both Verizon and T-Mobile has revealed potential M&A interest in Comcast and Charter, and this is combined with the signalling from John Malone by increasing his voting stake in Liberty Broadband as to pre-emptive defensive behaviour relating to hostile takeover scenarios. In this context, and before we look at why the fixed wireless counter case contention appears challenged, it is instructive to note, as per the quote above, that historically wireless companies such as AT&T have used the threat of deploying fixed wireless as a tool when attempting M&A negotiations.

Figure 29: Charter's per customer monthly cost base per gigabit deployed is $0.09, just 4% of T-Mobile's per customer monthly cost base per gigabit deployed at $2.18[131]



Fixed wireless today, as in the past, does not lend to viability as a long-term competitor to cable broadband because of both its high cost and handicapped throughput potential, hence its observed historic use in "business disruption" within deal negotiations, rather than long-term competitive threat.

In terms of its throughput potential, fixed wireless speeds are speeds at just 72 – 245 Mbps[124], relative to Comcast and Charter's current speeds moving from 1 Gbps today to 5 Gbps by year end 2025.

Fixed wireless is also not a cost-effective competitor, and this can be both evidenced and quantified by dividing Charter's total network throughput by its cost base, and assessing the company as a "gigabit factory", relative to the same assessment applied to T-Mobile. As per Figure 29, Charter and has a cost of production of each gigabit of 9 cents[125], gigabits it then sells at 12 cents[126]. By comparison, T-Mobile as a gigabit factory, has a cost of production of each gigabit of $2.18, and sells each gigabit for a mobile customer at $2.78[127], and yet for each fixed wireless customer it sells gigabits at 10 cents[128].

As such, deploying fixed wireless can still make some short-term sense for an operator in T-Mobile's position with the sunk cost of temporary surplus spectrum position already in place[129] as a result of its 2020 acquisition of Sprint[130], and which does not wish to reprice down its mobile back book by discounting mobile prices. After all, any incremental revenue is better than zero, once cost is already sunk. However, the fixed wireless business model does not make sense as a long-term strategy when compared to T-Mobile ultimately more steadily re-deploying the bandwidth, undiscounted, to gain more mobile customers.

It is also helpful to review exactly how much fixed wireless deployment the T-Mobile network can achieve, assuming the company continues to be aggressive in its (long-term, significantly uneconomical) deployment.

The per home broadband subscriber uses 35x as much data as the per mobile customer. As such, the total network deployment capacity of T-Mobile, inclusive of surplus spectrum, can be compared, in this instance, to Charter. The output from such an analysis, illustrated by Figure 30, makes clear that the total capacity of the T-Mobile network does not have nearly the competency to compete with a cable company's bandwidth throughput[132]. By our calculations, T-Mobile's incremental fixed wireless capacity, equal to the current surplus capacity of its network, is just 1.0% of the bandwidth currently used by Charter's customers, and just 0.4% of the bandwidth deployed by Charter's network by YE2025[133].

This observation can be triangulated with the comments from T-Mobile itself, whose CEO notes as per Figure 31, that the company only has the fixed wireless capacity to go to a single digit percentage penetration of the US population, and additionally only by capturing the lower tier of bandwidth users from copper wire or other low bandwidth products, with this service[137]. The same commentary is also reflected in management at Comcast and Charter, noting, as per Figure 32, that fixed wireless simply does not offer the same bandwidth competency as cable broadband, nor does its bundling by T-Mobile offer an economic saving[138].

Figure 30: Max incremental fixed wireless capacity is just 1.0% of the bandwidth currently used by Charter's customers, and just 0.4% of the bandwidth deployed by Charter's network in 2025[134]

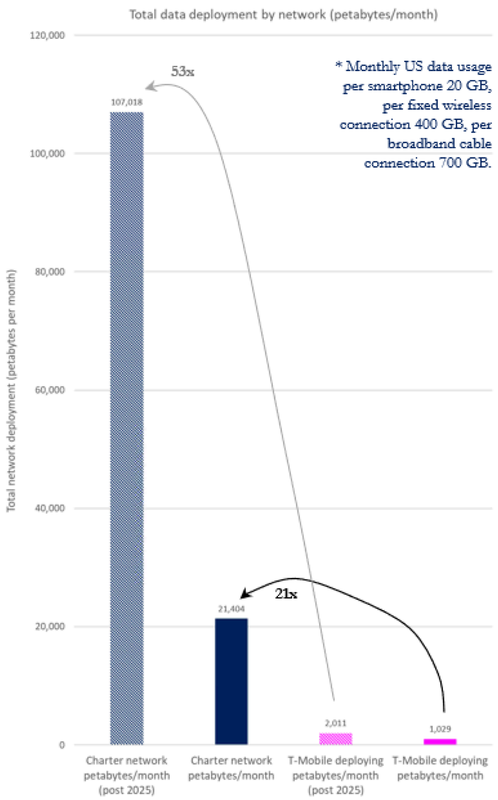


Figure 31: T-Mobile have publically stated target of 8m customers for their fixed wireless broadband product ("mid single digit percentage penetration" of US households), and that they are competing primarily against copper wire or other low bandwidth products[135]

T-MOBILE US, INC. COMPANY CONFERENCE PRESENTATION MAR 07, 2023

And so there are many, many customers who are super excited about a T-Mobile offering coming in, which is simple, clean, may not be -- it's not a fiber story. We're not saying we can deliver gig speeds.

And so for us, I mean, that 7 million to 8 million target is readily achievable. We're finding all sorts of places to go in and compete in this very nonmonolithic U.S. marketplace.

You're bringing this capacity and this network performance into areas that don't have fiber as a product, right? They might have DSL or other low-quality products that we're competing against. And so that's why you continue to see the run rate into T-Mobile. So this 500,000 roughly plus or minus net adds perspective is what we're anticipating for the balance 2023. We think the runway is strong for our 7 million to 8 million target, which again, you're going for a mid-single-digit penetration rate of this industry. This product is very competitive for mid-single-digit penetration and it's going to be durable.

Figure 32: Charter's CEO notes the limitations of fixed wireless as a long-term competitor to Charter[136]

"Fixed wireless customers will realize, this doesn't work the same way as full-blown broadband. And I'm not actually saving any money relative to what I could have."

Chris Winfrey, CEO Charter, March 8th 2023

Footnotes

1, 33, 37. Comcast's cable network passes 61.8m homes [source: Q2 2023 conference call transcript], and Charter's cable network passes 56.2m homes [link]. The total homes passed at 118m compares to 140m homes in the US, and as such the combined network of Comcast and Charter passes 84% of US homes.
2. Comcast connects 32.3 million homes and businesses to cable broadband [link]
3. Charter connects 32.2 million homes and businesses to cable broadband [link]
4 & 78. The average penetration achieved by Comcast is 52.1% (32.3m connections / 61.8m passings), by Charter 57.2% (32.2m / 56.2m passings)
5. AT&T connects 8.8m homes served with fiber, Source: AT&T corporate disclosures
6. The overlap between AT&T, and Comcast and Charter combined, is less than one third. Source: SSF Research
7. Cable television is in decline at both Comcast and Charter. Source: Comcast, Charter, corporate disclosures
8. Cable contributes only marginal economics to Comcast and Charter. Source: Comcast, Charter, corporate disclosures, SSF Research
9. For 55% of Comcast and Charter's footprint, they have no broadband competition. Source: Comcast, Charter, corporate disclosures
10. Cable broadband contributes almost all of the profitability of Comcast and Charter. Source: Comcast, Charter, corporate disclosures, SSF Research
11. Comcast abandons proposed acquisition of Time Warner Cable after DoJ informs parties of concerns [link]
12. Charter Communications to Merge with Time Warner Cable [link]
13. Under Regulators' Scrutiny, Comcast and Time Warner Cable End Deal, NYTimes [link]
14 & 80. A mega-Comcast could have squashed online competition, government says, Ars Technica [link]
15. Comcast, Time Warner Cable, and Bright House Networks sell advanced wireless spectrum to Verizon Wireless for $3.6 Billion [link], Comcast, Time Warner Cable, Bright House Networks and Verizon Wireless Enter into New Agreements [link]
16. Verizon CEO, speaking at UBS Media & Telecommunications Conference, Dec 7th 2011. Transcript source: StreetEvents
17 & 18. Comcast and Charter, May 16th 2023, and Nov 17th 2023, respective conference calls, executives reiterate that their ubiquitous MVNO access to Verizon network at wholesale prices is for perpetuity. Source: Capital IQ
19. FCC ruling obligates mobile companies to offer data roaming arrangements to other providers on "commercially reasonable terms and conditions," and does not obligate any reciprocal access to roaming on cable for the mobile companies, Dec 2014 [link]
20. Comcast and Charter to Explore Operational Efficiencies to Speed Entry into the Wireless Market [link]
21. Comcast and Charter agree not to compete against each other in wireless, Ars Technica ['link]
22. Comcast and Charter Wireless Operational Cooperation Agreement 8k [link]
23. Comcast Introduces Xfinity Mobile [link], Charter Launches Spectrum Mobile Service Across its Footprint [link]
24. FTC Announces 2023 Update of Size of Transaction Thresholds for Premerger Notification Filings [link]
25. A Brief History of the Browser Wars, Harvard Business School [link]
26. Operating Systems: Market shares since the 1970s [link]
27. 29 years ago, Microsoft thought of bundling Internet Explorer with Windows [link]
28, 30, 31 & 32. A history of web browswer market shares [link]
29. Andreessen affirmed that Netscape believed early that it would give away browsers to education and non-profit users, but planned to charge all others [link]
34. Source: corporate disclosures across all cable companies, new builders of cable. Excludes fixed wireless.
35. The Lanchester Strategy for Management: How to Win in Small and Medium-sized Enterprises [link]
36. Comcast and Charter US coverage map [link]
38. Comcast and Charter combined connect 8x as many homes as any of their nearest competitor. Source: corporate disclosures, all cable builders, SSF Research
39. The average penetration achieved by Comcast is 52%, by Charter 57%, averaging 55%, see footnotes 2 & 3
40. EU and US Regions by Population Density [link]
41 & 45. The mobile component at a more than 25% discount to incumbents Verizon, AT&T and T-Mobile. Source: corporate disclosures, SSF Research
42 & 46. Charter and Comcast's mobile net adds now leading the US wireless industry [link[Source: corporate disclosures
43. A "mobile virtual network operator" pact with Verizon allows Charter to purchase access to the latter's cellular network at wholesale pricing [link]
44 & 47. The mobile sector offers Comcast and Charter within footprint revenue potential at 2.5x their current cable sector revenues, source: Charter investor day presentation, slide 13 [link]
48. Difference between the mobile revenues of Comcast and Charter less Verizon's MVNO wholesale revenues, source: corporate disclosures
49. Cable MVNO service margins, at above 40%, it is already competitive with incumbent mobile service margins, source: corporate disclosures, SSF Research
50, 52 & 56. Charter has disclosed targets to increase the proportion of data offloaded to its own network from 85% to 90%, source: Charter investor day presentation, slide 37 [link]
51. Bandwidth from the cable company's own network can be provided at just 5% of the cost of a mobile service wholesale agreement, source: corporate disclosures, SSF Research
53. In Q1 2023, Charter disclosed that the portion of data going through the Verizon MVNO had already reduced to 13%, source: Capital IQ earnings call transcripts
54. Comcast and Charter's service margin rises to close to 60%, source: SSF Research modelling
55. Source: Charter corporate presentation disclosure
57. Source: Bloomberg consensus PE ratings
58, 59 & 103. Cable giant Charter snubbed a buyout bid from Verizon, NY Post [link]
60. Verizon mulling acquisition of big cable company, NY Post [link]
61. Comcast, Charter CEOs point to emerging CBRS partnership [link]
62. FCC, DOD and industry played a critical role in opening up the 3.5 GHz CBRS band for next-generation wireless services [link]
63. CBRS: New Shared Spectrum Enables Flexible Indoor and Outdoor Mobile Solutions and New Business Models [link]
64. Charter has 800,000 miles of cable, and 50 million passings, source: Charter corporate disclosures
65. Cell Tower Range: How Far Do They Reach? [link]
66. Chris Winfrey, Charter Communications CEO, March 2023, Source: Capital IQ earnings call transcripts
67. Comcast and Charter's are upgrading their broadband networks from 1 Gbps to 5 Gbps speeds, by year end 2025, source: Comcast and Charter corporate disclosures
68. The cost of Comcast and Charter's upgrade of their cable broadband assets is $12bn, source: Comcast and Charter corporate disclosures
69. From a spectrum standpoint, Charter's bandwidth increase is effectively the acquisition of 1 gigahertz of spectrum. By comparison, the C-band auction for 300 megahertz of spectrum cost $81bn, plus relocation costs of $13bn, so well over $100bn. So Charter is acquiring and deploying over 3x the amount of spectrum for about 5% of the cost. Also comparable, T-Mobile acquired Sprint in 2020, which was primarily an acquisition of 200 megahertz of spectrum, for $60bn. Source: C-band auction disclosures, corporate disclosures.
70 & 72. The speed increase, at 5x in 2.5 years, is a more than two fold acceleration in the prior gradient of bandwidth increase, source: corporate disclosures, SSF Research
71 & 73. When broadband speeds increase from 1 Gbps to 5 Gbps, ARPU increases from $80 to $180, source: corporate disclosures, SSF Research
74. Assuming two mobiles per home should be conservative, the US has 140m homes and 310m smartphones [link], so the average is 2.2 mobile per home
75. Bundling two mobiles per home increases the per home ARPU to from $70 to $130, source: Comcast and Charter mobile pricing, corporate disclosures, see also footnotes 41 & 45

76. Comcast and Charter's combined net income for FY2024 is $23bn, source: Bloomberg consensus
77 & 79. As at Q2 2023, 10% of Comcast's residential broadband customers had purchased mobile service plans, and at Charter, 11% of residential broadband customers had purchased mobile service plans, source: Capital IQ earnings call transcripts
81. Unpacked: Repeal of Open Internet Rule enables monopoly networks, Tom Wheeler, former FCC Chairman [link]
82. Comcast and Charter are already legally throttling Netflix traffic, 2019, Broadband TV News [link]
83. In 2022 Comcast and Charter announced a joint venture to develop their next generation streaming platform [link]
84. Source: Centre for Research in Security Prices (CRSP) and TCI annual reports
85. Comcast, Time Warner Cable, and Charter – achieved robust economic progress through the 2007-2009 financial crisis, source: corporate disclosures
86. TCI produced a shareholder return averaging 30% per annum from 1973 to 1998, source: Bloomberg
87. Berkshire Hathaway, which achieved a CAGR 1973-1999 of 34.2%, source: Bloomberg
88. AT&T's cable deal: The overview; Comcast wins bid for AT&T cable, NY Times [link]
89. Comcast, since acquiring TCI, has delivered shareholder returns averaging until end July 2023, 10.1% annualised, source: Bloomberg
90. Cable Giant Charter's IPO Raises $3.23 Billion, LA Times [link]
91. John Malone's Liberty Media buys stake in Charter Communications, LA Times [link]
92. From 2010 until end July 2023, Charter has produced a shareholder return averaging 24% per annum, source: Bloomberg
93. Roberts owns supervoting shares that account for 33.3 percent of the company's corporate votes [link]
94. Malone has 25% voting control of Charter [link], Newhouse family has 26.3% control [link]
95. Over the last seven years, Comcast increased its EBIT per share by 80%, and Charter has increased its EBIT per share by 440%, source: corporate disclosures
96. Over the last seven years, Comcast has reduced its share count by 13%, and Charter has reduced its share count by 44%, source: corporate disclosures
97. Comcast and Charter both priced at 10.9x consensus earnings for 2024, source: Bloomberg consensus estimates
98. The US benchmark index, the S&P500, trades at 20x PE for the same period, source: Bloomberg consensus estimates
99. March 2013, when John Malone acquired 27% of Charter, he paid 3.1x EV/Sales, source: corporate disclosures, Bloomberg
100. August 2014, Berkshire Hathaway also acquired a stake in Charter, paying 3.7x EV/Sales, source: corporate disclosures, Bloomberg
101. Comcast trades at 2.3x EV/Sales 2024, source: Bloomberg consensus
102. Charter trades at 3.0x EV/Sales 2024, source: Bloomberg consensus
104. "Verizon would have had to get more aggressive on price for that deal to have any chance", Malone 2019 interview with CNBC [link]
105. Since Q2 2021, Liberty Broadband has repurchased 25% of its stock. Over the same period, Charter has repurchased 19% of its stock, source: corporate disclosures. Malone's look-through share buying in excess of that conducted by the Charter board is despite Charter's public statements as to its undervaluation, source: Charter CEO, conference call December 13th 2022
106. Over the last 18 months Liberty Broadband has switched its buyback behaviour away from the non-voting K shares and to the super-voting B shares, and in doing so, increased Malone's voting right in Liberty Broadband from 37% to 48%, source: corporate disclosures, Bloomberg
107. How T-Mobile plans to navigate convergence, Light Reading [link]
108. Source: Thunder Said Energy Research disclosures. Also, in terms of the bandwidth usage proportionality to AI: processing for AI competency occurs centralised at the data centre, whereas both the training data and the real time data is local to the user: the result is that artificial intelligence processing becomes proportional to bandwidth throughput, source: SSF Research
109. Ready Player One, had part of its plot "bandwidth riots" [link]
110. The bundled plans from Comcast and Charter at double digit percentage pricing below the equivalent pricing from cable overbuilders, source: corporate disclosures
111. Comcast and Charter are both increasing their penetration; challenger penetration is both lower and not growing, source: corporate disclosures
112. Most fiber providers offer speeds up to 1 Gbps-5 Gbps, no premium over Comcast and Charter's prospective speeds [link]
113. Verizon, AT&T Scale Back Fiber Rollout [link], A slew of service providers lower 2023 fiber targets [link]
114. Only T-Mobile is competitive with Comcast or Charter on the bundled price with mobile, source: corporate disclosures
115. "*We're actually slightly gaining, despite new competition coming in, in the gig overbuild footprint*", source: Charter conference call March 8th 2023, Capital IQ transcripts
116. Clearly Comcast and Charter continue to penetrate market share in their regions, source: corporate disclosures
117. Comcast has reported improving penetration whilst EBITDA margins held constant, and Comcast's penetration gap vs all challengers increased by 4.5%, source: corporate disclosures
118. Charter, Figure 29, penetration has improved whilst EBITDA margins have increased by 3%, and Charter's penetration gap vs all challengers increased by 4.3%, source: corporate disclosures
119. The blue bars within Figures 28 & 29 also include the percentage "gig overlap" disclosures from Comcast and Charter, source: corporate disclosures
120. Comcast's footprint covers c. 43% of US homes, the percent of new build that is occurring within Comcast's footprint is just 12%, and declining, source: corporate disclosures, SSF Research
121. Whilst Charter's footprint covers c. 38% of US homes, the percent of new build that is occurring within Charter's footprint is just 10%, and declining, source: corporate disclosures, SSF Research
122. Cable Companies and Mobile Carriers Battle Over Fixed Wireless Internet, WSJ [link]
123. Cable Cowboy: John Malone and the Rise of the Modern Cable Business, Mark Robichaux [link]
124. Fixed wireless speeds are speeds at just 72 – 245 Mbps, source: T-Mobile fixed wireless speed disclosures [link]
125. Charter has a cost of production of each gigabit of 9 cents, source: corporate disclosures, SSF Research
126. Gigabits it then sells at 12 cents, source: corporate disclosures, SSF Research
127. T-Mobile as a gigabit factory, has a cost of production of each gigabit of $2.18, sells each gigabit for a mobile customer at $2.78, source: corporate disclosures, SSF Research
128. Yet for each fixed wireless customer at 10 cents, source: corporate disclosures, SSF Research
129 & 130. T-Mobile has a significant surplus spectrum position relative to AT&T and Verizon [link]
131. Charter's per customer monthly cost base per gigabit deployed is $0.09, just 4% of T-Mobile's per customer monthly cost base per gigabit deployed at $2.18, source: corporate disclosures, SSF Research
132. T-Mobile network has simply nothing close to the throughput competency to compete with a cable company's bandwidth throughput, source: corporate disclosures, SSF Research
133. T-Mobile's maximum incremental fixed wireless capacity is just 1.0% of the bandwidth currently used by Charter's customers, source: corporate disclosures, SSF Research
134. Max incremental fixed wireless capacity is just 1.0% of the bandwidth currently used by Charter's customers, and just 0.4% of the bandwidth deployed by Charter's network in 2025, source: corporate disclosures, SSF Research
135 & 137. T-Mobile conference call, March 7th 2023, source: Capital IQ transcripts
136 & 138. Chris Winfrey, CEO Charter, March 8th 2023, source: Capital IQ transcripts

Legal Disclosure

This white paper is for discussion and informational purposes only. The views expressed herein represent the opinions of *GreenAsh Partners* as of the date hereof. *GreenAsh Partners* reserves the right to change or modify any of its opinions expressed herein at any time and for any reason and expressly disclaims any obligation to correct, update or revise the information contained herein or to otherwise provide any additional materials.

The information contained herein is based on publicly available information, including filings made with the securities and exchange commission ("SEC") and other sources, as well as *GreenAsh Partners'* analysis of such publicly available information. *GreenAsh Partners* has relied upon and assumed, without independent verification, the accuracy and completeness of all data and information available from public sources, and no representation or warranty is made that any such data or information is accurate. *GreenAsh Partners* recognizes that the companies referenced herein may possess confidential or otherwise non-public information that could lead them to disagree with *GreenAsh Partners'* views and/or conclusions and that could alter the opinions of *GreenAsh Partners,* were such information known. No representation, warranty or undertaking, express or implied, is given as to the reliability, accuracy, fairness or completeness of the information or opinions contained herein, and *GreenAsh Partners* and each of its directors, officers, employees, representatives and agents expressly disclaim any liability which may arise from this white paper and any errors contained herein and/or omissions here from, or from any use of the contents of this white paper.

Except for any historical information contained herein, the information and opinions included in this white paper constitute forward-looking statements, including estimates and projections prepared with respect to, among other things, anticipated company performance, the value of company securities, general economic and market conditions, and other future events. You should be aware that all forward-looking statements, estimates and projections are inherently uncertain and subject to significant economic, competitive, and other uncertainties and contingencies, and have been included solely for illustrative purposes. Actual results may differ materially from the information contained herein due to reasons that may or may not be foreseeable. There can be no assurance that any securities referenced in this white paper will trade at the prices that may be implied herein, and there can be no assurance that any opinion or assumption herein is, or will be proven, correct.

This white paper and any opinions expressed herein should in no way be viewed as advice on the merits of any decision with respect to any of the companies or securities referenced herein. This white paper is not (and may not be construed to be) legal, tax, investment, financial or other advice. Each recipient should consult their own legal counsel, and tax and financial advisers as to legal and other matters concerning the information contained herein. This white paper does not purport to be all-inclusive or to contain all of the information that may be relevant to an evaluation of the companies or securities referenced herein, or the matters described herein.

This white paper does not constitute (or may not be construed to be) a solicitation or offer by *GreenAsh Partners* or any of its directors, officers, employees, representatives or agents to buy or sell and securities referenced herein, or an offer to sell an interest in funds managed by *GreenAsh Partners*. This white paper does not constitute financial promotion, investment, advice or an inducement or encouragement to participate in any product, offering or investment, or to enter into any agreement with the recipient. No agreement, commitment, understanding or other legal relationship exists or may be deemed to exist between or among *GreenAsh Partners* and any other person, including the parties and individuals referenced herein, by virtue of furnishing this white paper. No representation or warranty is made that *GreenAsh Partners'* investment process or investment objectives will or are likely to be achieved, or successful, or that *GreenAsh Partners'* investments will make any profit or will not sustain losses. Past performance is not indicative of future results.

Funds managed by *GreenAsh Partners* currently beneficially own and/or have an economic interest in, and may in the future beneficially own and/or have an economic interest in Comcast and Charter's securities. *GreenAsh Partners* intends to review its investments on a continuing basis and depending upon various factors, including without limitation, their financial position and strategic direction, the outcome of any discussions with them, overall market conditions, other investment opportunities available to *GreenAsh Partners*, and the availability of their securities at prices that would make the purchase or sale of such securities desirable, *GreenAsh Partners* may from time to time (in the open market or in private transactions) buy, sell, cover, hedge or otherwise change the form or substance of any of its investments to any degree, in any manner permitted by the law, and expressly disclaims any obligation to notify others of any such changes. *GreenAsh Partners* also reserves the right to take any actions with respect to its investments as it may deem appropriate.

GreenAsh Partners has not sought or obtained consent from any third party to use any statements or information contained herein. Any such statements or information should not be viewed as indicating the support of such third party for the views expressed herein. All trademarks and trade names used herein are the exclusive property of their respective owners.