

## Telecommunications Primer

# Making the Connection

In the TMT landscape, telecommunications is often overshadowed by large internet and multimedia companies that receive most of the attention of the media and investors. Despite this, the technology industry as a whole relies entirely on the infrastructure and services provided by telecommunications companies. Within the TMT coverage universe, the telecommunications companies covered are critical to widespread adoption and implementation of new technologies.

For these reasons, the TMT team took a deep dive into the industry, which when analyzed below the surface, contains many moving pieces and plenty of investable opportunities. While often viewed as a slow-moving industry, there are some critical changes that will take place in the coming years, notably the implementation of 5G, and dictate the near-term future of telecommunications.

In Canada, there are three large national players, which the team believes have the potential to be great long-term holdings. In the U.S., the team is more hesitant to allocate capital, as the industry will experience structural and regulatory changes in the next two to five years.

### LTM Relative Performance



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## Supply Chain and Technology

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As discussed thoroughly in previous reports, telecommunications is the business of the transmission of information. This information is transmitted using either wireless or wireline technologies, both of which operate in tandem on a telecommunications network. Wireless utilizes transmission towers, cells, satellites, and antennas. Wireline utilizes fixed cabling, the majority of which is produced out of copper. Together, they allow information of any type and size to be easily shared with others.

Analyzing the wireless supply chain is an effective way to understand the different industry players and the value they provide. First, there are the component manufacturers who produce the hardware, such as antennas, which allow information to be received and relayed. Notable players by market share include Huawei, Cisco Systems, Fujitsu, Nokia and Ericsson. To put these devices in a position where they can effectively operate, towers are required to hoist and position said equipment. In Canada, the “Big Three” each own and operate a large number of towers and lease excess capacity between themselves. This open cooperation is mutually beneficial as it minimizes the industry-wide capital expenditures required to provide national wireless coverage. This is particularly important in Canada as population density is low outside of the nation’s top five cities. In the U.S., most network service providers lease tower space from operators, who own the infrastructure. The largest tower operators are Crown Castle International, American Tower, and SBA Communications. These companies allow service providers to outsource capital expenditures and maintenance. Further, they act as a relatively trusted third party, which, unlike other competitors, are not incentivized to “pull the plug” on a competing service provider’s access.

Once the infrastructure has been erected, service providers (e.g., AT&T and TELUS) market access to this infrastructure, often in bundles. The primary services offered are call, text, and data, all of which are different information types travelling through the same infrastructure, on different bandwidth

frequencies. Simply, the wireless communication path travels across a spectrum of frequencies in the form of electromagnetic waves. The higher the frequency, the more information can be transmitted, and the lower propagation is. For these reasons, a service provider’s spectrum access usually encompasses a variety of frequencies in order to allow customers to use both high speed, low-latency services (e.g., video streaming), and low speed, high-latency services (e.g., texting). Both the U.S. and Canadian governments heavily regulate and auction these frequencies. Frequencies can be thought of as the lowest-level input in a long supply chain cumulating in customer access.

Additionally, there are number of ancillary players in the telecommunications space, which work to support the network in particular ways:

- 1) Wi-Fi: a short-range unregulated frequency which emits a ultra-high frequency. Wi-Fi is commonly used for media and internet consumption.
- 2) Satellite: super-high frequency, long-distance communication hardware used for communicating to remote areas (e.g., oceans and deserts)

Last, it is important to note that due to the technical intricacies of telecommunications, there are many inter-network relationships that do not fall in the supply chain above. For example, pre-5G capacity constrains are currently forcing many service providers to route wireless demand from device-to-antenna-to-wireline-to-receiving antenna, at a cost advantage to the usual device-to-antenna-to-receiving antenna. As technology investors lacking technical backgrounds, the TMT team believes is it critical to be cognizant of these nuances, but more important to focus on the large moving pieces that have the most significant impact on the value of a telecommunications company – capital allocation, user base, churn rates, ARPU, and payout policy.

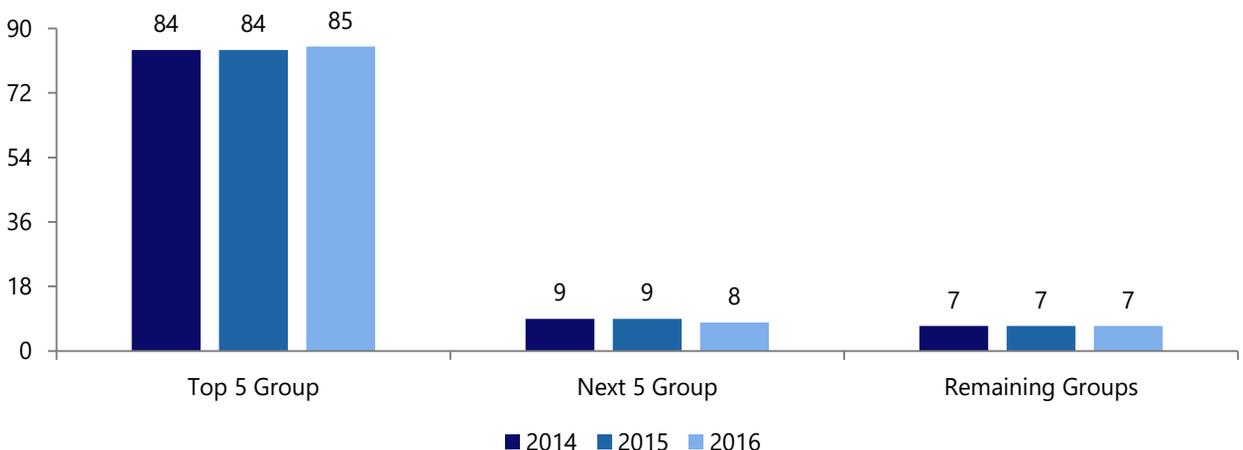
## Canadian Telecommunications

The Canadian telecommunications industry is characterized by low levels of competition, a favorable regulatory environment, and stability. The high concentration of market share, which is tolerated, and to some degree, encouraged, by the regulator, has led to sustainably high levels of profitability (Exhibits III and IV). The five most significant telecommunications companies in Canada are Bell, Rogers, TELUS, Shaw, and Quebecor. Collectively, they generated 85% of total industry revenues in 2016 (Exhibit I). This concentration is made possible by the inherent challenges in providing telecommunications services in Canada. Building and maintaining the infrastructure necessary to operate a telecommunications business is extremely expensive and technically demanding. These barriers to entry are higher in Canada than in other parts of the world. The size of the country and low population density keep costs high and create massive economies of scale. Scale is essential in keeping costs low, providing wider coverage (geographically and in service offerings), bidding on spectrum, and negotiating with regulators. The effect of size on profitability can be seen in Exhibit III and IV. Telecommunications regulations in Canada are also a

critical factor in limiting competition. The Canadian Radio-television and Telecommunications Commission (CRTC) is the federal body that regulates telecommunications in Canada. One of their many mandates is to enforce the *Telecommunications Act*. Section 16 of this act deals with ownership of Canadian telecommunications operations and assets. It stipulates that companies who generate more than 10% of industry revenues must be Canadian owned and controlled. This limits foreign competitors from gaining the market share needed to run a profitable operation in Canada. However, the past decade has brought a number of developments that have attempted to increase competition in the market, most notable of which was the introduction of spectrum auctions in 2008. However, in the years following the introduction of spectrum auctions, profitability, demonstrated through metrics such as ROE, and to a lesser extent, ROIC, increased dramatically across the “Big Three” (Bell, Rogers, and TELUS).

### EXHIBIT I

Canadian Telecom Firm Concentration by Revenue (% Market Share)



Source(s): CRTC

## Canadian Telecommunications

This likely occurred as the greater buying power of the large providers allowed them to out-bid smaller competitors.

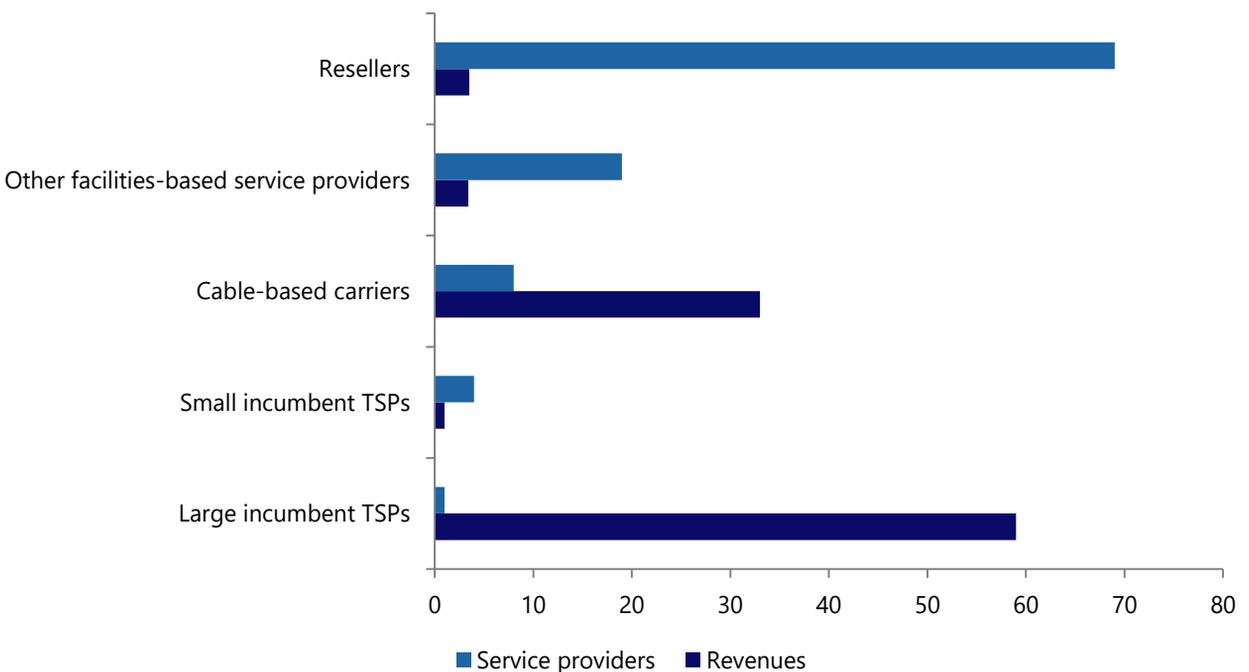
The other major development was the introduction of smaller players looking to displace, or at least disrupt, incumbents. Examples include Freedom Mobile (f.k.a., Wind Mobile), Koodo, and Fido. However, these smaller providers have all been acquired by the Big Three, further increasing concentration.

In all, the Canadian telecommunications industry consists of strong businesses that satisfy QUIC's investment philosophy. The Big Three players are

soundly managed, well capitalized, and remain protected by the entry barriers of the Canadian industry. This oligopolistic structure enables these companies to generate stable cash flows, which they use to fund regular and growing dividends. Looking at the expected industry returns calculations in Exhibit V, as long as the regulatory and competitive environment remain placid, we can expect large Canadian telecommunications players to continue generating substantial cash flows and returning capital to shareholders.

### EXHIBIT II

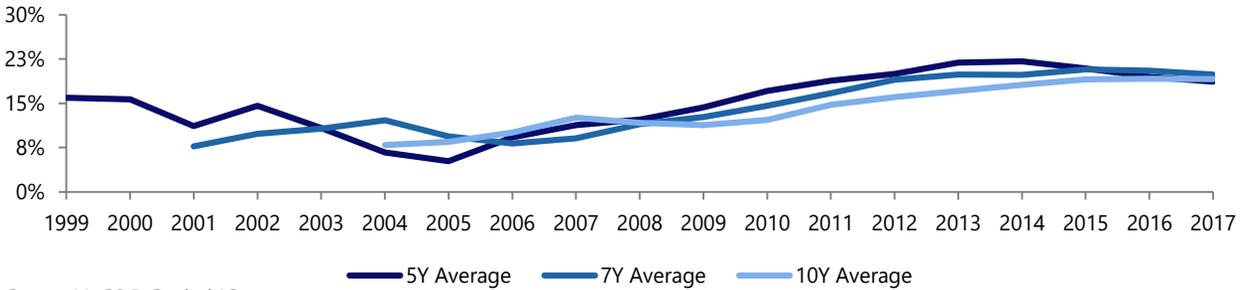
Distribution of Industry Revenues and Number of Firms According to Type, 2016



Source(s): CRTC

**EXHIBIT III**

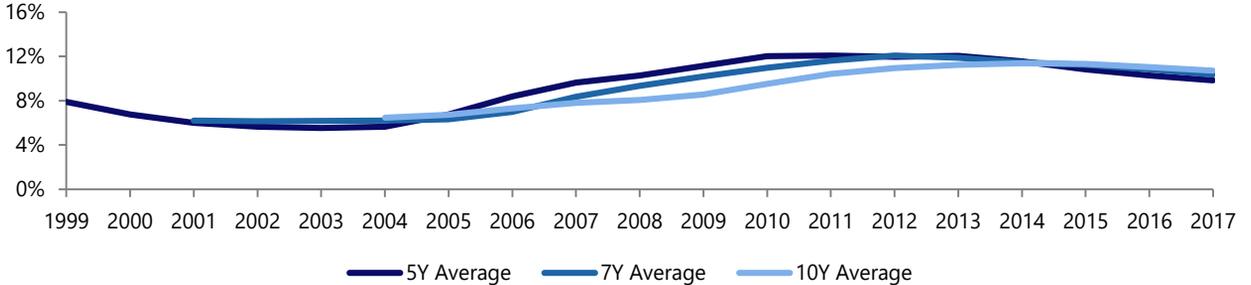
"Big Three" Historical Aggregate Returns on Equity



Source(s): S&P Capital IQ

**EXHIBIT IV**

"Big Three" Historical Aggregate Returns on Invested Capital



Source(s): S&P Capital IQ

**EXHIBIT V**

"Big Three" Expected Returns Analysis

Calculation of Expected Returns	
Dividend Yield	4.57%
Earnings Growth <sup>(1)</sup>	7.87%
<b>Expected All-In Return</b>	<b>12.4%</b>
Industry Beta	0.35
Beta-Adjusted Expected Return	36%

(1) Earnings Growth = Retention Ratio x ROE  
Retention Ratio = 1 - Payout Ratio

Source(s): S&P Capital IQ

## U.S. Telecommunications Industry

### U.S. Telecommunications Overview

The telecommunications industry in the United States can be categorized into wireline and wireless services. The wireless telecommunications industry is a \$272 billion industry set to grow at a 2.4% CAGR over the next five years. Wireline services is a broad classification that encompasses home phone, internet, and cable services and amounts to a nearly \$300 billion industry. While the wireline industry as a whole is expected to grow modestly over the next five years, the sub-industries within the category have varied outlooks. Strong growth in the internet subcategory is forecasted to offset stagnant cable and other wireline revenue.

Globally, wireline services are seeing stiff competition from over-the-top services that mimic the functionality of traditional wireline offerings, such as streaming services and VoIP solutions. This has added a new dimension of competition to the market, which may threaten churn rates. The wireless industry is facing its own challenges; while mobile data usage continues to grow year over year, the price of mobile data is quickly falling. In 2017, mobile phone prices fell by 13% as a result of fierce competition. All of the national players have been developed unlimited data plans that are priced aggressively to attract new customers. Given the industry's high fixed costs, it is very probable that this trend will continue as the marginal cost of servicing an additional customer is far lower than the marginal revenue. With over 80% of the U.S. population owning a mobile phone, the opportunity to increase mobile penetration is limited. Wireless carriers may need to seek new monetization opportunities in areas beyond cellular in order to offset ever-increasing capital investments.

For both wireline and wireless, telecommunications services have become increasingly commoditized. With providers offering nearly indistinguishable products, price has become a major driver in purchase decisions. Investments in advertising and brand equity are utilized to create differentiation, since differences in

network strength and latency are difficult to accurately quantify and convey to the consumer.

Structurally, the U.S. wireless telecommunications market is similar to that of Canada, albeit more competitive. The wireless market is composed of four major national players – Verizon, AT&T, T-Mobile, and Sprint. Additionally, several large players exist that serve select states, including U.S. Cellular and Claro Puerto Rico.

### Exhibit VI

#### U.S. Wireless Landscape



Source(s): S&P Capital IQ, Google Images

The wireline market in the United States is far more competitive than that of Canada. AT&T and Verizon maintain a presence in this space, but these players are accompanied by other giants such as Comcast and Charter Communications (formerly Time-Warner Cable). Many other mid-sized players occupy the field, including Windstream Communications (\$6B), Cox Communications (\$10B), and Frontier Communications (\$5B). While these smaller players pale in size relative to the aforementioned names, they are certainly notable players. Despite their limited scope, their revenues are less than half that of TELUS.

An interesting implication of this industry structure is its impact on bundling. Bundled offerings have historically reduced churn, so the product breadth of these industry giants may be akin to a structural moat. With a strong presence in both the wireline and

## U.S. Telecommunications Industry

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wireless industries, AT&T is able to offer compelling bundles that include internet, television, cellular, and home phone services. Verizon does not currently bundle wireless and wireline services but has the capability of doing so.

### **Regulatory Environment:**

The U.S. telecommunications industry is regulated by the Federal Communications Commission (FCC). This body functions similarly to the CRTC, but has additional power over matters such as spectrum allocation. This federal agency is directed by five commissioners that are elected by the President and confirmed by the Senate for a five-year term. Currently, the agency is led by Chairman Ajit Pai and comprised of three Republicans and two Democrats.

One of the most prominent aspects of telecommunications regulation is net neutrality, which mandates that ISPs treat all content equally and do not prioritize or otherwise benefit particular companies. Net neutrality has had a turbulent history over the last decade. In 2010, the FCC released the Open Internet Order that restricted providers from blocking access to certain websites or giving advantages to select online services. This was challenged and repealed in 2014 by Verizon, who claimed that the FCC did not have the authority to impose such restrictions based on the way that broadband providers were classified. This was because broadband providers were not considered to be "common carriers", which is the domain that the FCC has authority over. In 2015, the Protecting and Promoting the Open Internet rule was passed in order to classify ISPs in a way that allowed for regulation to reinstate net neutrality. After considerable pushback from telecommunications providers who claimed that the Title II Order had forced them to trim capital expenditure, the FCC voted to repeal net neutrality on December 14, 2017. Six months later on June 11, 2018, the provisions were rolled back.

Net neutrality is deeply unpopular among consumers: a December 2017 poll revealed that 83% of voters

supported keeping the rules on net neutrality. It is unclear how long net neutrality will remain intact, however, ISPs do have considerable power to utilize the ruling in order to increase profitability. Providers are able to offer more module packages that allow users to fine-tune their internet access, which should allow for better price discrimination. Additionally, providers also have the opportunity to negotiate with internet services for either faster or unlimited access. In a cut-throat media environment, content providers may be willing to pay a considerable amount in order to have an advantage over their competition.

The FCC has also championed the expedited rollout of 5G mobile technology. The 28 GHz wireless spectrums will be auctioned on November 14, with the 24 GHz licenses going up for auction immediately afterward. This is a stark contrast to the spectrum auctions in Canada, which will likely occur in 2020. This expedited roll-out will negatively impact capital expenditure in the short run, but also will accelerate the development of new revenue-producing products in emerging spaces.

Beyond the FCC, the Federal Trade Commission (FTC) also plays an important role in the telecommunications landscape by monitoring actions for anticompetitive behaviour. Under the Trump administration, it appears that mergers and acquisitions have been subject to stringent and often time unpredictable resistance. While AT&T's acquisition of Time Warner Cable ultimately materialized, it was subject to challenge from the Department of Justice – a rare occurrence for vertical mergers. Ultimately, antitrust rulings could make it very difficult to achieve the level of consolidation found in the Canadian market.

There have been numerous efforts in the past to consolidate wireless players in the United States. In 2011, AT&T abandoned its efforts to acquire T-Mobile after facing opposition from the Department of Justice and Federal Communications Commission. In 2014, Sprint abandoned its attempt to acquire T-Mobile after concluding that the deal would likely not receive regulatory approval. Four years later, a renewed effort

## U.S. Telecommunications Industry

to merge T-Mobile and Sprint has spawned. The companies agreed to a \$26 billion deal that would bring them close in size to AT&T and Verizon, and submitted an application to be reviewed by the FCC in June. While the FCC typically reviews mergers within 120 days, they announced in September that they would require additional time to review the proposal, so a verdict will likely not be announced for months. Even if the deal receives FCC approval, the Department of Justice may still oppose the deal.

The wireline industry has also had several mega-mergers take place in recent years. In 2015, AT&T acquired DirecTV for \$48.5 billion to create a stronger broadband and video network. The deal was approved by the FCC in exchange for a few minor conditions such as the inability to discriminate against video distribution services and the mandate to offer discounted rates for low-income subscribers. Just one year later, Charter Communications merged with Time Warner Cable and Bright House Networks; a \$67.1B deal that formed a telecom giant with over 25 million customers. While the FCC ultimately approved of the deal, Ajit Pai dissented on the decision, claiming that the commission allowed for a deal against the public's interest in exchange for regulatory power through the imposition of numerous conditions. This stance has implications for future consolidation: while concessions

have historically been used to offset the adverse effects of mergers on the public, there are limits to the extent they can be leveraged.

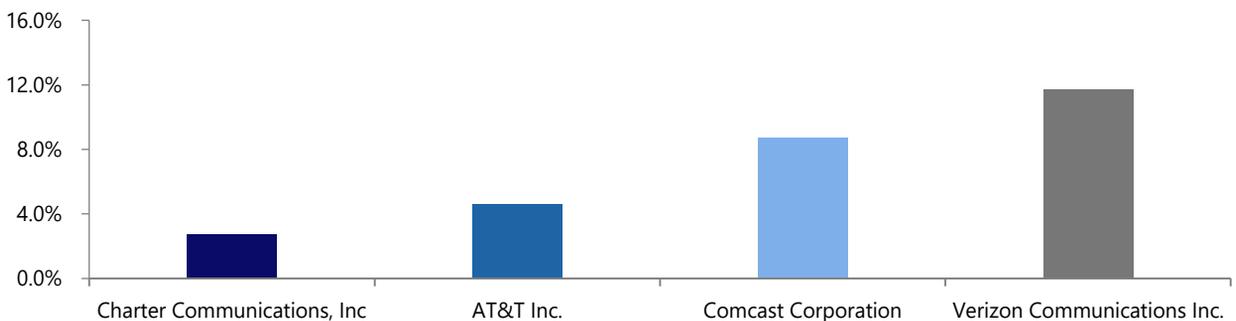
### Historical Performance:

In recent years, Verizon has achieved the greatest returns on invested capital among U.S. S&P 100 telecommunications companies. Conversely, Charter Communications has performed the worst. One key differentiator between these two companies is their business mix – while Verizon generates approximately 70% of their revenue from wireless services, Charter Communications operates entirely in the wireline business. Comcast and AT&T fall somewhere in the middle with mixes that include revenue from media holdings.

Looking beyond the S&P 100, wireless-focused providers have not performed well in recent years. Sprint and T-Mobile have posted lower returns on equity than other telecommunications players. This can be partially attributed to the aforementioned price wars in the industry. Verizon's performance is not a reflection of favorable industry conditions; instead, it has been able to use its reputation as a network leader to attract and retain customers.

### Exhibit VII

S&P 100 Telecom Return on Invested Capital (LTM)



Source(s): S&P Capital IQ

## Future of Telecommunications: 5G Networks

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### Understanding 5G Networks

The newest generation of mobile communication is referred to as 5G networks. The adoption of 5G will enable peak speeds that are 10 times faster than existing 4G networks, which are comparable to traditional fiber-to-the-home broadband networks. Latency is also expected to decrease substantially to the point where devices will be able to access cloud-based data in real time. Furthermore, 5G will pave the way for lowered energy consumption, meaning multiple devices can co-exist on one network. In essence, what these developments enable is the rapid increase of functionality for mobile and other internet-enabled devices.

### Adoption Barriers

The implementation of 4G was clearly a response to the consumers' desire to consume more high-bandwidth data on mobile devices, at higher speeds. As such, the roll-out of 4G proved to be predictably profitable for service providers.

With 5G, however, service providers are less confident that they will be able to monetize the network improvements, particularly the latency improvements. For example, there exists no precedent for how and who a service provider would charge for the low-latency network access, as traditionally customers have been charged on a volume basis. A recent survey of the 19 largest mobile network providers worldwide suggests that over half see no business case for 5G technology in the near future.

Beyond the challenge of monetizing new 5G network access, there are still many questions around the timeline and adoption of the main technologies 5G networks aim to enable, namely IoT, AR, VR, and autonomous vehicles. This uncertainty increases the hesitation of service providers to invest in the implementation of 5G.

The other significant barrier to implementation lies in the upfront investment required to build the necessary

infrastructure. Research suggests that network service providers would need to increase their capital expenditures by approximately 10%, even if 5G was implemented only in densely populated areas.

5G requires a level of bandwidth that can only be attained through higher-frequency bands. These high-frequency bands reach shorter ranges, and as such, service providers will need to have access to a much higher number of transmission cells in order to maintain their existing coverage ranges. This increased density of cells is known as densification.

There are a number of additional considerations, which experts believe may offset some of the costs of implementing 5G. For one, not all internet-based activities require a 5G connection, meaning its implementation does not need to mirror the nationwide, full coverage model of 4G. Technologies are materializing that would enable operators to allocate capacity to 4G and 5G carriers based on real-time demand, decreasing inefficiencies associated with supply constraints. Further, the development of additional cells may free up capacity on 4G networks, thus reducing the amount of capacity needing to be leased. Last, it is uncertain whether service providers (in Canada) and tower operators (in the U.S.) will need to make upgrades to their existing transmission hardware, or build completely new hardware.

Additionally, 5G cells are anticipated to be more efficient, so while the upfront cost of implementation may be significant, the technology behind 5G could potentially yield cost savings in the long-run.

### Verizon's 5G Roll-Out

On October 1<sup>st</sup>, Verizon will launch 5G Home, the world's first commercial 5G service, in Sacramento, Los Angeles, Houston, and Indianapolis. At speeds of up to 1 Gbps, and competitive pricing as low as \$50 per month, Verizon is hoping to switch customers entirely away from home broadband connections. The success of Verizon's roll-out could be a strong indicator of the viability of 5G implementation in the short-term.

## Portfolio Conclusions

As discussed, secular trends toward higher data consumption, and the roll-out of 5G, are expected to continue creating opportunity for companies and investors in the space. Overall, there is a positive outlook for this industry; the runway for growth is evident, but some obstacles stand in the way.

The team finds the Canadian industry especially attractive for a few reasons. Despite it lagging behind the U.S. with respect to 5G implementation, the structural competitive advantages stemming from the industry’s oligopolistic structure allow Canadian service providers to reliably compound and return capital.

With respect to the U.S. market, not only are there many more competitors in the space, but there exists much uncertainty around the regulatory environment going forward, specifically around net neutrality and consolidation.

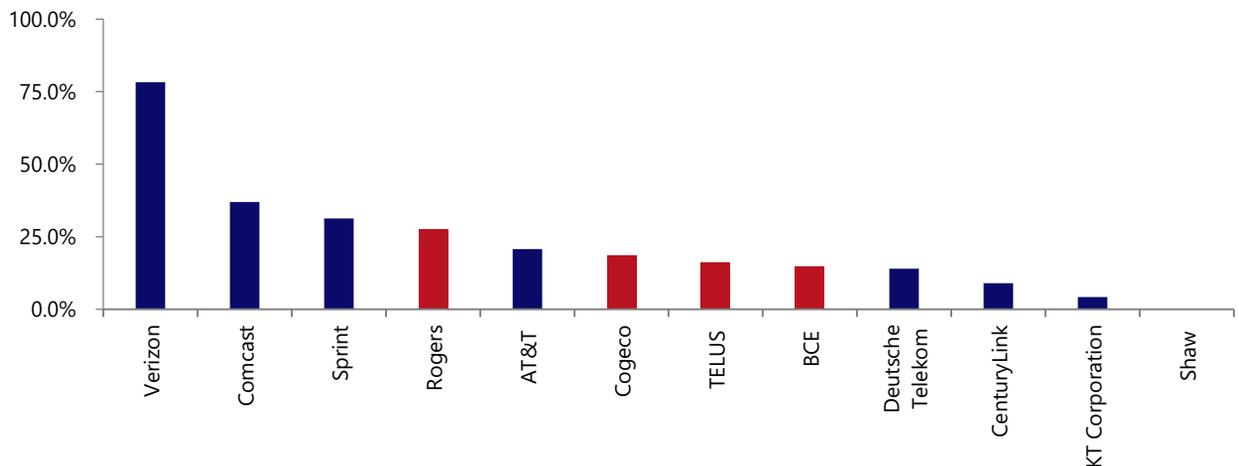
For these reasons, TMT would like to remain invested in the Canadian telecommunications space by holding

a large national service provider, ideally a single name. The challenge is in differentiating between the “Big Three” – Bell, Rogers, and TELUS. In the last several years of 4G coverage, there have been no significant changes that have allowed certain players to differentiate themselves from, or outperform, others. However, because 5G implementation will be the largest hurdle this industry faces in the next five years, the best performing company of the “Big Three” will likely be the one who can most successfully integrate and monetize it.

As such, the next exercise for the team must be drawing a conclusion about which company this will be. As the research in this report regarding the implementation of 5G still remains inconclusive, the team will continue its research into this highly important piece of the telecommunications industry and derive a more concrete thesis in the upcoming weeks. This will allow the team to pick a single name in the Canadian space in which to concentrate the portfolio’s telecommunications exposure.

### EXHIBIT VIII

Return on Equity, LTM – Canadian vs. Others



Source(s): S&P Capital IQ

## References

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2. Bloomberg
3. Canaccord Genuity
4. Company Filings
5. CRTC
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