

5G: The Investing Opportunity is in the Supply Chain

Chris Moshy
Senior Vice President, Domestic Equities
December 2020



Investing in 5G



A pillar of Bailard’s Tech & Science team’s investment approach is researching opportunities in emerging technology products and services that demonstrate broad potential and durable business cycles. The rollout of the next generation cellular network technology, “5G,” is one such investment theme we believe is now catalyzing and has several years of investable opportunities ahead.

We anticipate 5G will have a massive impact on the economy by enabling a new generation of services and products dependent on super speedy cell networks. As a benchmark, the last time a major cell network upgrade took place was in the 2008 to 2010 timeframe when LTE (or 4G) technology was introduced. 4G service brought much needed bandwidth to mobility, launched video binge watching as a global pastime, and the ensuing boom in content-sharing (e.g. Youtube, Instagram, and Tik-Tok) accelerated the growth of the video-on-demand ecosystem.

This time around, 5G are network services operating on newly allocated radio spectrum, known as “sub-6” and “millimeter wave.” With the launch of the new spectrum and its services, networks should experience marked improvements in bandwidth, data transmission speeds, and latency. In turn, performance gains in network data rates should drive demand for the next generation of services and products, including applications built on artificial intelligence, autonomous machines, and highly-automated, remotely operated factories and smart-homes, to list a handful. With this wide range of applications, the Tech & Science team at Bailard has identified the key areas we see as opportunities for 5G, from initial infrastructure builds through the entire supply chain for the years ahead.

5G Opportunities

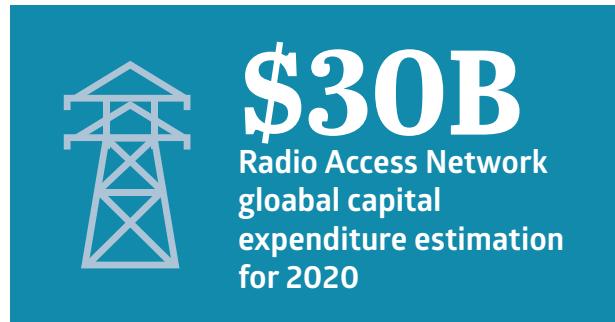
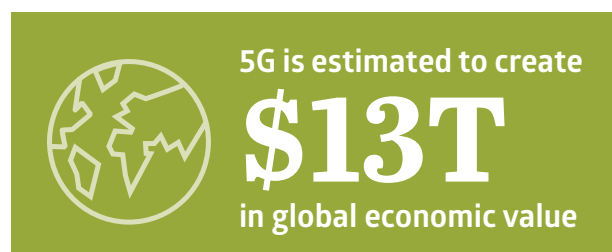
With the required capital investments needed for 5G to reach its full potential, there comes a variety of opportunities for investors. According to a study by the World Economic Forum, 5G alone can create over \$13 trillion of global economic value across every conceivable industry, as well as over 22 million jobs, by 2035. While the exact numbers for value and jobs can certainly be debated, we strongly believe that the impact to business and industry will be broad and the investment in the technologies around 5G will be significant.

As adoption spreads, we expect the U.S. to lead in 5G infrastructure investment, followed by Europe, Latin America, and then other emerging markets. Currently, all the major telecom companies around the world are undertaking 5G rollouts, although they are taking place at different pace and scale.

When we think about investing in 5G-related businesses, we group the opportunities into three broad buckets: infrastructure builds, connected devices, and applications & services.

For infrastructure builds, Radio Access Networks (a part of which is the equipment you see hanging from cell towers used to transmit and receive 5G cellular signals) capital expenditure is estimated at \$30bn globally in 2020 and projected to grow in the high single digits. Many of the large radio access network providers are well-known. Huawei had the leading global market share at the start of 2020, but trade restrictions placed on the company by the U.S. and other countries is providing significant opportunities for share gains by global competitors, including Nokia, Ericsson, and Samsung, to name a few.

In connected devices, the overall unit demand for mobile phones has been fairly flat for several years.



In addition, the pandemic has led to an approximately 6% global decline in handset sales in 2020. However, 5G is expected to drive demand in the premium handset category this year and current industry estimates of 175mm to 225mm 5G handset shipments has remained unchanged, offering year end bright spots as handset models launch in the third and fourth quarters of 2020; estimates for 2021 shipments are in excess of 500mm units. Leading handset makers participating in 5G technology rollouts include Apple (U.S.), LG (SE Asia), Oppo, and Xiaomi (China).

The Opportunity is in the Supply Chain

Many of the largest investment opportunities are in the supply chain, which provides the specialized technology and components necessary to build the network infrastructure, manufacture the connected devices and offer next generation services. Earlier, we highlighted base station infrastructure companies and mobile handset makers. However, if you were to crack open and look inside those products, or any of the thousands of devices that will populate homes, autos, factories, wearables, and more, you'll quickly grasp the opportunities for key suppliers who are behind these technology-driven products and services.

As devices become more powerful, their processing and componentry become more complex. Using the mobile handset example, each new flagship model, along with the supporting product line, drives higher content value through component proliferation and product complexity. One semiconductor company, supplying radio frequency send and receive chips, has seen its content value (revenue per handset) rise from \$3 in the 2G handsets to over \$25 in some 5G models coming out later this year.

The largest near-term 5G capital investment opportunity is in factory and industrial automation. 5G networks in industrial complexes will control thousands, if not millions, of machine automations managed by artificial intelligence (AI) applications running on data centers miles away. Similarly, campus and factory 5G networks will elevate inventory management, fulfillment, and logistical AI systems by scaling and operating autonomously, driving efficiencies in e-commerce, distribution, and customer service. As these new capabilities ramp-up, so will the supply chain supporting their growth.

In the longer term, billions of consumer products from home A/V systems, climate control and kitchen appliances to in-home medical devices and security monitoring will have enabled interconnectivity. In a smart home, you can expect to have the majority of your devices and home systems connect to super-speed 5G networks rather than ethernet or Wi-Fi, and always-on giga-speed bandwidth will follow you as you move about within a 5G cluster. Product upgrades and new devices and services in the consumer market will similarly drive demand through the consumer electronics supply chain.

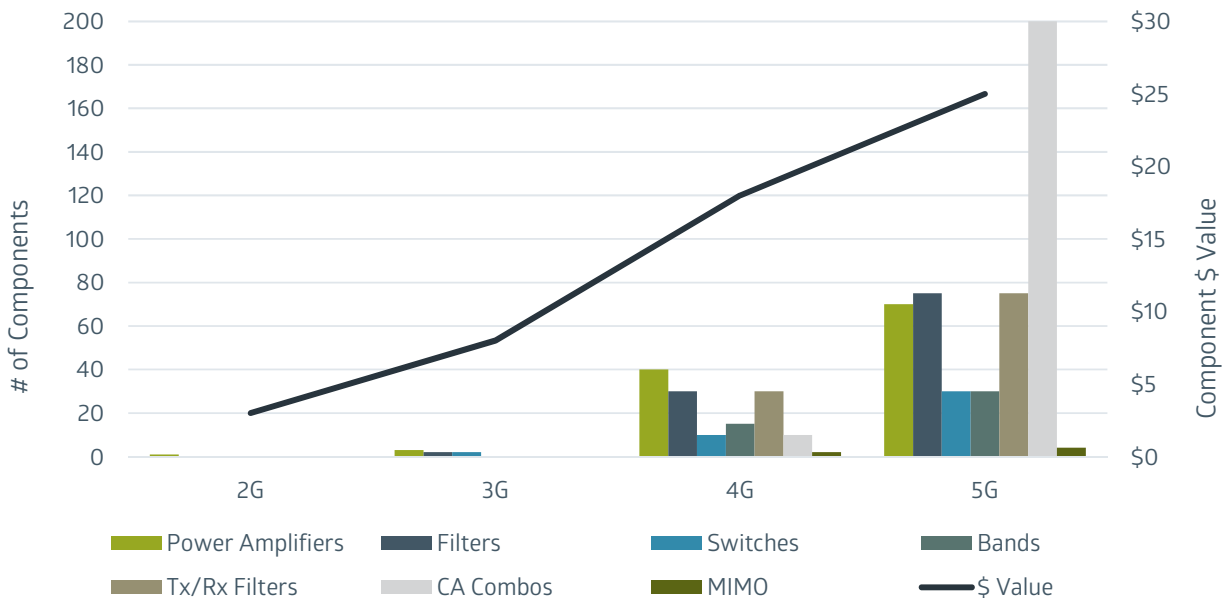
5G also unlocks possibilities in the world of autonomous vehicles. “V2X” stands for “vehicle to everything,” indicating the breadth of connectivity required for millions of vehicles to operate autonomously. Bandwidth, transmission speeds and the ultra-low latency of 5G networks paired with an escalating number of sensors, processors, filters, interconnects, and a staggering amount of software code will soon make of autonomous machines a reality.

Examining the supply chain behind 5G-enabled devices reveals that several suppliers, including semiconductors companies, application developers and system integrators will play key roles in the 5G technology landscape. Companies across the technological supply chain are proving integral to leading-edge 5G products, services, and ecosystem.

When inevitably the icon on your mobile phone switches from “4G/LTE” to “5G,” we hope this helps our clients have a greater understanding of the powerful investment themes that also underlie the new technology.

SUPPLIER COMPONENT CONTENT: 5G HANDSET

Example of components and \$ value gains per handset for a single supplier



Source: Baird, Skyworks. All investments have the risk of loss.

ABOUT THE AUTHOR



Chris Moshy, Senior Vice President, Domestic Equities

Chris joined Bailard in 2015. As a member of the Technology investment team, he focuses his investment research on semiconductor and related industries and coordinates broadly on technology investment strategies.

Prior to Bailard, Chris founded Primary Funds, LLC, an investment firm specialized in low-volatility, long/short technology-biased equity strategies where fundamental research played an integral role in stock selection and portfolio construction. Chris and Bailard have a relationship that began in 2004, when Bailard became an institutional client of Primary Funds, LLC.

Before Primary Funds, Chris served as Director of Equity Research at RCM, at that time a \$60 billion investment advisory firm best known for its fundamental research approach to investing in equities. (Today, RCM is part of Allianz Global Investors.) As the Director of Equity Research, Chris also led the research effort behind the management of \$7.1 billion in research-driven sector funds. He served on that firm's Executive Committee and Equity Management Group.

Chris holds an undergraduate degree in economics from the University of California, San Diego and an MBA from Cornell University.

ABOUT BAILARD'S TECH & SCIENCE TEAM

With strong roots in the heart of the Silicon Valley and the San Francisco Bay Area, Bailard's technology and science team is focused on the forefront of innovation and value creation. The team of six combine their 19-years of average investment experience to deliver deep sector expertise and analyze the rapidly-advancing technology and science industries. Leveraging our "Man + Machine" approach through our proprietary systematic models and tools, fundamental research, and access to industry experts, we seek to deliver a portfolio of high-conviction technology and science stocks dynamically allocated across rising technology stars, science leaders, and core technology holdings. We believe that this domain and fundamental investment expertise—together with our in-house quantitative acumen—is a differentiated and powerful combination when applied to these dynamic, cutting edge market segments.

DISCLOSURES

This communication is for informational purposes only and is not a recommendation of, or an offer to sell or solicitation of an offer to buy, any particular security, strategy or investment product. This communication does not take into account the particular investment objectives, financial situations or needs of individual clients. References to specific stocks are for illustrative purposes only and are not intended to represent any past, present or future investment recommendations. All investments have risks, including the risks that they can lose money and that the market value will fluctuate as the stock and bond markets fluctuate. Technology stocks generally have above

average risk due to, among other things, style and sector risks. There is no assurance that Bailard or any of its investment strategies can achieve their investment objectives. **Past performance is no guarantee of future results.** This communication contains the current opinion of its author and such opinions are subject to change without notice. Information contained herein has been obtained from sources believed to be reliable, but is not guaranteed. Bailard cannot provide investment advice in any jurisdiction where it is prohibited from doing so. We do not think this publication should be relied on as a sole source of information and opinion on the subjects addressed.

Published December 2020

Bailard Institutional
950 Tower Lane, Suite 1900
Foster City, California 94404-2131
phone: (650) 571 5800

For more information, please visit
www.bailard.com.

*Bailard Institutional is a division
within Bailard, Inc.*

Bailard
Institutional