Secular Supply and Demand Forces Aligning to Support Industrial Commodities

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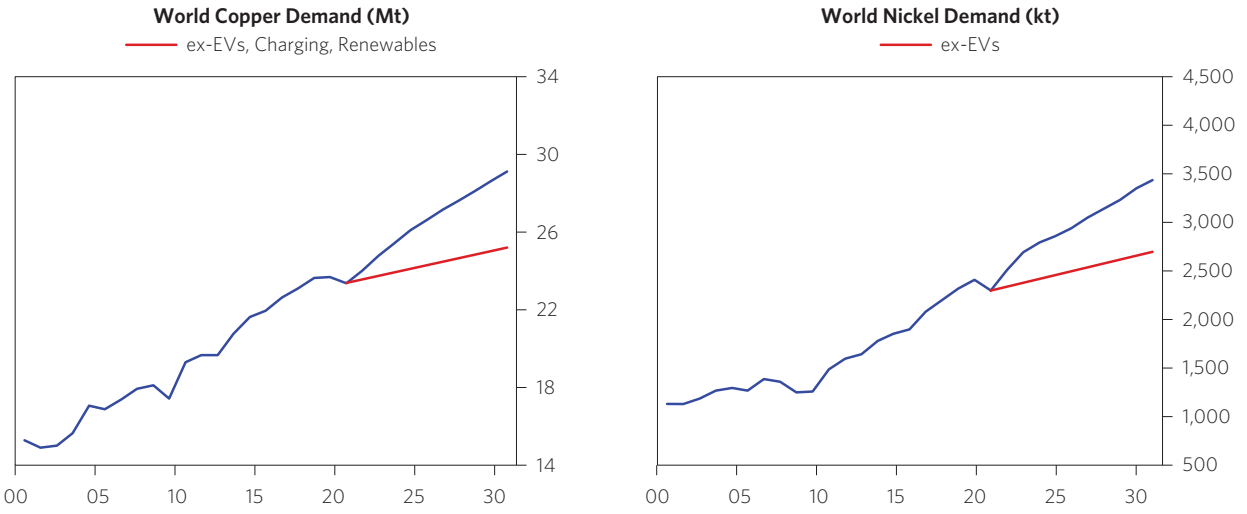
Over the past two decades, China's secular rise dominated commodity markets, as its industrialization required a massive amount of raw materials to build up the country. As we consider the future, we see many reasons to be bullish on commodities tactically, but one of the most important secular factors will likely support industrial commodity demand for years to come: the shift in global economies away from fossil fuels and toward greener energy.

To enable this transition, the rising share of electric vehicles (EVs) in the world car fleet and the rising share of renewable energy in the generation of electric power, along with their requisite infrastructure, all require significant raw materials. These secular forces will support the demand for metals at the same time that future supply growth is restrained due to producers' low investment in new capacity in recent years. Too much demand relative to supply will require higher prices until demand growth is constrained and/or new sources of supply are brought online. Given the substantial lag between a producer investing and bringing new capacity online, such commodity imbalances typically unfold over many years until they get resolved.

The charts below illustrate the dynamics by looking at two of the most affected commodities: copper and nickel. Demand growth will be strong for years to come due to the rise in EVs and renewables, while supply growth will likely be weaker at today's prices.



Both charts: Wood Mackenzie

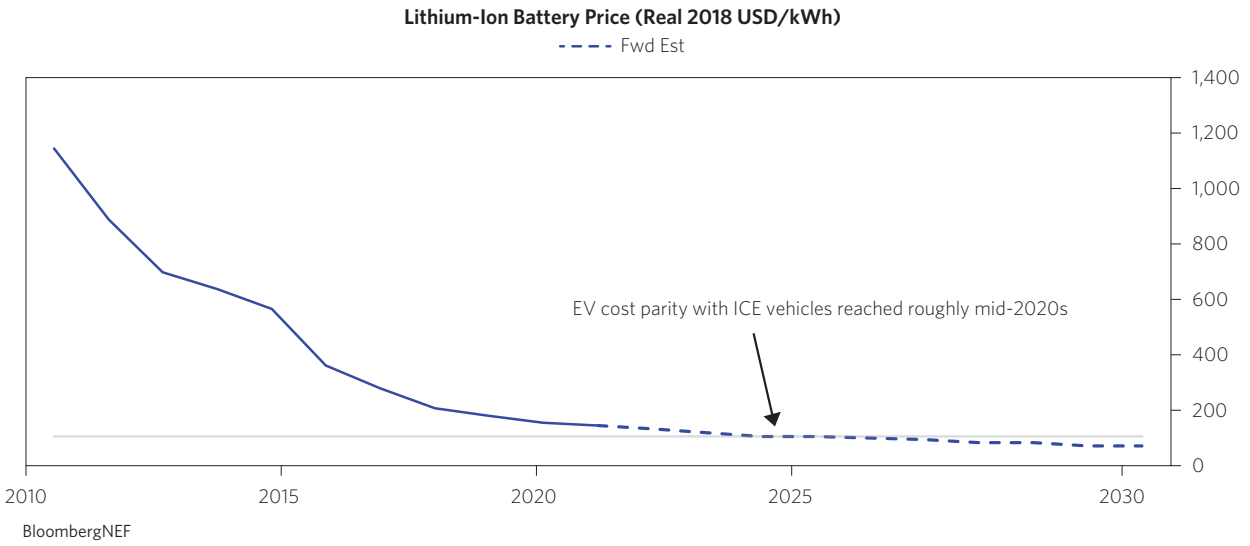
The Transition Away from Fossil Fuels Is a Secular Trend That Will Be a Major Support to Metals Demand for Years to Come

The Rise of Electric Vehicles

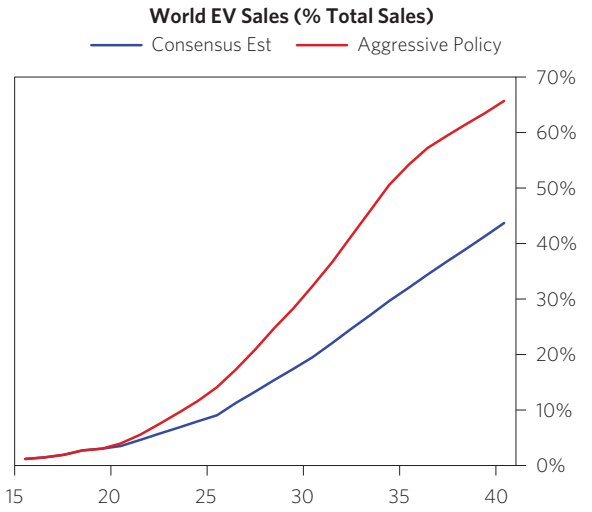
Vehicle transportation is one of the largest sources of carbon emissions, and any transition toward electric vehicles requires a significant amount of raw materials for both:

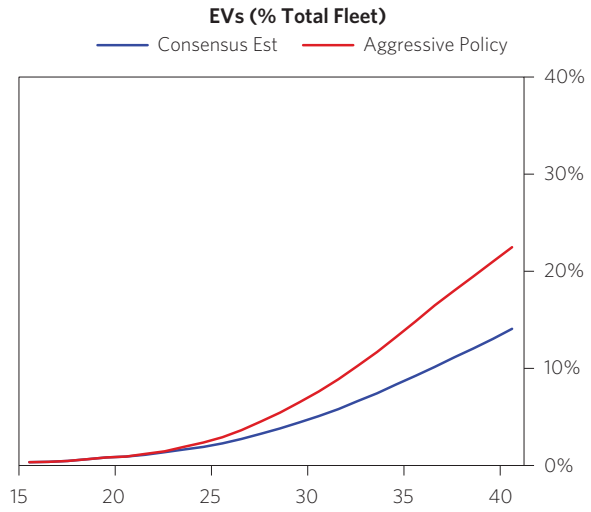
- **The cars themselves:** a wide array of new drivetrain technologies are coming to market, ranging from hybrids where a conventional fossil fuel engine works in tandem with a battery, to cars that use electricity as the sole source of power. Whether an EV is hybrid or fully electric, *each electric automobile requires two to five times as much conductive metal (like copper and nickel) as an internal combustion engine (ICE)*, and large new increments of battery metals (like cobalt and lithium).
- **Supporting infrastructure:** the infrastructure that an electric fleet needs to operate demands still more amounts of conductive metals as well as steel (i.e., iron) to build the tens of thousands of charging stations that EVs require.

The cost of acquiring and maintaining EVs has dropped by 85% over the last decade. While policy initiatives have been important at spurring adoption by consumers thus far, EVs are fast becoming competitive with traditional ICE drivetrains. On the current trajectory, EV cost of ownership will intersect with ICE vehicles in roughly three years' time.

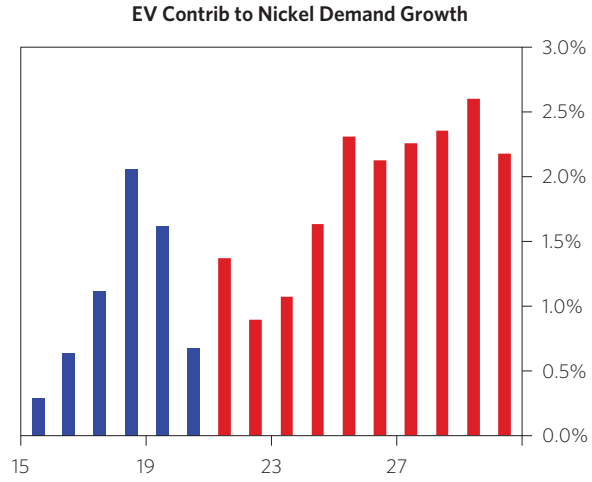


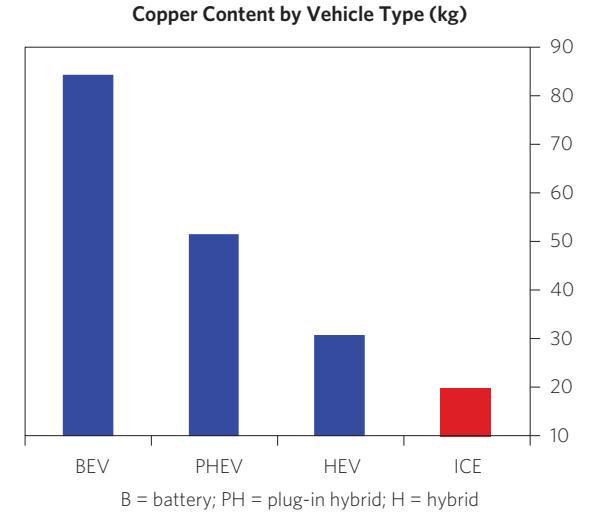
EVs today represent a low percentage of new sales and a small share of cars on the road, but their share of new sales is rising at a fast rate. As their cost approaches parity with ICE vehicles, the pool of prospective consumers broadens dramatically. Policy support can accelerate the rate of adoption even more. But the projected rate of adoption will be driven more by the declining cost of ownership than by subsidies. EVs are no longer just a luxury good.





Zooming in again on nickel and copper: nickel is not used in ICE vehicles at all, and EVs represent an entirely new source of demand for the metal. For copper, battery electric vehicles (BEVs) use almost five times as much copper as ICE vehicles, while hybrid drivetrains consume twice as much copper. Even though the current penetration level of EVs is low, the rate of growth is significant and the intensity of metals usage high, meaning they will likely be a significant demand boost for both metals in the coming years.

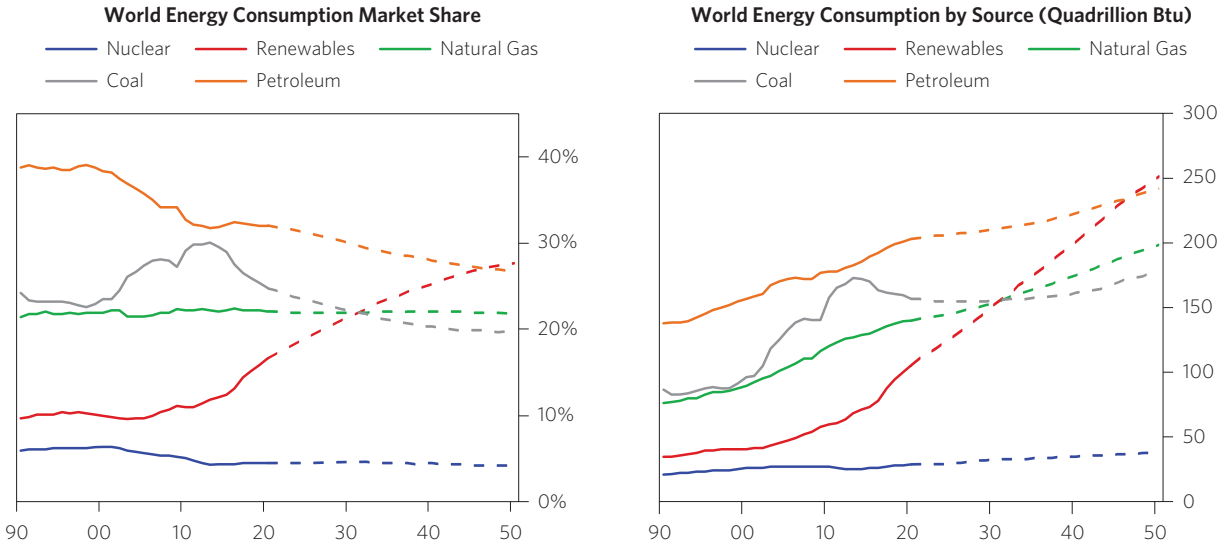




The Rise of Renewable Power Generation

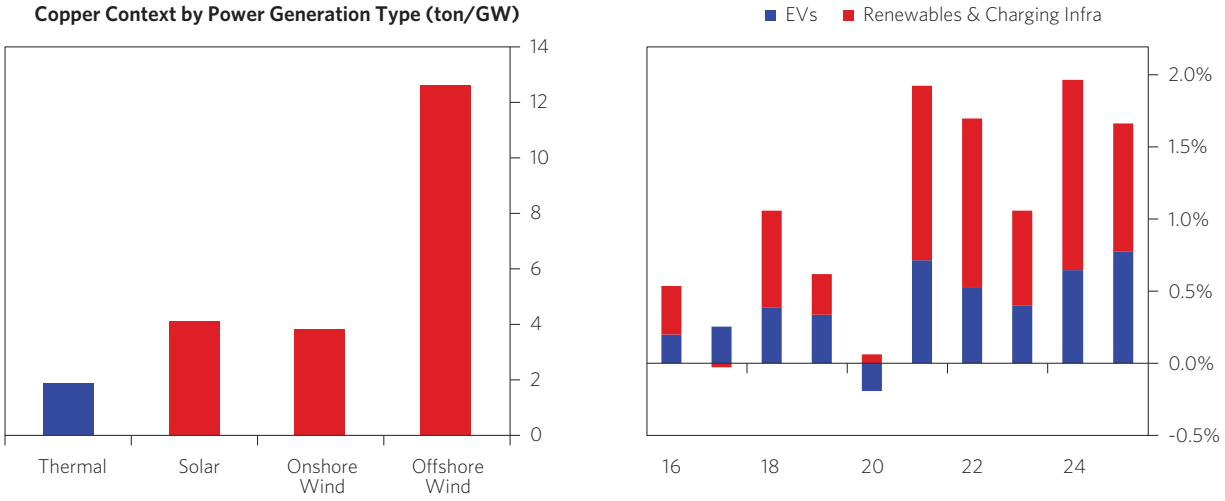
Electricity generated from solar panels and wind turbines is more metal-intensive than conventional power generation. Nuclear, natural gas, and coal-fired electricity plants are large-scale; their turbines are clustered together into one relatively tight place. In contrast, solar panels and wind turbines are spread over wide geographic areas, often located far away from population centers. Additionally, copper and aluminum are needed to connect these disparate and distant producing assets to the electrical grid and to transport the energy they produce to consumers. As the generation cost of solar and wind declines, their share of electricity production rises. Policy support was important in the early stages of adoption, but as economics and scale have improved, renewable power is starting to compete on cost with fossil fuels.

All of these elements—more metals needed to manufacture renewable generation, more metals needed to connect renewables to the grid, and the sharp decline in cost relative to fossil fuels helping to drive a rise in adoption—parallel what is happening with EVs.



Both charts: U.S. Energy Information Administration (2020, 2019)

Copper will benefit from both EVs and increased investment in renewable power generation as new sources of secular demand growth. The chart below to the right sums up the impact of the two, as the global transition away from fossil fuels picks up.



More Aggressive Policy Action on Climate Would Lead to Stronger Support to Metals Demand

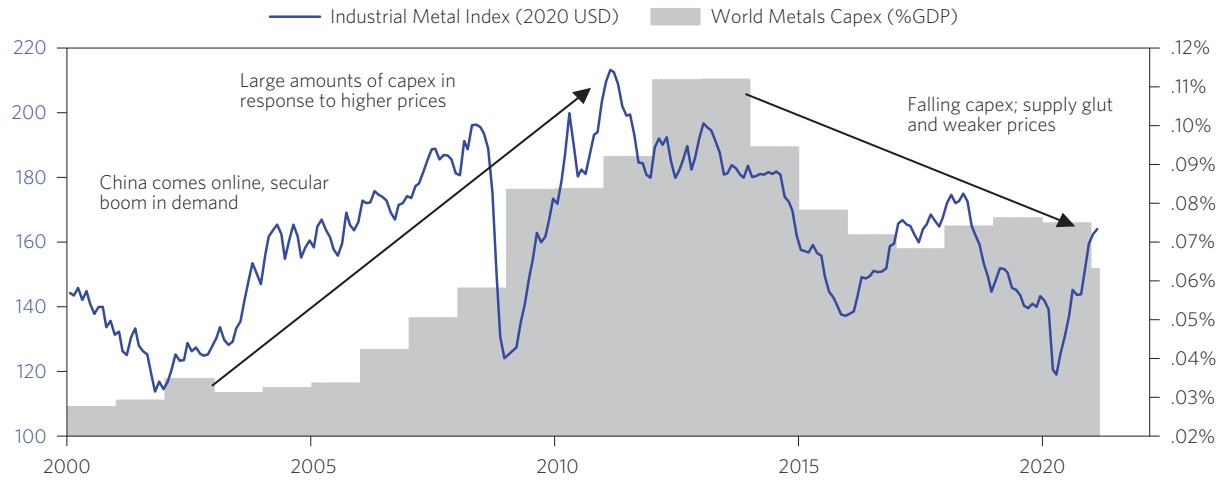
Although it is difficult to predict how any nascent technology will evolve and there is a wide range of outcomes for each individual metal (e.g., there is uncertainty as to the nickel content of the batteries that will be used in EVs, with some having no nickel at all), it is clear that a significant amount of raw materials will be necessary for a climate transition. Current policy responses (e.g., commitments under the Paris Agreement) are already likely to lead to a 10–30% increase in demand for various industrial metals by 2050, but the upper bound is far higher. As shown below, most countries' policies are highly insufficient in order to reach their Paris Agreement targets. If the world were to deliver a coordinated global policy response to climate change, demand for metals from energy technology could effectively double by 2050. Among major metals, silver and aluminum are likely to be some of the largest beneficiaries, due to their importance to a variety of renewable energy technologies. Silver is an important input for solar power, nuclear power, and electric vehicles, while aluminum is an important input for wind power, solar power, and carbon capture and storage (among others).

Weaker Supply Growth After Years of Lower Investment by Producers; Will Likely Need to See Higher Prices for More Supply to Come Online

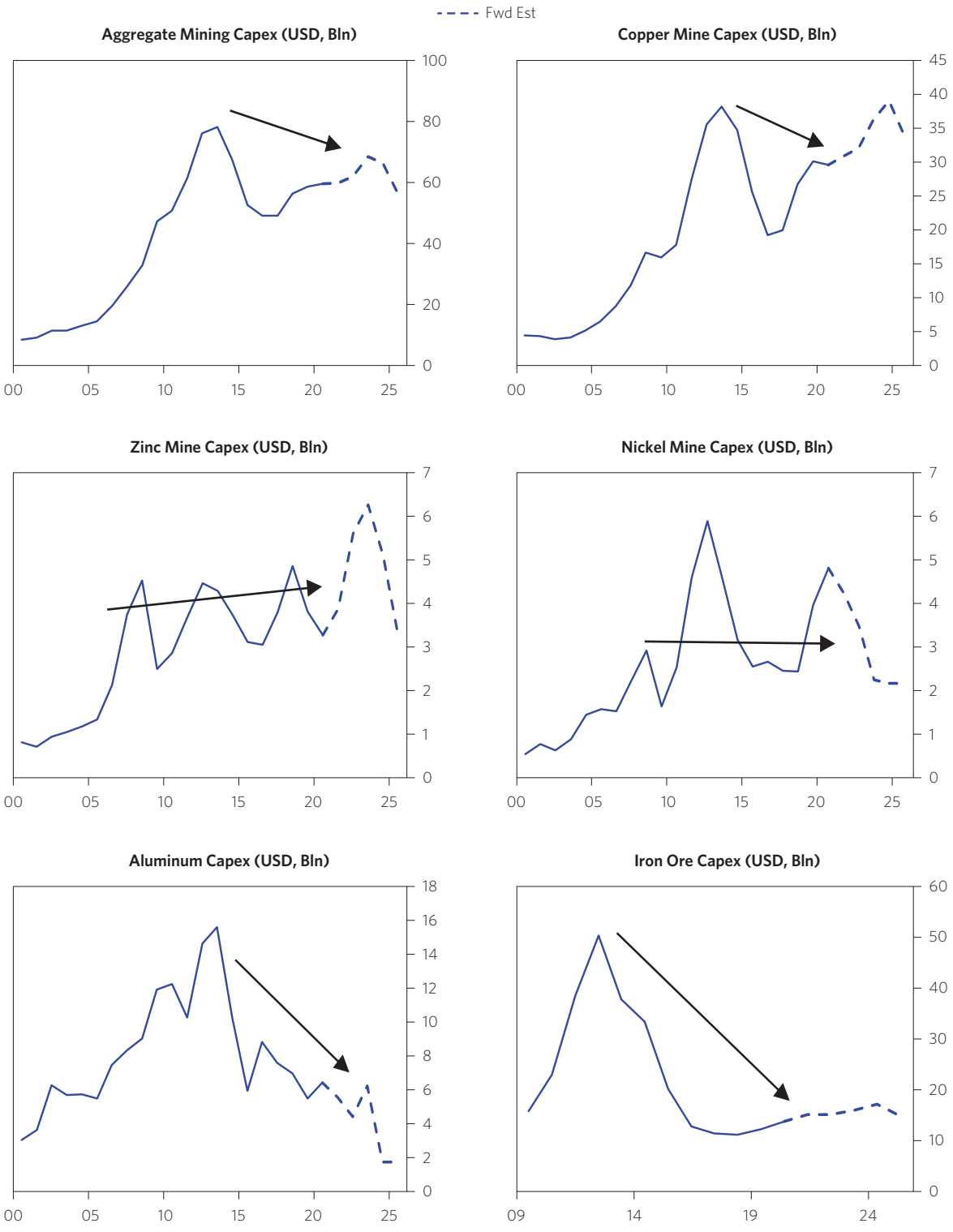
Industrial commodities have just endured a long, difficult period of low prices and low profitability for producers. The seeds for that difficult period were sowed a decade prior, during the very profitable years at the height of the China commodities boom in the mid-2000s. High profits led to high levels of investment and eventually to oversupply, falling prices, a contraction in profits, and reduced levels of investment. The typical investment cycle in commodities has five phases. This cycle has played out many times before and is potentially playing out again:

1. In the first phase, a pickup in commodity-intensive growth causes a global surge in demand for commodities that outstrips supply. As demand pushes up against capacity limits, prices rise.
2. In the second phase, high prices caused by supply/demand imbalance induce large amounts of capital expenditure. As prices rise, margins widen and profits increase. Producers, flush with cash, invest in profitable opportunities to expand production. There is a massive investment boom. This supports growth and inflation as capital expenditure accelerates.
3. The third phase is typically marked by a slowdown in commodity demand that occurs when the original growth that sparked the cycle fades, and high prices incentivize reductions in demand growth by encouraging substitution and efforts to improve efficiency. Simultaneously, the investment boom begins to bring new supply online, demand/supply imbalances ease, and prices stabilize—helping to set in motion the increase in supply and reduction in demand that eventually leads to the turning of the cycle.
4. In the fourth phase, there is a supply glut. The balance between demand and supply swings sharply in the other direction, as production is much greater than demand.
5. As prices fall, margins for commodity producers are squeezed. In the fifth phase, producers respond to low prices by slashing investment and in some cases shutting down production permanently. This decline in supply eventually brings the market back into balance, as the low investment decreases capacity, sowing the seeds for the next cycle.

We think the industrial commodities completed the fifth phase in 2020. In fact, the extreme uncertainty of the pandemic in its beginning stage and the extreme price turbulence it engendered brought the fifth phase of the most recent cycle to a head.



A long period of low prices and low producer profitability has limited producers' access to capital, reduced the level of capital investment, and winnowed down the pipeline of new projects. The extreme economic uncertainty and price volatility precipitated by the early stages of the pandemic in Q1 of 2020 prompted companies to reduce their investment plans even more. It takes time to bring new supply online, so near-term weak supply growth is "baked in the cake." The scan below reflects the weak level of capex across metals in recent years.



Source: Wood Mackenzie

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