Steel Performance Initiative

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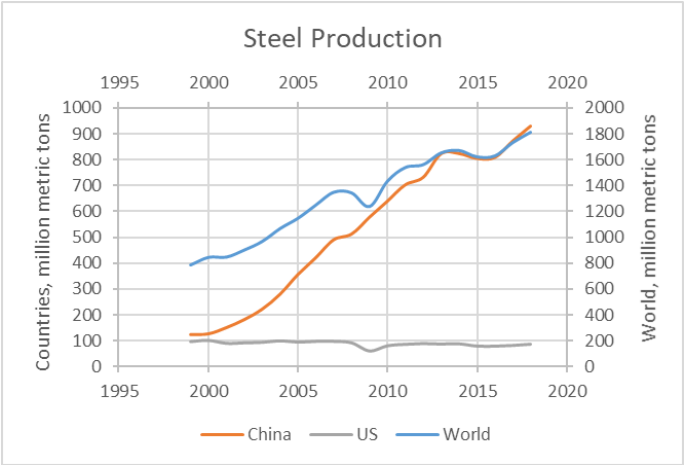
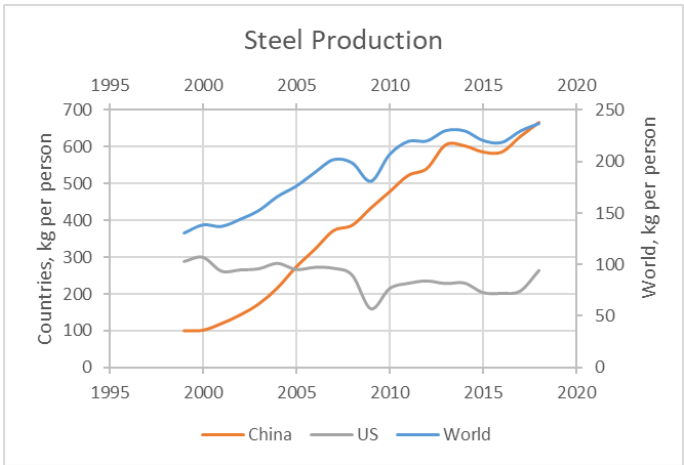
Commentary

China remains a strategic challenge in the steel supply chain. With the support of their public policy, China has expanded its steel-making capacity from parity with the U.S. in 1997 at around 85 million tons to a capacity of over 900 million tons in 2019. The U.S. still makes about 85 million tons and our economy uses about 130 million tons so imports are necessary to meet domestic steel demand.



As can be seen in the graph, China makes over half the steel in the world while having no advantage in technology or raw materials. Labor costs are typically less than the cost of shipments so their ability to be the low-cost supplier is not based on product value or manufacturing efficiency or domestic sources of ore, scrap, or energy. They buy ore from Australia, energy from the Middle East, scrap and coal from the U.S.



China does have a larger population but their steel production per capita is three times the production as the U.S. Only Japan and South Korea have higher levels of per capita steel production than China. These economies are net exporters but are not endowed with domestic resource or superior technology advantages. Their dominant position in steel supply is the result of cultural and policy decisions that see steel production as necessary for national success.

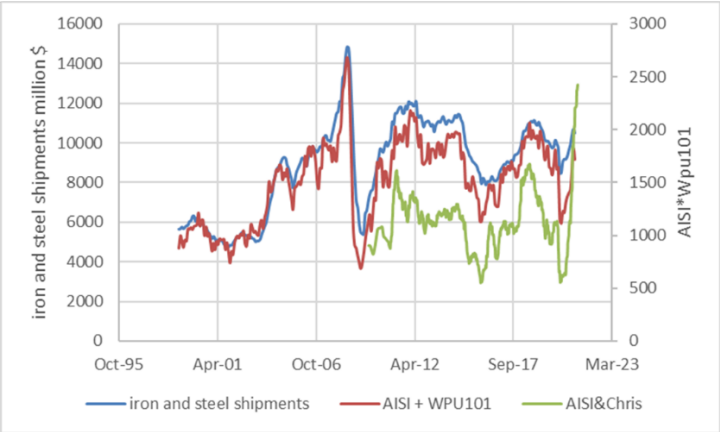
Projects & Partners: Purdue University

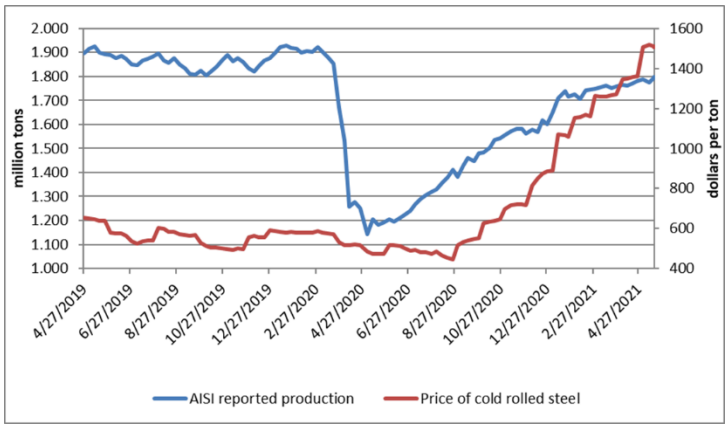
As highlighted in the April edition of the SPI Newsletter, ballistic testing is expensive, and there's currently not a high-confidence method for predicting if and how a material will fail. To address this gap, SPI supports research aimed at improving dynamic performance understanding and modeling capability.

Purdue is investigating the microstructural effects in the intermediate strain rate regime for RAHSS. They have the ability to perform interrupted Hopkinson Bar tests in order to study the amount of loading required to initiate microstructural deformation mechanisms, such as shear banding. During the first year, they will perform these interrupted tests to understand where the mechanisms of interest are occurring within the microstructure. Then, they will perform in-situ Hopkinson Bar tests while taking x-rays of the features indicated during year one testing. This will allow characterization of the effect of local microstructure on the onset and growth of shear localization, which will inform and improve models of material behavior in the intermediate rate regime. This supports the development of an MP^2D approach for considering process-inherent parameters in the design and performance assessment of RAHSS intended for dynamic applications.

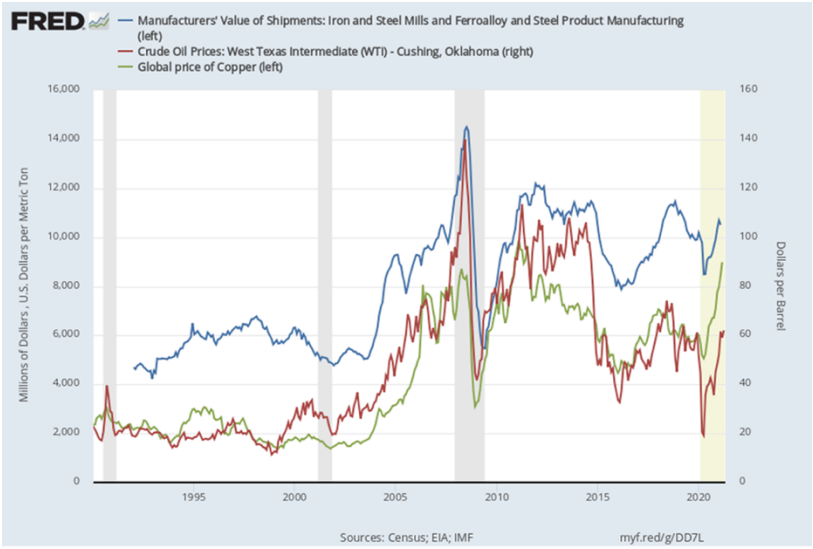
Steel Markets

Understanding the market activity for steel products helps us to know what is happening to our specialty steel producers that form the heart of the SPI. The graph of the shipments of all U.S. iron and steel products shows the sharp drop from the pandemic and the robust current recovery. The AISI + WPU101 is the production from AISI reports multiplied by the producer price index for iron and steel products, WPU101. As expected, these trends match. AISI also reports weekly production and Chris gives the futures price of cold rolled steels and these can be combined and as expected show similar but earlier movement. This allows us to make a chart of the AISI + Chris that gives an early view of what is happening to the steel markets.





This can be seen in the weekly data for the past two years in the graph. This shows the dramatic drop in demand at low prices during the pandemic from March to May 2020. That sharp drop was not persistent, and the market began to see increased production from these very low levels starting in July. Production has increased steadily since then and now is limited by the availability of materials and difficulties in recruiting the workforce required.

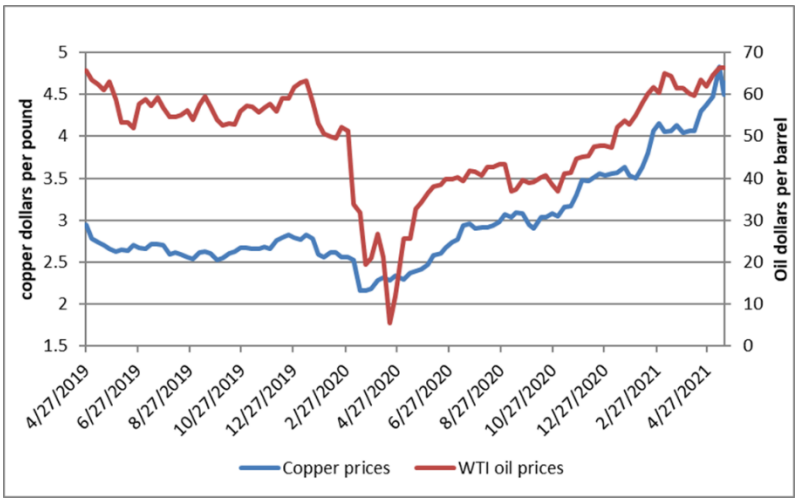


In addition to using steel production and pricing for an indication of market demand, WTI oil prices and copper prices are also correlated with steel shipments. These common trends can be seen in the monthly graph of iron and steel shipments and these commodity prices. This can be correlated so the shipments are estimated by the equation:

$$Iron\ and\ Steel\ Mill\ Shipments\ (\$M) = 33.28 \times WTI\ Oil\ Price\ \left(\frac{\$}{bbl}\right) + 0.56 \times Copper\ Price\ \left(\frac{\$}{ton}\right) + 4947$$

with a standard error of 956 or about 10%.

This is also tracked weekly and shows the sharp drop for oil prices and a more modest drop for copper. Of interest is the movement of the price of steel and the price of copper. Both of these basic commodities are at high prices reflecting limits in the supply. This condition may be long-lived since production remains limited by workforce availability and capacity. This is occurring while auto production is stalled because of a lack of chips.



We may well see a persistent and longer-term rise in pricing and limits on supply.

Update on White Paper Open Call

The open call for white paper proposals announced in March has been modified to remain open indefinitely, as well as to include specific topics of interest. Both SPI objective-focused and topic-specific white paper submissions will be accepted while resources remain available. The white paper selection process is competitive. Visit https://steelperformance.org/proposals.html to view the modified open call and download the white paper template.

Update on Newsletter Frequency

The SPI Newsletter will be moved to a quarterly publication schedule, with special announcements sent as needed. For any questions regarding the SPI Newsletter, contact Raymond Monroe, monroe@steelperformance.org.