# Russia, Ukraine, and Pig Iron Supply

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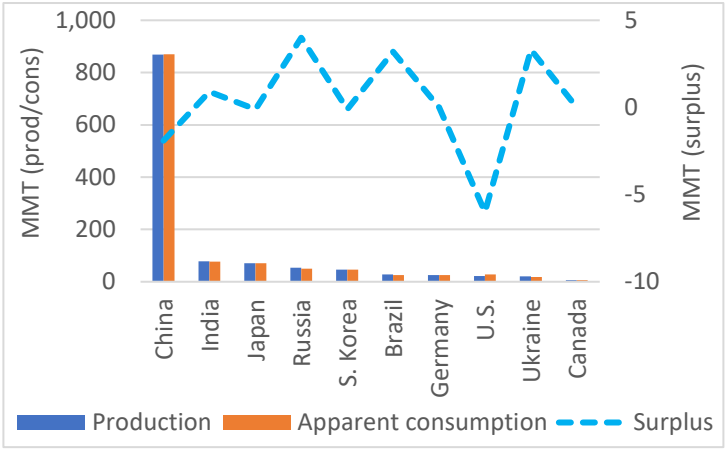
*Pig iron is a critical input that is derived from iron ore (the primary raw material of steel) and is used by steel mills to produce finished steel. A large and growing segment of the U.S. steel industry that produces steel from scrap is heavily reliant on imported pig iron. The recent conflict in Ukraine which began with the Russian invasion in late February 2022 is having an impact on pig iron supply chains, as Russia and Ukraine are the world's largest sellers of "merchant" pig iron and, in recent years, the U.S. steel industry is the world's leading consumer. This briefing examines the impact of the conflict on trade and the U.S. steel mills that will most likely need to look to alternative sources of pig iron as the conflict continues.*

**Background:** Pig iron is produced by smelting iron ore in a blast furnace and then casting the hot metal (liquid iron) into ingots. Pig iron is produced both by dedicated merchant plants (which sell all their output to third parties in the form of cold ingots) and by integrated mills (which sell iron that is surplus to the requirements of their steelmaking operations in the form of cold ingots or granulated pig iron).

In the United States there are two primary types of steel production: integrated mills that make steel by processing iron ore and other raw materials in blast furnaces, and "minimills" that employ electric arc furnaces (EAFs) to produce steel from a mixture of steel scrap and ore-based metallics in the form of pig iron and direct reduced iron (the metallics are used to dilute impurities found in the scrap). Since about 70 percent of all steel produced in the United States is made in minimills, the steel industry is particularly reliant on scrap steel and imported pig iron. Depending on the specifications of the steel produced, EAFs may need to mix as much as 20–90 percent metallics with the scrap steel in a furnace charge. While integrated steel mills produce their own pig iron, most minimills are reliant on purchased merchant pig iron.[1] In the United States, very little merchant pig iron is produced for the market, so most of the material is imported from Russia, Ukraine, and Brazil. In addition, much of the 11.8 million metric tons (MMT) of new steel capacity expected to come online in the United States by 2024 will use EAFs for steel production and require more pig iron.

**Global Pig Iron Production:** In 2021, global production of pig iron was 1.4 billion metric tons with China accounting for about 64 percent of both global production and consumption. China produced 869 MMT of pig iron and consumed nearly 871 MMT in 2021. Excluding China, the leading producers were India, Japan, and Russia. With the exception of Russia, Brazil, and Ukraine, most countries consumed all of the pig iron produced domestically and had little surplus (fig. 1). Consequently, Russia, Brazil, and Ukraine were the primary global exporters of pig iron.

**Figure 1**: Global production, consumption, and surplus of pig iron in 2021



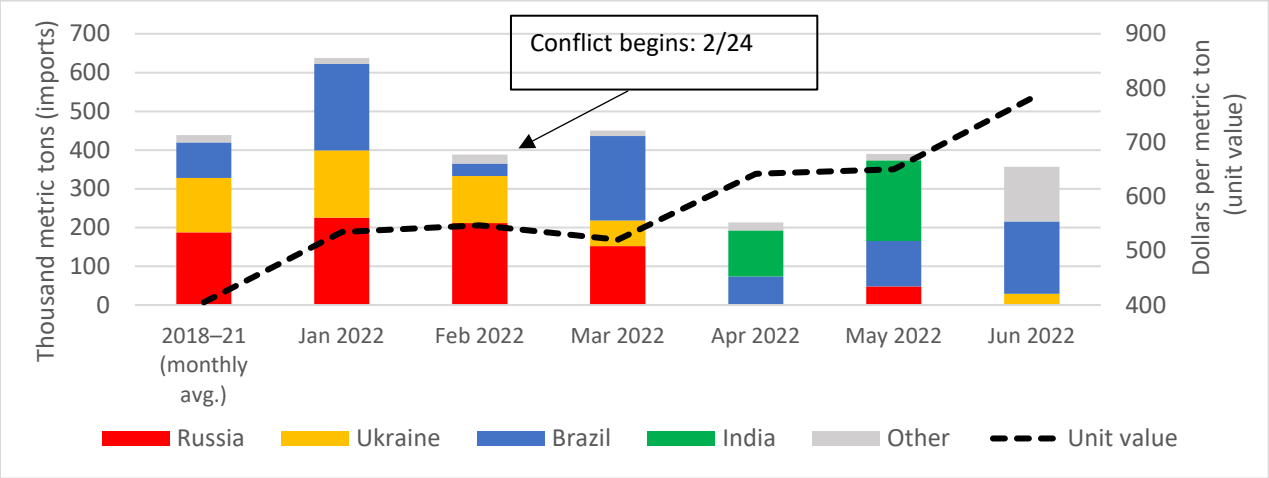

Source: World Steel Association

**Trade:** U.S. imports of pig iron ranged from four to six MMT per year from 2018–21, with Ukraine and Russia accounting for 72 percent of total imports during that period (fig. 2). Imports from both countries declined precipitously after the Ukraine conflict

[1] More than 95 percent of domestic pig iron production is consumed internally by integrated steel producers.

began and in-transit shipments had reached port, which became visible in the April 2022 trade data (fig. 2). After the conflict began, it was reported that almost all Ukrainian pig iron production capacity was suspended, and most Western firms ceased purchasing Russian pig iron. Imports from Brazil and other sources, notably India, entered the United States, but total imports through June 2022 declined by 15 percent from same the period in 2021. Along with the reduced volume and a transition to different sources, there was a marked increase in the unit values of pig iron imported after the conflict began. The average unit value of imported pig iron in June 2022 was $781 per ton, a 46 percent increase from January 2022, potentially indicating that products from alternative sources are more expensive and/or some producers are taking advantage of a tighter global pig iron market.

**Figure 2**: U.S. imports and unit values of pig iron, 2018–22




Source: USITC/Census DataWeb, HTS subheading 7201, accessed August 6, 2022.

**U.S. Industry Outlook:** It is uncertain how domestic producers will respond to supply disruptions associated with the conflict in Ukraine and if there will be more domestically produced merchant pig iron brought to the market. Traditionally, imported pig iron prices had been low enough that most domestic firms did not invest in the capacity to supply merchant pig iron. Additionally, there has been hesitation from some integrated steel producers to supply pig iron to minimills that might compete in the same steel markets.

In the absence of imports from Russia and Ukraine, it is likely that Brazil and India will supply more pig iron to the U.S. market. Separately, in July 2022, Canadian integrated steel producer Stelco Holdings Inc. reported in a national newspaper that it had significant quantities of pig iron capacity (one million metric tons per year) available for use in the U.S. market. Some U.S. steel producers are also adjusting their usage of inputs, relying on a larger share of scrap steel, whenever possible, and reducing pig iron usage. However, the recent increased demand for steel scrap has led to price increases for that material as well. Some domestic producers have announced plans to bring more pig iron capacity online, but primarily to fill their own needs. For example, U.S. Steel recently announced plans to add capacity to produce 500,000 metric tons per year of pig iron at its steel mill in Gary, IN, that will feed its Big River Steel minimill in Osceola, AR, and Cleveland-Cliffs recently opened a plant in Toledo, OH, to produce hot-briquetted iron, which can substitute for pig iron.

*Sources:* International Iron Metallics Association (IIMA), "Frequently Asked Questions," accessed August 3, 2022; IIMA, "Pig Iron"; Loftin, "Facing Headwinds," May 2022; USGS, "MCS 2022—Iron and Steel,"January 2022; USGS, "Mineral Commodity Profiles—Iron and Steel," 2005; Fastmarkets, "New Steel Capacity Unlikely to Depress Prices," May 18, 2022; Fastmarkets. "Pig Iron Shortage from Lost Ukraine-Russia Volumes May Be Partly Covered by Other Sources," March 23, 2022; WSJ, "U.S. Steel Mills Don't Need the Russian Oligarch's Pig Iron," July 29, 2022; Tita, "Ukraine War Drives Shortage in Pig Iron, Pushing Steel Prices Higher," July 29, 2022; CRU, ""US BFs Positioned to Supply Domestic Pig Iron," May 26, 2021.