Potential Impacts of the War in Ukraine on the Fourth District

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This *District Data Brief* examines the trade connections between Ukraine and Russia and the Fourth Federal Reserve District, which includes Ohio, western Pennsylvania, eastern Kentucky, and the northern panhandle of West Virginia. It appears that supplies to the District will be substantially reduced for several items that Ukraine and Russia export, such as primary metals and fertilizer. We should expect prices to rise for these goods, as they have already for petroleum. However, there are generally alternate global suppliers for many of the goods sold by Ukraine and Russia, so Fourth District firms will probably not be forced to halt production because of lack of materials.

Some industries in the District, including coal mining and corn and soybean farming, could experience increased demand because the trade partners of Ukraine and Russia will need to replace these countries' exports. However, the estimates detailed below suggest the net increase in demand would be less than one tenth of a percent of the District's gross domestic product (GDP).

At the time this brief was prepared, the Russia–Ukraine war does not appear to be de-escalating. For the analysis, I assume that Ukraine will not be able to export goods for the remainder of 2022 and that sanctions on Russia will be left in place or increased.[1]

Goods the United States imports from Ukraine and Russia

Most of the goods that the United States imports directly from Ukraine and Russia are raw materials and intermediate goods (see Table 1). There are no items for which the United States relies on Ukraine and

[1] There are some published studies that estimate the impact of the 2014 sanctions against Russia on the sanctioning countries (Giumelli, 2017; Kholodilin and Netšunajev, 2019; Gullstrand, 2020; and Crozet and Hinz, 2020). The studies find small impacts, but there are reasons to believe that the impacts could be larger this time. The sanctions enacted so far in 2022 have been more extensive, and hundreds of Western corporations have voluntarily severed economic relationships with Russia. For details, see https://www.piie.com/blogs/realtime-economic-issues-watch/russias-war-ukraine-sanctions-timeline, https://graphics.reuters.com/UKRAINE-CRISIS/SANCTIONS/byvrjenzmve/ and https://www.reuters.com/world/white-house-more-sanctions-against-russia-likely-2022-04-25/.

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Russia for the majority of its imported supply. The United States also produces some of these goods for domestic consumption, including iron and oil. The availability of domestic supplies ensures that the loss of 30 percent of the imported supply of a specific commodity, for example, does not force a full 30 percent decline in consumption of that commodity.

Table 1. Top Direct US Imports of Goods from Ukraine and Russia, Annual Values Averaged 2016–2020

Category	Product	Ukraine and Russia		Ukraine		Russia	
		Share of US imports (%)	Value of imports ($M)	Share of US imports (%)	Value of imports ($M)	Share of US imports (%)	Value of imports ($M)
Metals	Pig iron	31	1,879	10	594	21	1,284
Energy	Uranium	24	848	0	0	24	848
Energy	Oil, processed	17	9,346	0	3	17	9,344
Metals	Iron or steel ingots	17	706	0	0	17	705
Ag and Food	Fertilizers, chemical	12	900	0	0	12	900
Other	Synthetic rubber	8	152	0	0	8	152
Metals	Miscellaneous nonferrous base metals	7	166	0	5	7	161
Metals	Aluminum	6	1,185	0	0	6	1,185
Ag and Food	Fish	6	536	0	0	6	535
Metals	Nickel	6	138	0	1	6	137
Ag and Food	Oilseeds	5	51	4	34	2	17
Metals	Iron ore	4	34	2	12	3	22

Notes: Values are inflation adjusted to 2022 dollars before averaging. The sum of the individual country values may not match the combined values because of rounding.
Sources: DESA/UNSD, United Nations Comtrade database via World Bank World Integrated Trade Solutions.

Goods Ukraine and Russia supply to world markets

Countries that normally buy Ukrainian and Russian commodities will likely direct their purchases to the same remaining trading partners that normally sell goods to the United States. This shift will affect the quantities and prices available to District firms. Table 2 lists the top 20 commodities in terms of Ukrainian and Russian supply of global exports along with the share of those global exports that typically head to the United States. Metals, fertilizers, and fossil fuels are prominent on the list.

Table 2. Top 20 Goods by Ukrainian and Russian Share of Global Exports, Annual Values Averaged 2016–2020

Category	Product	Ukraine and Russia	Ukraine	Russia	United States
		Share of global exports (%)			Share of global imports (%)
Metals	Iron or steel ingots	31	9	21	10
Ag and Food	Wheat	21	7	14	1
Ag and Food	Barley	18	9	9	1
Ag and Food	Vegetable oil	18	11	7	9
Ag and Food	Fertilizers, chemical	16	0	16	9
Metals	Pig iron	16	5	11	12
Energy	Coal	14	0	14	0
Ag and Food	Corn	13	11	2	1
Ag and Food	Sulphur (fertilizer ingredient)	12	0	12	4
Metals	Nickel ores and concentrates	11	0	11	0
Metals	Nickel	11	0	11	10
Other	Wood, simply worked	10	1	9	18
Ag and Food	Fertilizers, crude	10	0	10	7
Other	Wood in the rough	9	0	9	1
Energy	Briquettes, lignite, and peat	9	0	9	6
Metals	Platinum group metals and silver	8	0	8	16
Energy	Crude oil	7	0	7	11
Energy	Fuel wood	7	6	1	4
Energy	Coke and semi-coke	7	0	7	0
Ag and Food	Oilseeds	7	1	6	8

Note: The sum of the individual country values may not match the combined values because of rounding.
Sources: DESA/UNSD, United Nations Comtrade database via World Bank World Integrated Trade Solutions.

Considering the shares displayed in Tables 1 and 2, the items that appear as if they could have the most impact on the Fourth District are intermediate forms of iron used in making steel and steel products.[2] The Fourth District is home to some of the nation's largest industry clusters in steel, automotive, and aviation manufacturing, a situation which means that 1 out of every 12 workers in the District could be idled if the metals supply chain were interrupted. In the District, approximately 48,000 people are employed in the primary metals sector (NAICS 331), which processes iron ingots and ores into the steel

[2] Fertilizer and fertilizer ingredients, especially potash and sulphur, are other major Ukrainian and Russian exports. A shortage of this fertilizer could diminish crop yields for Fourth District farmers. The direct impact on the District's economy would be limited by the fact that agriculture contributes only 0.5 percent of the District's GDP annually. This percentage estimate is based on the Bureau of Economic Analysis's (BEA's) GDP estimates by county by industry. https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1&acrdn=5. I estimate the District's total and industry-specific GDP by adding the BEA's estimate of Ohio's GDP to the BEA's estimated county GDP in the non-Ohio Fourth District counties.

used in manufacturing and construction.[3] Primary metal manufacturing accounts for about 0.7 percent of total District employment. Approximately 6.6 percent of employment in the District is in industries reliant on the steel produced by these primary metals manufacturers. Specifically, 125,000 District workers are employed in the fabricated metal manufacturing industry (NAICS 332), and 265,000 people are employed in steel-intensive durable-goods manufacturing.[4] Another 1.1 percent of our District's employment, 93,000 workers, is employed in steel-intensive construction.[5]

Global shortages of several other commodities used in metal manufacturing could hamper production of automobiles and appliances even if iron remains available. For example, nickel is necessary to produce stainless steel, and Russia supplies about 11 percent of global exports of nickel. The US also imports approximately 16 percent of the platinum-group metals that are exported globally, and Russia is a major supplier of these. The largest demand for platinum is for the manufacturing of catalytic converters for vehicles.

Considering the overlapping concentrations of Ukraine, Russia, and the Fourth District in metals industries, we engaged with several of our contacts in the steel industry to ask specifically about the impact of the war. As of the end of April 2022, they said that prices for various inputs had risen, but they did not expect work stoppages. Our contacts indicated that US steel producers have successfully substituted imported iron and scrap steel from other countries. They also said their customers do not expect to reduce production because of a lack of other inputs such as catalytic converters.

Lost sales to Ukraine and Russia and increased sales to their trading partners

Some Fourth District firms could benefit from increased demand as global buyers seek to replace supplies unavailable because of the war. Table 3 lists the potential increases in demand for commodities exported by Fourth District producers that could substitute for Ukrainian and Russian supplies. At the same time,

[3] The employment estimates are based on the Quarterly Census of Employment and Wages (QCEW) 2021 county by industry data, https://www.bls.gov/cew/downloadable-data-files.htm. The estimate of employees in the Fourth District is the sum of employment in Ohio and employment in the non-Ohio Fourth District counties. Where the Bureau of Labor Statistics suppresses the county-industry employment (3-digit NAICS codes) count to protect confidentiality, the county is assigned a share of the suppressed employees proportional to its share of employees in the industry's sector (2-digit NAICS codes). Sector employment counts are less likely to be suppressed because there are usually enough reporting firms in each sector. For example, consider employment in primary metals (NAICS 331) in counties in Pennsylvania. Total employment in the state is 30,731, and total employment disclosed in Pennsylvania counties is 28,165, so *undisclosed_employees = 30,731 - 28,165 = 2,566*. The county's share is *county_share = NAICS_33_employees in county_with_suppression / NAICS_33_employees_in_all_counties_with suppression.* For each county that has its count suppressed, I impute *employees = undisclosed_employees * county_share.*

[4] NAICS 333 – Machinery Manufacturing, NAICS 335 – Electrical Equipment, Appliance, and Component Manufacturing, NAICS 336 – Transportation Equipment Manufacturing.

[5] NAICS 2362 – Nonresidential Building Construction, 237 – Heavy and Civil Engineering Construction.

Fourth District producers are losing customers they had in Ukraine and Russia. Table 4 lists the top items by value that are produced in the District and exported to Ukraine and Russia.

Table 3. Top 10 Commodities by the Potential Increase in Demand for Fourth District Producers If Ukrainian and Russian Exports Remain Unavailable

Product	Ukraine value of exports ($M)	Russia value of exports ($M)	US share of world exports (%)	District share of US production (%)	Potential District demand increase ($M)
Coal	38	15,526	9	24	366
Corn	4,393	824	34	3	57
Oilseeds	2,202	745	29	6	56
Fertilizers, chemical	256	9,516	7	7	46
Liquefied propane and butane	0	1,469	36	7	41
Ferrous waste and scrap	69	1,491	13	16	32
Residual petroleum products	192	3,173	11	7	28
Pig iron	1,939	4,105	2	22	28
Railway vehicles	381	865	9	24	27
Iron or steel ingots	3,115	7,095	1	22	26
Other goods	31,492	290,267			589
Total	**44,078**	**335,075**			**1,294**

Notes: The rightmost column is calculated as follows: *D4_demand_increase = (UKR_exports + RUS_exports) x US_share_global_exports x D4_share_US_production*. The District share of US production is estimated based on the share of employment in the industry in District counties observed in the QCEW in 2021. The dollar values are averages of the annual figures from 2016 to 2020. Values are inflation adjusted to 2022 dollars before averaging. Columns sums may not equal totals because of rounding.
Sources: DESA/UNSD, United Nations Comtrade database via World Bank World Integrated Trade Solutions, Quarterly Census of Employment and Wages.

The estimates in Table 3 represent an upper bound on demand increases because many nations, including China and India, have announced they will continue to buy exports from Russia. As a result, global supplies will probably not contract by the total Russian export volume.

In some cases, Ukrainian and Russian exports include related products at multiple stages of production. For example, pig iron is used to produce flat-rolled steel products, and fertilizer is used to produce corn. The ability of District producers to meet the added demand could be constrained by shortages of the intermediate items.

Table 4. Top 10 Commodities by the Potential Decrease in Demand for Fourth District Producers If They Cannot Export to Ukraine and Russia

Product	Ukraine, value of imports from United States ($M)	Russia, value of imports from United States ($M)	District share of US production (%)	Potential District demand decrease ($M)
Coal	631	0	24	152
Light vehicles	334	200	7	39
Automotive parts	16	302	9	27
Pumps for air or gases	8	137	13	18
Other machinery	8	181	9	18
Miscellaneous chemical products	5	150	8	12
Nonelectrical machinery	16	50	18	11
Tires	10	69	14	11
Civil engineering equipment	10	251	4	11
Perfumery, cosmetics, toiletries	12	78	12	11
Other goods	782	3,206		253
Total	1,831	4,625		563

Notes: The rightmost column is calculated as follows: *D4_demand_decrease = (UKR_imports_from_US + RUS_imports_from_US) x D4_share_US_production*. The District share of US production is estimated based on the share of employment in the industry in District counties observed in the QCEW in 2021. The dollar values are averages of the annual figures from 2016 to 2020. Values are inflation adjusted to 2022 dollars before averaging. Columns sums may not equal totals because of rounding.
Sources: DESA/UNSD, United Nations Comtrade database via World Bank World Integrated Trade Solutions, Quarterly Census of Employment and Wages.

The net changes from this analysis sum to $731 million in additional demand for raw materials and products produced in the District. Compared to the Fourth District's GDP, the increase is less than one tenth of 1 percent.[6] While there will be winners and losers among the District's exporters, it appears the net change may be modest.

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