

KIEL POLICY BRIEF

Holger Görg, Anna Jacobs, and
Saskia Meuchelböck

War in Ukraine and
Western sanctions –
How vulnerable are
German firms?

UKRAINE SPECIAL NO. 2



June 2022

- We analyse a novel firm-level dataset for Germany to investigate the involvement of German firms in the Russian and Ukrainian market as well as the impact of the annexation of Crimea and the associated sanctions in 2014.
- The number of firms exporting to Russia dropped substantially since the annexation of Crimea, to around 18 thousand in 2018. Moreover, Russia became a substantially less important export destination for those firms still serving the market.
- Imports from Russia are dominated by a few large firms highly dependent on the Russian market. They include mostly energy products and raw materials. In contrast, German exporters are not very dependent on Russia, with only few small firms highly specialised in the country.
- The number of firms trading with Ukraine is substantially smaller than that for Russia. However, trade with Ukraine has become more important for German firms, despite some temporary turmoils related to the Russian annexation of Crimea. Yet, only few firms are highly specialised in Ukraine.
- As an important share of goods imported are intermediate inputs, vulnerabilities not only arise due to the direct exposure of German firms to Russia or Ukraine, but also via potential disruptions of value chains.

OVERVIEW/ÜBERBLICK

- We analyse a novel firm-level dataset for Germany to investigate the involvement of German firms in the Russian and Ukrainian market as well as the impact of the annexation of Crimea and the associated sanctions in 2014.
- The number of firms exporting to Russia dropped substantially since the annexation of Crimea, to around 18 thousand in 2018. Moreover, Russia became a substantially less important export destination for those firms still serving the market.
- Imports from Russia are dominated by a few large firms highly dependent on the Russian market. They include mostly energy products and raw materials. In contrast, German exporters are not very dependent on Russia, with only few small firms highly specialised in the country.
- The number of firms trading with Ukraine is substantially smaller than that for Russia. However, trade with Ukraine has become more important for German firms, despite some temporary turmoils related to the Russian annexation of Crimea. Yet, only few firms are highly specialised in Ukraine.
- As an important share of goods imported are intermediate inputs, vulnerabilities not only arise due to the direct exposure of German firms to Russia or Ukraine, but also via potential disruptions of value chains.

Keywords: Russia, Ukraine, Sanctions, War, Vulnerability, International Trade, Firms

- Wir analysieren einen neuen Datensatz auf Unternehmensebene für Deutschland, um das Engagement deutscher Unternehmen auf dem russischen und ukrainischen Markt sowie die Auswirkungen der Annexion der Krim und der damit verbundenen Sanktionen im Jahr 2014 zu untersuchen.
- Die Zahl der Unternehmen, die nach Russland exportieren, ist seit der Annexion der Krim deutlich gesunken und lag 2018 bei rund 18 Tausend. Außerdem hat Russland als Exportziel für die Unternehmen, die den Markt weiterhin bedienen, erheblich an Bedeutung verloren.
- Die Einfuhren aus Russland werden von einigen wenigen Großunternehmen dominiert, die stark vom russischen Markt abhängig sind. Sie umfassen hauptsächlich Energieerzeugnisse und Rohstoffe. Im Gegensatz dazu sind die deutschen Exporteure nicht sehr stark von Russland abhängig, und nur wenige kleine Unternehmen sind hochspezialisiert auf dieses Land.
- Die Zahl der Unternehmen, die mit der Ukraine handeln, ist wesentlich geringer als im Falle Russlands. Allerdings hat der Handel mit der Ukraine für deutsche Unternehmen an Bedeutung gewonnen, trotz einiger vorübergehender Turbulenzen im Zusammenhang mit

der russischen Annexion der Krim. Insgesamt sind jedoch nur wenige Unternehmen hoch spezialisiert auf die Ukraine.

- Da es sich bei einem großen Teil der importierten Waren um Vorleistungen handelt, sind deutsche Unternehmen nicht nur direkt gegenüber Russland oder der Ukraine verwundbar, sondern auch durch potenzielle Unterbrechung innerhalb von Wertschöpfungsketten.

Schlüsselwörter: Russland, Ukraine, Sanktionen, Krieg, Verwundbarkeit, Internationaler Handel, Unternehmen

Holger Görg
Kiel Institute for the World Economy
Kiellinie 66
24105 Kiel, Germany
Phone: +49 (431) 8814-258
E-Mail: holger.goerg@ifw-kiel.de



Anna Jacobs
Kiel Institute for the World Economy
Kiellinie 66
24105 Kiel, Germany
Phone: +49 (431) 8814-327
E-Mail: anna.jacobs@ifw-kiel.de



Saskia Meuchelböck
Kiel Institute for the World Economy
Kiellinie 66
24105 Kiel, Germany
Phone: +49 (431) 8814-674
E-Mail: saskia.meuchelboeck@ifw-kiel.de



War in Ukraine and Western sanctions – How vulnerable are German firms?

Holger Görg, Anna Jacobs, Saskia Meuchelböck

1 Introduction¹

The invasion of Russia in Ukraine has led to a sudden reevaluation of political and economic relations with Russia, including financial and trade linkages. The European Union, the United States, and many other countries have imposed a series of sequential sanction packages against Russia. The sanctions range from measures against individuals in the form of travel restrictions and asset freezes, to sanctions in the aviation sector and broader economic sanctions targeting Russia's trade and financial relations with other countries. Similar sanctions have also been implemented against Russia's accomplice Belarus due to its supporting role in the matter.²

The sanctions imposed since the beginning of the war add to measures already in place since the annexation of Crimea by Russia in 2014. The initial measures taken in the course of 2014 were targeted against certain individuals and entities, and were complemented by economic sanctions in August 2014. The list of sanctioned products was rather selective and included defense equipment, dual-use goods and technologies, energy equipment, and selected capital goods. As a response, Russia implemented an embargo on imports of agricultural goods, which is still in place today.

The EU has implemented a variety of additional measures against Russia since the invasion, adding up to sanctions of unprecedented scope and scale. First, the sanctions now encompass a somewhat larger list of products, including exports of luxury goods such as luxury cars, watches and jewelry. Second, the EU has introduced restrictions on the import-side for the first time. Thus, the import of steel, iron, wood, cement and certain fertilisers as well as imports of seafood and liquor are now prohibited. From August 2022, the import of coal and other solid fossil fuels will also be prohibited, and a partial ban of oil imports was agreed upon at the end of May. Third, the EU imposed sanctions on road and maritime transport in the beginning of April, prohibiting Russian and Belarusian road transport operators from entering the EU, and closing European ports to Russian vessels (the transport of selected goods including energy, medical and agricultural products into the EU is still possible, though). And fourth, new sanctions against the financial sector have been imposed – most notably the ban of several Russian and Belarusian banks from the international payment system SWIFT. The European Council (2022) gives a more detailed overview of the EU sanctions against Russia and Belarus.

¹The Federal Ministry for Economic Affairs and Climate Action is contracting authority and financier of the project generating the dataset used in this policy brief. More information about the project can be found here.

²Due to Belarus' limited role as a trading partner for Germany - the share of Belarus in German exports and imports is less than 0.1% each -, we do not include Belarus in our analysis.

German foreign trade with Russia and Ukraine has been severely affected by the war and the sanctions imposed. German exports to Russia in March fell by 58% to just over 1 billion euros compared to the previous year, and dropped even further in April, according to the German Federal Statistical Office. Exports to Ukraine were 45% lower in March 2022 than in 2021, and also imports from Ukraine fell by almost 30%. While foreign trade with Ukraine has been severely affected directly by the war itself, exports to Russia dropped as a result of the political and economic reaction to the war. Several companies not directly targeted by those sanctions yet have decided to restrict their business with Russia or withdraw from the market entirely, adding to the immediate and direct effect of the sanctions.³

This policy brief aims at shedding light on the vulnerabilities of German firms arising from the Russian invasion of Ukraine. For this purpose, we analyse a novel firm-level dataset for Germany to investigate the involvement of German firms in the Russian and Ukrainian market, respectively. While the data is only available up to the year 2018 at the time of our analysis, it can offer valuable insights into the exposure of German firms vis-à-vis Russia and Ukraine. Moreover, it allows us to track the reactions to sanctions and countersanctions starting in 2014 of German foreign trade at the firm level.

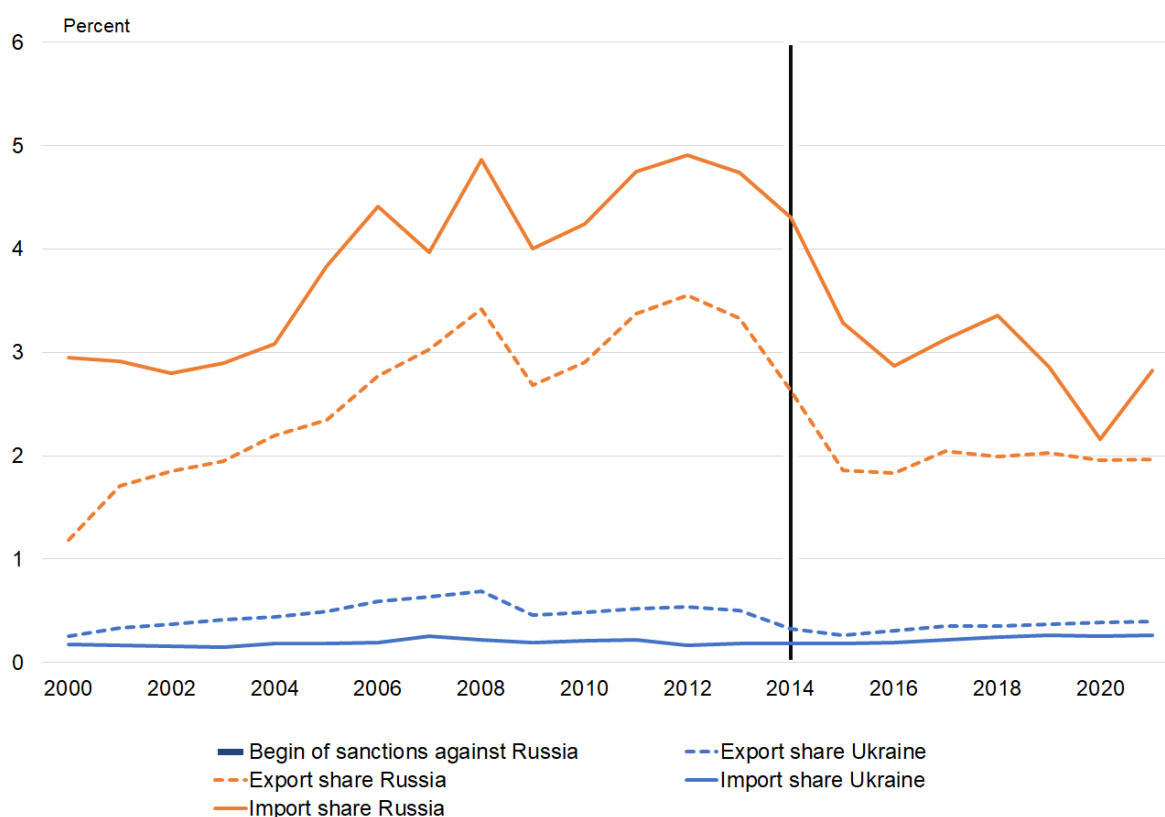
Section 2 takes an aggregate view at German foreign trade with Russia and Ukraine, providing a general overview of the trade relationship. We then turn to the more disaggregated level of the firm. In section 3, we begin by analysing how many German firms trade with Russia and Ukraine, how much they trade, and how trade at the firm level developed between 2012 and 2018. We also document differences in economic exposure of German firms vis-à-vis the two countries. Section 4 identifies vulnerabilities at the product-level. Section 5 discusses our results and concludes.

2 German trade with Russia and Ukraine – A macroeconomic perspective

From an aggregate perspective, Russia and Ukraine account for comparatively low shares in German foreign trade. In fact, Russia has become noticeably less important as a trading partner for Germany since the annexation of Crimea and associated sanctions in 2014. Russia's share of goods exports has been around 2% since 2015; before it had been over 3% (Figure 1). Russia's share of goods imports was 2.8% in 2021, and thus around 2 percentage points lower than in the years before the annexation of Crimea. Ukraine's share of German exports and imports is less than 0.5%, respectively.

³For an overview of German firms leaving the Russian market see Tagesschau (as of May 16th 2022).

Figure 1: Share of Russia, Ukraine and Belarus in German foreign trade



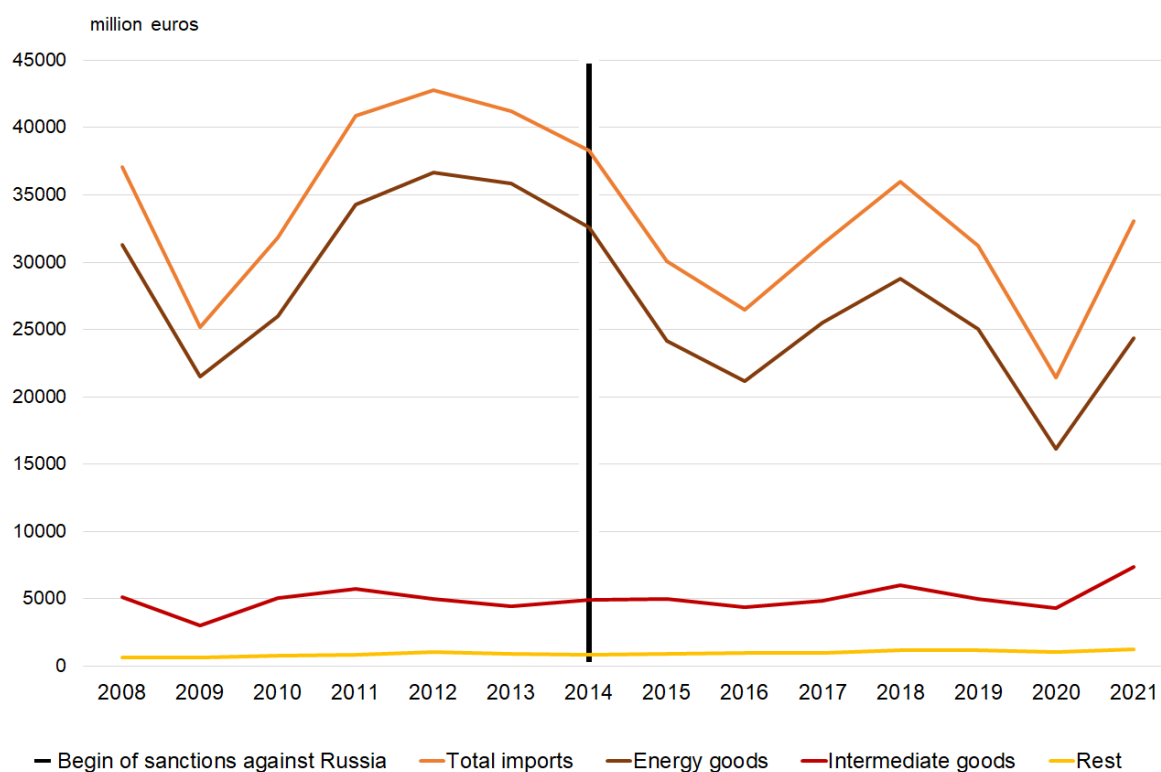
Yearly data. Share of Russia, Ukraine and Belarus in total German exports and imports, respectively.

Source: Federal Statistical Office of Germany via Refinitiv Datastream; IfW Kiel calculations. Reports of natural gas imports are currently under examination by the Federal Statistical Office of Germany. This might possibly lead to changes in Russia's share of energy imports.

Looking at these aggregate numbers, the role of two countries in German trade might appear minor at first sight. Yet, focusing on the content of trade they emerge as crucial for particular goods or commodities. Breaking down Germany's trade relationship with Russia, its dependence on energy imports stands out. Energy goods account for three quarters of imports from Russia (Figure 2), which corresponds to around a quarter of Germany's total energy imports. The remainder are predominantly imports of intermediate goods. Here, Russia is comparatively important for individual raw materials such as nonferrous metals, nickel or copper. On the export side, machinery, cars and car parts as well as chemical and pharmaceutical products are supplied to Russia; these four groups of goods account for around 60% of total German goods exports to Russia. Schrader and Laaser (2022) offer an up-to-date analysis of Russia's importance as a trading partner for Germany. Exports to Ukraine are dominated by similar products as exports to Russia, while imports are concentrated predominantly on electrical equipment, iron and steel, ores, wood and agricultural products, most

notably oil seeds.

Figure 2: German imports from Russia by type of good



Yearly data. German imports from Russia by Eurostat's *Main Industrial Groupings* product classification.

Source: Genesis-Online database, Federal Statistical Office of Germany; IfW Kiel calculations. Reports of natural gas imports are currently under examination by the Federal Statistical Office of Germany. This might possibly lead to changes in Russia's share of energy imports.

3 German trade with Russia and Ukraine – A firm-level perspective

In the following, we take a more disaggregated perspective and analyse German foreign trade with Russia and Ukraine at the firm level. For this purpose, we use a dataset on German international trade from the Foreign Trade Statistics that is provided on a monthly basis for the years 2012 to 2018, the most recent year available at the time of our analysis. The dataset contains information on trade in goods between Germany and other EU member states (intra-trade statistics) as well as non-EU countries (extra-trade statistics). It is broken down by company according to direction of trade, partner country and products traded.⁴ Data on trade with non-EU countries is collected for

⁴Please note that the dataset is still under construction and might be subject to changes in the future.

all transactions. The dataset only contains firms domiciled in Germany. Intra–EU trade is collected for firms exceeding a reporting threshold of 500 thousand for exports and 800 thousand for imports per firm and year.⁵

The dataset is merged with the Statistical Business Register (*URS*) which provides some core information on companies located in Germany, including sales, the number of employees and the main economic activity of the firm. Our final dataset covers around 87% of exports and imports in extra–EU trade and 84% of the volume of intra–EU trade for the years 2012 to 2018. The data is provided by the Federal Statistical Office of Germany; see Kruse et al. (2021) for a more detailed description of the data.

3.1 The extensive margin of trade

We start by segmenting German exports and imports at the firm level into two margins, the number of German firms trading with Russia and Ukraine (the extensive margin) and the volume of German trade with these countries (the intensive margin). Tables 1 and 2 give an overview of German exporters and importers by partner country and year.

In 2012 around 28.5 thousand firms – that is 22% of all German firms in our dataset – exported goods to Russia. 44% of these firms exported intermediate goods.⁶ By 2018 the number of exporters dropped by more than 10 thousand, especially after the imposition of sanctions by the EU against Russia and Russian countersanctions in 2014. The share of firms trading intermediate goods increased to almost 61% in the same time period – suggesting that the drop in the number of exporters to Russia was mainly driven by firms trading goods other than intermediates. The number of German firms importing from Russia is significantly lower. In 2012 around 7.4 thousand firms, or 4.8% of the firms in our dataset, imported from Russia. Interestingly, and in contrast to the export side, we see a slight increase in the number of importers on that market over time. The share of firms importing intermediate goods stayed fairly constant between 2012 and 2018 at around 48%.

Turning to German firms trading with Ukraine, only around half as many firms that trade with Russia trade with Ukraine on both the export and import side. We see a drop in the number of firms exporting to Ukraine from 15.6 thousand in 2012 to 11.3 thousand in 2015, similar to the case of Russia. However, in contrast to Russia, the number of German exporters to the Ukrainian market recovered almost fully until the end of the period under consideration. The number of firms importing from Ukraine is about a third of the number of exporting firms. It rose steadily over time, reaching a total of 5.2 thousand firms, accounting for around 3% of the firms in our dataset. Moreover, the share of intermediate goods traders is fairly high, reaching 45% in 2018.

⁵For exports, this reporting threshold applies since 2012, for imports it applies since 2016 and was 500 thousand between 2012 and 2018. The reporting thresholds are chosen such that 97% of the export volume and 93% of the import volume of Germany is covered. As goods trade is highly concentrated, this implies that many small firms active in intra–EU trade are not included in the dataset.

⁶Products are classified via the Main Industrial Groupings (MIGs) by Eurostat.

Table 1: Exporting firms by destination country and year

Year	Russia			Ukraine		
	# of firms	Share (%)	Of which inter-mediates (%)	# of firms	Share (%)	Of which inter-mediates (%)
2012	28 560	22.0	44.4	15 565	12.0	36.3
2013	27 522	20.2	45.4	15 238	11.2	36.1
2014	23 188	17.1	52.0	12 527	9.2	38.2
2015	19 137	13.9	58.4	11 345	8.2	40.8
2016	18 295	13.3	60.2	13 248	9.7	37.5
2017	18 957	13.7	59.4	15 228	11.0	35.2
2018	18 484	13.6	60.5	15 160	11.1	36.6

Share (%): percentage of firms in the dataset trading with Russia/Ukraine.

Source: AH-Core, Federal Statistical Office of Germany; IfW Kiel calculations.

Table 2: Importing firms by origin country and year

Year	Russia			Ukraine		
	# of firms	Share (%)	Of which inter-mediates (%)	# of firms	Share (%)	Of which inter-mediates (%)
2012	7 413	4.8	48.0	3 716	2.4	41.3
2013	7 309	4.4	45.3	3 803	2.3	40.0
2014	7 498	4.3	45.5	4 098	2.4	46.8
2015	7 443	4.1	46.0	4 017	2.2	46.4
2016	7 922	4.2	46.6	4 349	2.3	44.6
2017	8 152	4.3	47.0	4 829	2.5	44.8
2018	8 530	4.3	47.8	5 236	2.7	45.1

Share (%): percentage of firms in the dataset trading with Russia/Ukraine.

Source: AH-Core, Federal Statistical Office of Germany; IfW Kiel calculations.

3.2 The intensive margin of trade

We now turn to the volume of trade by firms trading with Russia and/or Ukraine.⁷ Figure 3 summarizes selected statistics on trade between German and Russian (upper part) or German and Ukrainian firms (lower part) between 2012 and 2018. It plots the average value traded per firm (column 1), the average share of trade with the respective partner country in total trade per firm (column 2), the average number of products traded with Russia or Ukraine per firm (column 3), as well as the

⁷Note the following descriptive statistics are exclusively based on firms trading with Russia and Ukraine, respectively.

average share of products traded with the respective partner country in the total product portfolio traded per firm (column 4).

Average imports per firm from Russia (top first panel) dropped significantly from 5.5 million in 2012 to 3 million in 2016 (-45%). Even though this value recovered by 2018 to almost 4 million this number represents a total loss of 30% over the whole time period considered. The average export value per firm (top second panel) is significantly smaller and does not change over time compared to the import side. Looking at the average import and export share of Russia in a firms' total imports and exports, this picture reverses. The average share of exports to Russia for a firm exporting to that country stood at 28% in 2012. This number dropped to 16.5% in 2018. At the same time the average share of imports from Russia for a firm importing from there increased from around 3% to 17% over the same time period.

Looking at the product margin of trade we see that firm-level exports to Russia are much more diversified than imports (top third panel). On average, a German firm imports about 2.5 products from Russia, and this remains fairly stable over time. By contrast, the average exporter to Russia trades 9 products in 2012, a number that increased to 12 products in 2018. The share of goods traded with Russia in a firm's total product portfolio (top fourth panel) decreased on the export-side from over 35% in 2012 to 25% in 2018, while it increased slightly on the import-side from 15% in 2012 to 18% in 2018 – a similar but less pronounced picture as observed for the average trade share of Russia in terms of value.

A more detailed view on the intensive margin of trade with Russia reveals that the distribution of the value and the number of products traded is widely dispersed. Table A.1 and A.2 in the appendix show the whole distribution of the statistics discussed above. In 2018, for example, the average imported value per firm was 3.9 million. The median, however, was only 2 thousand, while firms from the 90th percentile imported 379 thousand. This implies that the distribution is dominated by small values. Only a very small number of firms reported very high import values in 2018; the 99th percentile was 20.1 million. The same patterns can be observed for the export side and the beginning of the period considered, 2012.

In the case of German-Ukrainian trade we observe some key differences compared with German-Russian trade patterns (figure 3 bottom row). The average value traded per firm is much lower compared to Russia on both the export and import side. Yet, the relative importance of the Ukrainian market has increased at the firm level between 2012 and 2018 – especially on the import side. Average imports of German firms amounted to 314 thousand in 2012 (bottom first panel). This number increased to almost 400 thousand in 2018, however, following a significant drop between 2013 and 2015. Average exports stood at 340 thousand in 2012 – similar to the average value of imports in that year. This number has declined since, with the largest drop between 2012 and 2014. From 2017 onwards the average export value started to recover, reaching 250 thousand in 2018 – well

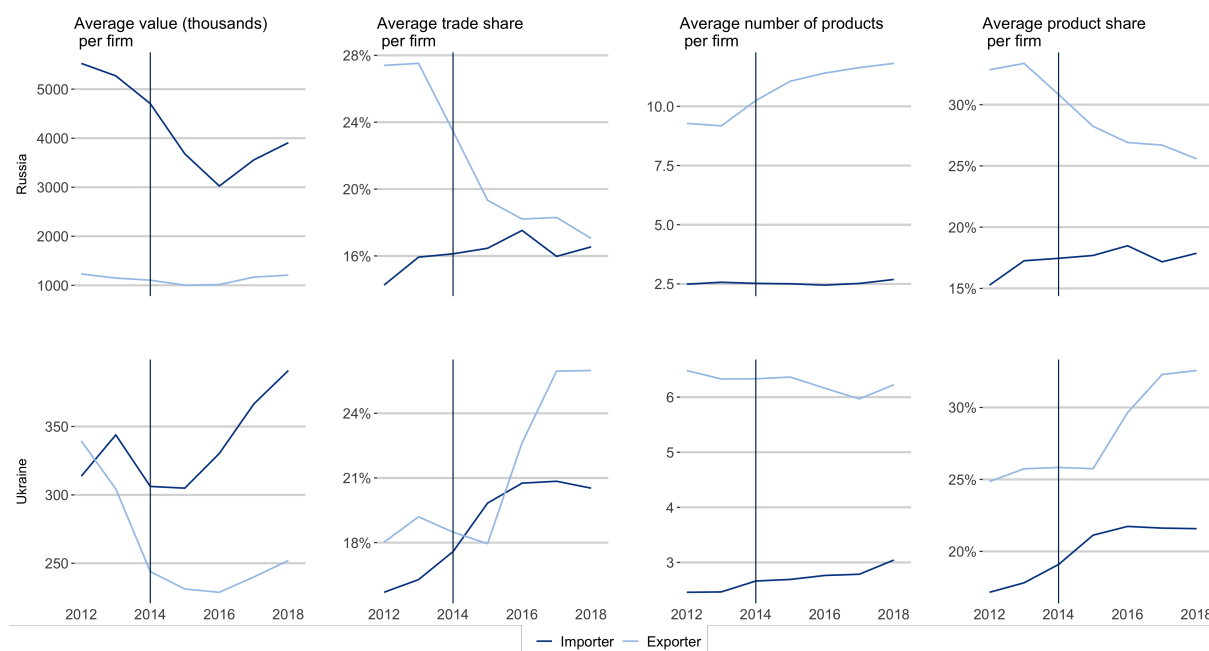
below average imports. When looking at the average importance of Ukraine as a trade partner for a German firm (bottom second panel) we see that – in contrast to German–Russian trade – both on the import side and on the export side, Ukraine as a trade partner becomes significantly more important over time. The average share of Ukraine as an export partner in total exports of a firm increased from 18% in 2012 to 26% in 2018. Similarly, the average share of imports increased from 16% to 21% between 2012 and 2018.

On the product margin, exporters to Ukraine are more diversified when it comes to the average number of products traded than importers (bottom third panel). The number of firm–level export products to Ukraine is, on average, twice as high as the number of firm–level import products (6 versus 3 products in 2018). While the average number of products has not changed much over the time period analysed, looking at the importance of Ukraine in a firm’s total export or import portfolio, we observe that the share of products traded with Ukraine increased over time. This might source from a shift in the type of firms serving the market, towards firms with a smaller total product portfolio, or incumbent firms reduced their overall product portfolio.⁸

Summing up the analysis on the extensive and intensive margin of trade by German firms with Russia and Ukraine revealed important information for further understanding the patterns in aggregate trade values observed in section 2. Both German–Russian exports and imports show a significant drop in aggregate values after 2012 (compare again figure 1). The results from the firm–level analysis suggest that the drop in exports is mainly driven by the extensive margin, i.e. the number of firms exporting to Russia. The drop in aggregate imports seems to be dominated by the intensive margin, i.e. the average value per firm imported from the country. However, we know from section 2 that imports from Russia are highly dominated by energy goods. The observed movement of import values in the aggregate and on the firm–level is therefore also driven by world market prices for these products.

⁸Tables A.1 and A.2 in the appendix show that for example the number of products exported by a firm in the highest percentiles drops between 2012 and 2018, whereas high product shares can not only be found in the highest percentile anymore but also more generally across the upper percentiles.

Figure 3: Descriptive statistics by country and direction of trade



Yearly data; Average value in thousand EUR; Average trade share: Average share of Russia/Ukraine in firms' total trade value; Average product share: Average share of products traded with Russia/Ukraine in firms' total product portfolio.

Source: AH-Core, Federal Statistical Office of Germany; IfW Kiel calculations.

3.3 Exposure vis-à-vis Russia and Ukraine at the firm level

In order to further analyse the importance of Russia and Ukraine for German companies and thus their exposure to the war in Ukraine, we divide the companies into five categories. The categorisation is based on the share of the respective country in a company's total exports or imports. This observation can provide initial insights into how strongly German companies are economically exposed to the countries at war. Companies that generate only a small part of their total export turnover in Russia or Ukraine are less affected by the war as they are less exposed vis-à-vis these countries. They are also more likely to be able to sell the products destined for these markets somewhere else or source from other countries ("diversion effects"). For companies that are highly specialised in the Russian or Ukrainian market – either on the export or import side –, however, the war and corresponding sanctioning policies might constitute a threat to their existence.

The categories are as follows:

- Category 1: The share of Russia/Ukraine in total exports/imports of a firm is < 10%; similarly:
- Category 2: 10 – 25%;
- Category 3: 26 – 50%;
- Category 4: 51 – 75%;
- Category 5: 76 – 100%

Descriptive statistics on the value of total exports and imports generated by firms in each category, the number of firms by category, as well as the average trade value, sales and number of employees per firm and category are displayed in Figures 4 and 5. In addition, Figure 6 shows the number of firms by category according to their main economic activity.⁹

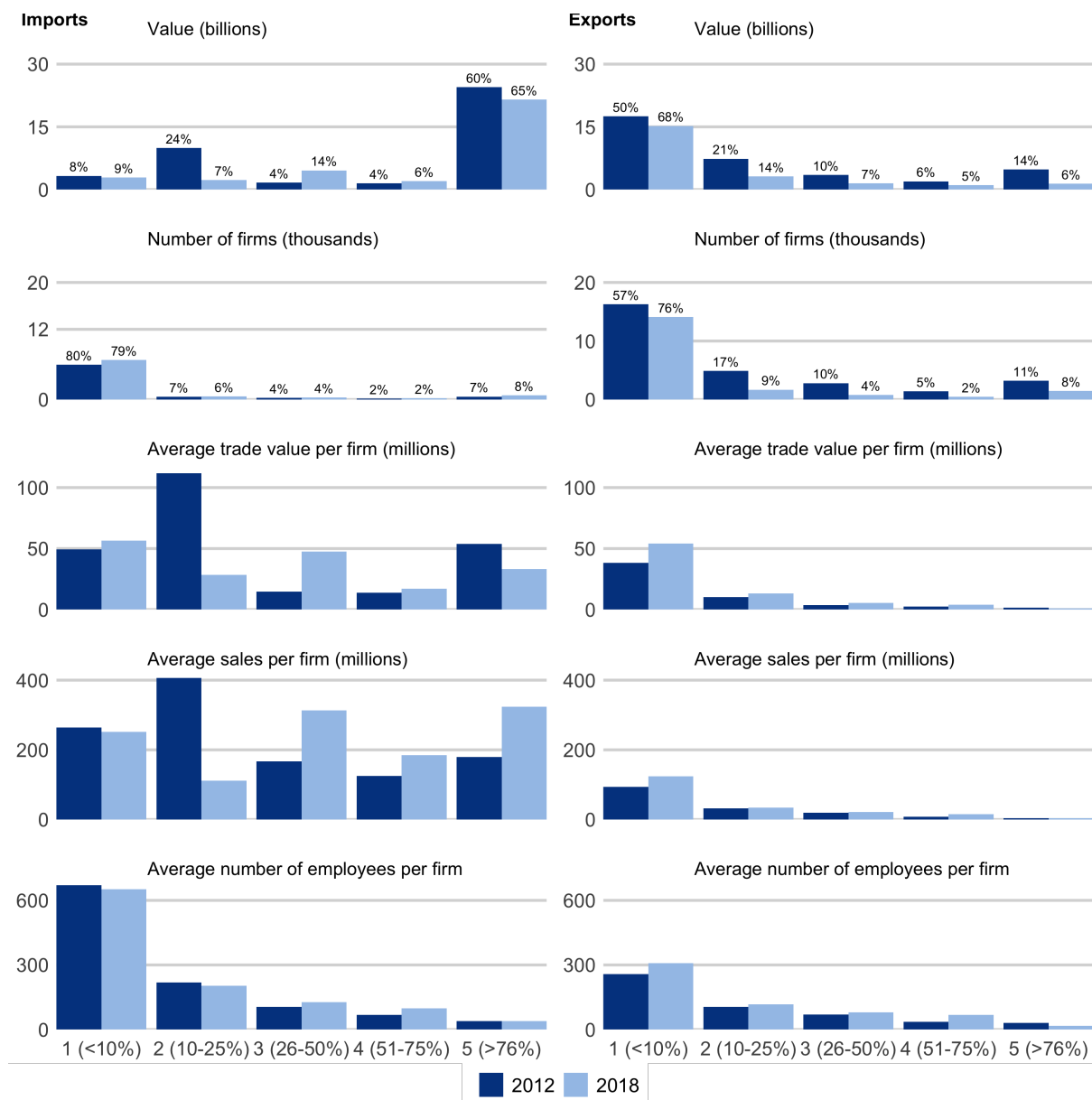
In a nutshell, the majority of exports to Russia is generated by companies with a low exposure vis-à-vis Russia and overall exposure has even decreased over time. Those firms that are highly exposed tend to be small. This is shown in Figure 4 (right panel). In 2012, 50% of the total value of exports to Russia was generated by firms selling less than 10% of their total exports to Russia (category 1 firms, right upper panel). By 2018, this number increased to 68%, while at the same time the absolute value of goods exported to Russia decreased. On the other hand, the share of total exports generated by companies highly specialised in the Russian market (category 5 firms) decreased from 14 to 6%. Similarly, the number of firms with an exposure of more than 10% (categories 2–5) dropped from around 12 thousand to 4.4 thousand. Accordingly, the share of firms trading with Russia but selling less than 10% of their exports there increased from 57% to 76% between 2012 and 2018 (right upper–middle panel). The importance of the Russian market has thus decreased and a higher share of total exports to Russia in 2018 was generated by firms with low exposure. Average firm size, as approximated by total exports, total sales and employees per company decreases with exposure (middle, lower–middle and lower right panel). Thus, firms highly specialised in Russia tend to be small with average sales of 3.6 million and 17.7 employees in 2018. When looking at the sector distribution of firms by exposure, we find that exporting firms in category 1 are predominantly in manufacturing, followed by wholesale and retail trade, and services. Highly exposed firms (category 5) are mostly active in wholesale and retail trade. (Figure 6).

In contrast to the export-side, a few companies that are highly specialised in the Russian market are responsible for the bulk of imports from Russia. In 2012, 60% of the total import value from Russia was generated by 507 firms that sourced more than 75% of their imported goods from Russia (left upper panel). This corresponds to only 7% of the companies trading with Russia (left upper–middle panel). While the absolute value of imports was lower in 2018, it was even more concentrated on firms with high exposure vis-à-vis Russia. The large majority of firms importing from Russia – 80% –, sourced less than 10% of their imports from there. Most firms in this category are active in manufacturing, followed by wholesale and retail trade and the services sector. The high concentration of imports on few firms with high exposure is a result of the concentration of German imports from Russia on energy goods, most notably oil and gas. This fact is also likely to explain the firm size distribution on the import-side. While there is no clear pattern regarding average total sales by exposure category (lower middle panel), the average number of employees per firm decreases with the degree of specialisation on the Russian market. Most firms whose imports are highly concentrated

⁹ Unfortunately, we can only use a very aggregated industry classification in our analysis due to statistical confidentiality restrictions.

on Russia are active in wholesale and retail trade. Unfortunately, it is not possible to directly identify energy firms from our analysis.

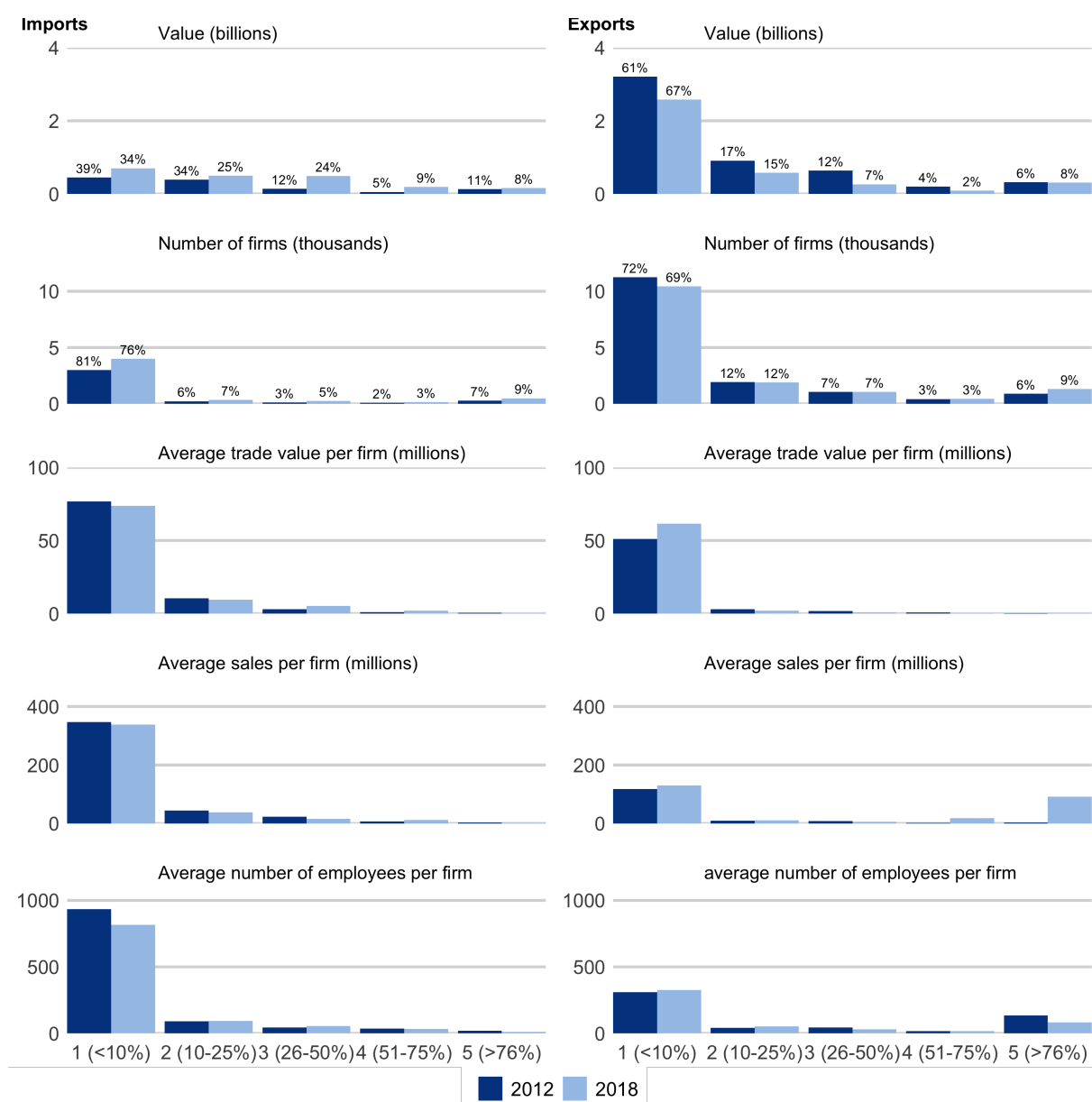
Figure 4: Descriptive statistics by exposure category and direction of trade: Russia



Data for 2012 and 2018; Statistics by exposure category; Exposure categories are based on the share of Russia in a firm's total export/import value.

Source: AH-Core, URS, Federal Statistical Office of Germany; IfW Kiel calculations.

Figure 5: Descriptive statistics by exposure category and direction of trade: Ukraine



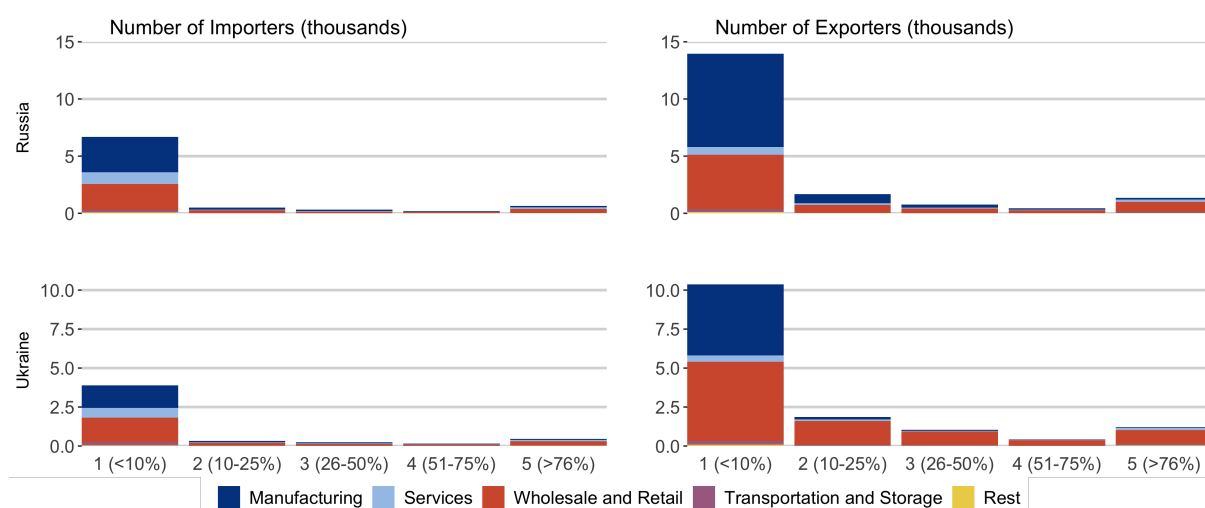
Data for 2012 and 2018; Statistics by exposure category; Exposure categories are based on the share of Ukraine in a firm's total export/import value; Due to confidentiality reasons, the values for average sales per firm (millions) in category 1 and 5 are substituted by their respective values in 2017.

Source: AH-Core, URS, Federal Statistical Office of Germany; IfW Kiel calculations.

When it comes to trade with Ukraine, only very few and small firms are highly exposed to the country. As Figure 5 shows, this is true for both exports and imports. On the export side, roughly 70% of the companies trading with Ukraine sell less than 10% of their exports there, generating around two-thirds of the total value of German exports (right upper and upper middle panel). Most of the firms exporting to Ukraine are classified as firms in the wholesale and retail trade sector, followed by

manufacturing (Figure 6). The large majority of manufacturing firms have a low exposure vis-à-vis Ukraine; firms with a higher exposure (category 2 to 5) are mostly active in wholesale and retail trade. On the import side, the share of low-exposure firms is even higher than on the export side, while the value of imports is more evenly distributed across exposure categories 1 to 3 (left upper and upper middle panel). Most firms importing from Ukraine are also active in wholesale and retail trade as well as in the manufacturing sector. There are no notable differences between 2012 and 2018.

Figure 6: Number of firms by main economic activity and exposure category for Russia (top) and Ukraine (bottom) and imports (left) versus exports (right) in 2018



Data for 2018; German trade with Russia/Ukraine by main economic activity and exposure category; Exposure categories are based on the share of Ukraine in a firms total export/import value.

Source: AH-Core, URS, Federal Statistical Office of Germany; IfW Kiel calculations.

4 German trade with Russia and Ukraine – A firm–product–level perspective

So far we have investigated the vulnerability of German firms trading with Russia and Ukraine on the firm–country level. Now we take a closer look at the vulnerability with respect to specific products traded with these countries. Tables 3 to 4 summarize the top 10 product categories in German–Russian and German–Ukrainian imports for 2018, tables 5 to 6 do the same for the export side.¹⁰ The ranking follows the share of exports (imports) to (from) the respective country in total exports (imports) – ranked in descending order. Cells containing “ – ” had to be suppressed due to a confidentiality clause. The table reports the share of trade in the respective product category with Russia/Ukraine in total German trade of the respective product category (column 4), the corresponding trade value (column 5), the overall number of countries, German firms trade the respective product with (column 6), the total number of German firms trading the respective product anywhere (column 7), the total number of German firms trading the respective product with Ukraine/Russia (column 8) and the average number of partner countries a firm trades the respective product with.

In line with the decomposition of German–Russian imports from figure 1 in section 2 we observe that Russia is an important supplier for mineral fuels, mineral oils and products thereof. Almost 32% of all German imports in that product category came from Russia in 2018. In total, 5 689 German firms imported products from that product category, sourcing from 86 different countries. Thereof, 384 firms imported from Russia and these firms had on average 6.2 different countries from which they sourced products from this category. Looking further down the ranking we see similar patterns suggesting that firms importing from Russia have a number of potential suppliers that might substitute trade with Russia. Yet, some product groups show stronger dependencies at the firm level than others: For example, firms trading products from product group “Lead and articles thereof” (rank 8) have, on average, only 3.3 different supplying countries. The total number of potential partner countries (column 6) is 57, which is substantially smaller compared to other product groups. At the same time, Russia is only supplying 4.2% of total imports of lead.¹¹

The list of product groups German firms mainly import from Ukraine looks significantly different and concentrates on agricultural goods and food products. The most important product group with respect to its import share in overall German imports – “Oil seeds and oleaginous fruits” – holds a share of 9%. Rank number 3 – “Cereals” – holds a share of merely 3%. The overall diversification for the upper 5 product categories is quite high (> 5 alternative supplier countries, column 9).

Overall, the import side in terms of both Russia and Ukraine holds few, if any surprises, but highlights

¹⁰Products are categorized according to their Harmonized System (HS) Code.

¹¹The numbers we show should nevertheless be treated with caution, since we have to aggregate from 8 digit product codes to 2 digit product codes for reasons of confidentiality. Aggregate and firm–level vulnerabilities for specific products can be much more pronounced than suggested by this analysis.

the expected role of natural resources and agricultural products. The export side, as shown in Tables 5 and 6, is quite different. The absence of any of Germany's traditionally strong export industries is striking. Instead, export product groups with the highest share in Russia are also agricultural products and some natural resources, while exports to Ukraine – beside such agricultural products, also include fabrics and fibres.

Table 3: List of products with the highest share of Russia in total imports in 2018

Rank	HS-2 code	Description HS-2 code	Trade share (in %)	Value (in m.)	No. of supplier countries	No. of firms	No. of firms imp. from RUS	Mean no. of countries per firm
1.	27	Mineral fuels, mineral oils and products..	32.2	27 400	86	5 689	384	6.2
2.	75	Nickel and articles thereof	25.7	373	62	2 114	135	5.0
3.	74	Copper and articles thereof	14.8	1 312	114	11 535	119	9.8
4.	81	Metals; n.e.c., cermets and articles the..	8.4	135	80	4 184	132	6.4
5.	28	Inorganic chemicals; organic and inorgan..	6.4	362	104	6 767	400	8.1
6.	76	Aluminium and articles thereof	5.9	739	110	22 535	327	9.3
7.	44	Wood and articles of wood; wood charcoal	4.9	322	128	16 487	492	5.7
8.	78	Lead and articles thereof	4.2	16	57	615	19	3.3
9.	71	Natural, cultured pearls; precious, semi..	4.0	606	175	10 817	104	11.9
10.	31	Fertilizers	3.5	26	54	1 091	50	4.1

Trade share: Share of Russia in firms' total import volume; Value in million EUR; No. of supplier countries: Overall number of countries supplying products from that product category; No. of firms: Overall number of German firms importing products from that product category; No. of firms imp. from RUS: Number of German firms importing products from that product category *from Russia*; Mean no. of countries per firm: Average number of firms' supplier countries for products from that product category.

Source: AH-Core, Federal Statistical Office of Germany; IfW Kiel calculations.

Table 4: List of products with the highest share of Ukraine in total imports in 2018

Rank	HS-2 code	Description HS-2 code	Trade share (in %)	Value (in m.)	No. of supplier countries	No. of firms	No. of firms imp. from UKR	Mean no. of countries per firm
1.	12	Oil seeds and oleaginous fruits; miscell..	8.9	333	138	3 419	174	9.7
2.	-	-	-	-	-	-	-	-
3.	10	Cereals	3.0	61	83	1 855	130	5.5
4.	26	Ores, slag and ash	2.5	181	100	746	76	11.7
5.	-	-	-	-	-	-	-	-
6.	44	Wood and articles of wood; wood charcoal	1.9	124	128	16 487	679	3.8
7.	15	Animal or vegetable fats and oils and th..	1.6	46	109	3 748	85	7.7
8.	78	Lead and articles thereof	-	-	57	615	5	4.8
9.	62	Apparel and clothing accessories; not kn..	0.8	107	165	14 873	298	17.5
10.	81	Metals; n.e.c., cermets and articles the..	0.6	9.8	80	4 184	18	8.4

Trade share: Share of Ukraine in firms' total import volume. Value in million EUR. No. of supplier countries: Overall number of countries supplying products from that product category. No. of firms: Overall number of German firms importing products from that product category. No. of firms imp. from UKR: Number of German firms importing products from that product category *from Ukraine*. Mean no. of countries per firm: Average number of firms' supplier countries for products from that product category.

Source: AH-Core, Federal Statistical Office of Germany; IfW Kiel calculations.

Table 5: List of products with the highest share of Russia in total exports in 2018

Rank	HS-2 code	Description HS-2 code	Trade share (in %)	Value (in m.)	No. of destination countries	No. of firms	No. of firms exp. to RUS	Mean no. of countries per firm
1.	-	-	-	-	-	-	-	-
2.	43	Furskins and artificial fur; manufacture..	8.1	5.4	103	599	87	12.8
3.	-	-	-	-	-	-	-	-
4.	12	Oil seeds and oleaginous fruits; miscell..	7.1	94	147	2209	74	26.1
5.	98	-	6.8	97	73	120	16	5.6
6.	1	Animals; live	4.3	43	109	891	20	10.4
7.	35	Albuminoidal substances; modified starch..	4.1	113	179	6929	499	20.9
8.	26	Ores, slag and ash	3.8	16	70	399	15	5.7
9.	33	Essential oils and resinoids; perfumery,..	3.7	227	192	5417	464	19.9
10.	21	Miscellaneous edible preparations	3.4	148	189	3571	257	20.5

Trade share: Share of Russia in firms' total export volume; Value in million EUR; No. of partner countries: Overall number of countries buying products from that product category; No. of firms: Overall number of German firms exporting products from that product category; No. of firms exp. to RUS: Number of German firms exporting products from that product category to Russia; Mean no. of countries per firm: Average number of firms' partner countries for products from that product category.

Source: AH-Core, Federal Statistical Office of Germany; IfW Kiel calculations.

Table 6: List of products with the highest share of Ukraine in total exports in 2018

Rank	HS-2 code	Description HS-2 code	Trade share (in %)	Value (in m.)	No. of destination countries	No. of firms	No. of firms exp. to UKR	Mean no. of countries per firm
1.	-	-	-	-	-	-	-	-
2.	-	-	-	-	-	-	-	-
3.	-	-	-	-	-	-	-	-
4.	12	Oil seeds and oleaginous fruits; miscell..	2.5	33	147	2209	57	28.0
5.	-	-	-	-	-	-	-	-
6.	58	Fabrics; special woven fabrics, tufted t..	-	-	134	3661	167	15.4
7.	53	Vegetable textile fibres; paper yarn and..	1.7	0.6	93	860	34	13.1
8.	55	Man-made staple fibres	1.4	23	126	1968	115	15.1
9.	1	Animals; live	1.4	14	109	891	14	7.3
10.	13	Lac; gums, resins and other vegetable sa..	-	-	154	900	37	27.3

Trade share: Share of Ukraine in firms' total export volume. Value in million EUR. No. of partner countries: Overall number of countries buying products from that product category. No. of firms: Overall number of German firms exporting products from that product category. No. of firms exp. to UKR: Number of German firms exporting products from that product category to Ukraine. Mean no. of countries per firm: Average number of firms' partner countries for products from that product category.

Source: AH-Core, Federal Statistical Office of Germany; IfW Kiel calculations.

5 Conclusion

A number of interesting insights emerge from the analysis of firm level data on firms' trade engagement with Russia and Ukraine:

The number of firms exporting to Russia stands at around 18 thousand in 2018, having declined substantially since 2012 and particularly since 2014, the starting point of EU sanctions against Russia. These firm make up only around 14 % of total exporters in our dataset that includes firms responsible for the large part of German foreign trade. At the same time, the average export share (share of

exports to Russia in total exports by a firm) has also declined substantially from about 28 to 16 %. By contrast, the number of importers, as well as the average import share, has remained fairly stable over the same period.

We also find that the majority of exports to Russia is accounted for by a large number of companies with relatively little exposure to Russia – in other words, German firms are not very dependent on Russia as an export market. Firms highly specialised in Russia as an export market tend to be small. By contrast, only a few companies that are highly dependent on the Russian market are responsible for the bulk of imports from Russia, which are dominated by energy goods and other raw materials.

The number of firms trading with Ukraine is – not unexpectedly – substantially smaller than that for Russia. While the number of firms exporting to Ukraine has declined from 2012 to 2015, similarly to the case of Russia, it recovered fully by 2018 in the case of Ukraine whereas the downward trend for Russia continued. Similar patterns can be observed for the average export value to Ukraine compared to Russia. On the import side both the number of German importers as well as the average trade share increased between 2012 and 2018. In other words, trade with Ukraine has become more important for German firms, at the same time that the relative importance of Russia in firm exports has declined and has remained stable on the import side. We also find that only very few and small firms are highly exposed to trade with Ukraine, be it on the import or the export side.

On the product margin our results suggest – unsurprisingly – that imports of natural resources and agriculture / food products dominate for Russia respectively Ukraine. While on the import side firms are less diversified regarding supplier countries other than Russia, the number of alternative destinations for German exporters trading with Russia is significantly higher. This is not surprising as the product portfolio of German firms importing from Russia is dominated by energy goods and natural resources where naturally fewer alternative suppliers exist.

When interpreting our analysis one has to keep in mind an important point. We are only able to show exporters and importers that trade directly with either Russia or Ukraine. However, an important share of goods imports are intermediate inputs – energy imports or natural resources from Russia are a prime example. This implies that any disruptions in this relationship will – sooner or later – make their way down the value chain, affecting the importers' production, or other firms that are linked to these firms through value chains. Only analysing the direct exposure of German firms vis-à-vis Russia and Ukraine is thus underestimating economic vulnerabilities caused by the war in Ukraine.

6 Appendix

Table A.1: Descriptive statistics by country – 2012

Country	Variable	Imports						Exports					
		Sum	Mean	P25	Median	P90	P99	Sum	Mean	P25	Median	P90	P99
Russia	Value	40.90 bn.	5 525.3	0.2	1.9	442.9	25 688.0	35.20 bn.	1 232.2	12.9	52.9	1 369.4	18 209.8
	No. of products		2.5	1.0	1.0	4.0	21.0		9.3	1.0	2.0	18.0	127.0
	Trade share		0.14	0.0	0.0	0.7	1.0		0.27	0.02	0.09	1.0	1.0
	Product share		0.15	0.02	0.04	0.50	1.0		0.33	0.12	0.25	1.0	1.0
Ukraine	Value	1.17 bn.	313.7	0.1	3.3	318.2	5 697.8	5.28 bn.	339.4	7.3	23.2	413.4	5 495.3
	No. of products		2.46	1.0	1.0	5.0	25.0		6.5	1.0	2.0	12.0	88.0
	Trade share		0.16	0.0	0.0	0.94	1.0		0.18	0.01	0.03	0.68	1.0
	Product share		0.17	0.01	0.04	0.67	1.0		0.25	0.08	0.17	0.5	1.0

P25, –90, –99: percentiles; Value: in 1 000 unless otherwise specified; Trade share: Percentage share of the respective country in total exports/imports of a firm; Product share: Percentage share of products traded with the respective country in the total number of products traded by a firm (by direction of trade); Percentile statistics reported as “0” due to rounding.

Source: AH-Core, Federal Statistical Office of Germany; IfW Kiel calculations.

Table A.2: Descriptive statistics by country – 2018

Country	Variable	Imports						Exports					
		Sum	Mean	P25	Median	P90	P99	Sum	Mean	P25	Median	P90	P99
Russia	Value	33.30 bn.	3 908.0	0.2	1.9	379.4	20 125.9	22.3 bn.	1 206.5	8.7	48.6	1 324.2	18 309.2
	No. of products		2.7	1.0	1.0	5.0	22.0		11.8	1.0	2.0	25.0	167.0
	Trade share		0.17	0.0	0.0	0.92	1.0		0.17	0.0	0.02	0.82	1.0
	Product share		0.18	0.02	0.05	0.60	1.0		0.26	0.07	0.17	0.67	1.0
Ukraine	Value	2.04 bn.	390.9	0.2	4.3	300.1	6 288.2	3.82 bn.	252.0	7.1	19.4	287.1	3 929.6
	No. of products		3.1	1.0	1.0	6.0	28.0		6.2	1.0	2.0	12.0	81.0
	Trade share		0.2	0.0	0.01	1.0	1.0		0.26	0.0	0.04	1.0	1.0
	Product share		0.2	0.01	0.05	1.0	1.0		0.3	0.1	0.2	1.0	1.0

P25, –90, –99: percentiles; Value: in 1 000 unless otherwise specified; Trade share: Percentage share of the respective country in total exports/imports of a firm; Product share: Percentage share of products traded with the respective country in the total number of products traded by a firm (by direction of trade); Percentile statistics reported as “0” due to rounding.

Source: AH-Core, Federal Statistical Office of Germany; IfW Kiel calculations.

REFERENCES

European Council (2022). EU sanctions against Russia explained.

Kruse, H., Meyerhoff, A., and Erbe, A. (2021). Neue Methoden zur Mikrodatenverknüpfung von Außenhandels- und Unternehmensstatistiken. *WISTA-Wirtschaft und Statistik*, 73(5):53–63.

Schrader, K. and Laaser, C. (2022). Deutschlands Russlandhandel und der Krieg in der Ukraine: Was steht zur Disposition? *Kiel Policy Brief*, 163(März 2022).

IMPRESSUM

Publisher:

Kiel Institute for the World Economy – Leibniz
Center for Research on Global Economic
Challenges
Kiellinie 66, 24105 Kiel, Germany
Phone +49 (431) 8814-1
Email info@ifw-kiel.de

The Kiel Institute for the World Economy – Leibniz
Center for Research on Global Economic
Challenges is an independent foundation under
the public law of the German federal state of
Schleswig-Holstein

Value Added Tax Id.-Number:

DE 251899169

Board of Directors:

Prof. Holger Görg, Ph.D., President, and
Prof. Dr. Stefan Kooths, Vice President: Executive
Scientific Directors (interim)
Birgit Austen-Bosy: Executive Administrative
Director

Cover Photo:

© European Union

Responsible Supervisory Authority:

Ministry of Education, Science and Cultural
Affairs of the Land Schleswig-Holstein



© 2022 Kiel Institute for the World Economy.
All rights reserved.

<https://www.ifw-kiel.de/de/publikationen/kiel-policy-briefs/>