March 23, 2022

CSH–Harvard Growth Lab Policy Brief

The Economic Geography of the war in Ukraine:

Twelve Facts about the Relation Between the Economies of Ukraine, Russia, and the EU

The war in Ukraine has been waging for a month now, not only causing human suffering on a massive scale, but also sending economic tremors that are felt far beyond the country's borders. Since the collapse of the Soviet Union, Ukraine's economy has been pulled between its strong historical ties with the Russian economy and the opportunities in forging new ties with the European Union (EU). With the help of Metroverse [1], an online tool for analyzing the local economies of over a thousand cities worldwide, and of the data that power this tool, we analyze the evolving economic relations between Ukraine, Russia, and the West and weigh the consequences of their disruption.

Link to interactive website: https://vis.csh.ac.at/12-facts-ukraine-rus-eu/

Part 1. The Ukrainian economy's slow but steady move West

The war in Ukraine is often depicted as a war over whether the country's future is, metaphorically speaking, in the West or in the East. A closer look at the shifting economic geography of Ukraine shows that this can perhaps be taken much more literally. Moreover, the westward reorientation of the Ukrainian economy may have had profound and unintended consequences for the economic geography of Ukraine, shifting opportunity from the East to the West, away from the areas with large Russian minorities toward the areas closer to the center of Europe.

Fact 1: A tectonic shift in trade

In a working paper in 2020, with Ernesto Lopez Cordova from the World Bank and a team of researchers at the Growth Lab at Harvard University, we studied the evolution of the Ukrainian economy and its integration into western European value chains [2]. Here, we noted how drastically Ukraine's trade relation with Russia had changed after the Euromaidan protests and the subsequent annexation of Crimea in 2014.

In 2012, Ukraine sent about 25% of its exports to both Russia and the European Union. However, in 2014, the exports to Russia collapsed to about a third of their 2012 levels. Nowadays, just 7% of Ukrainian exports go to Russia. In contrast, the EU nowadays imports over 40% of all Ukrainian exports.

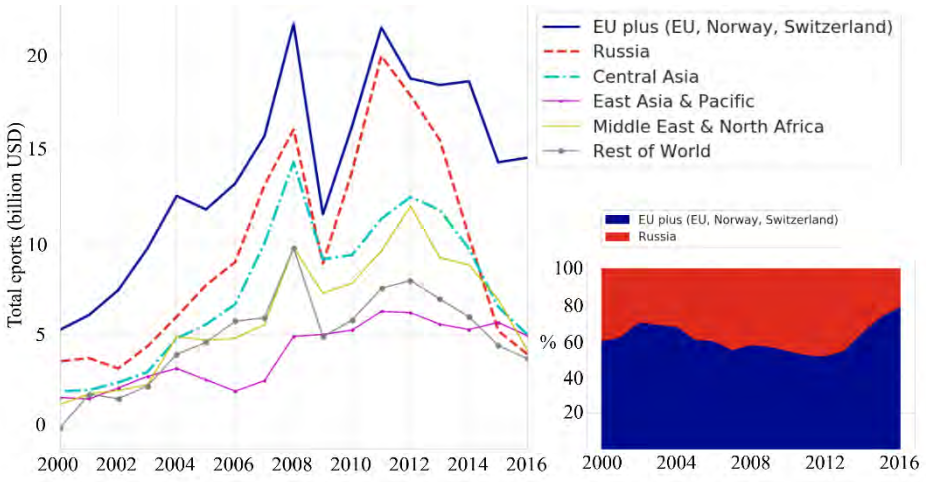
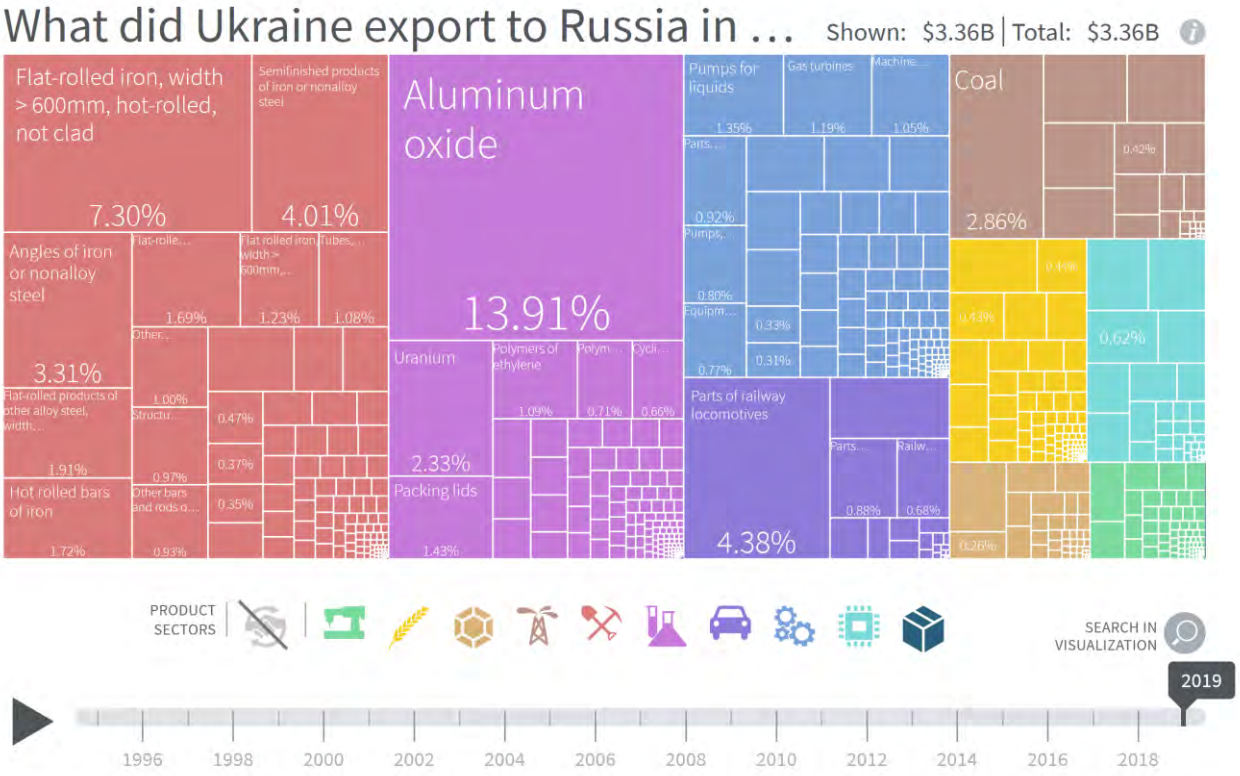


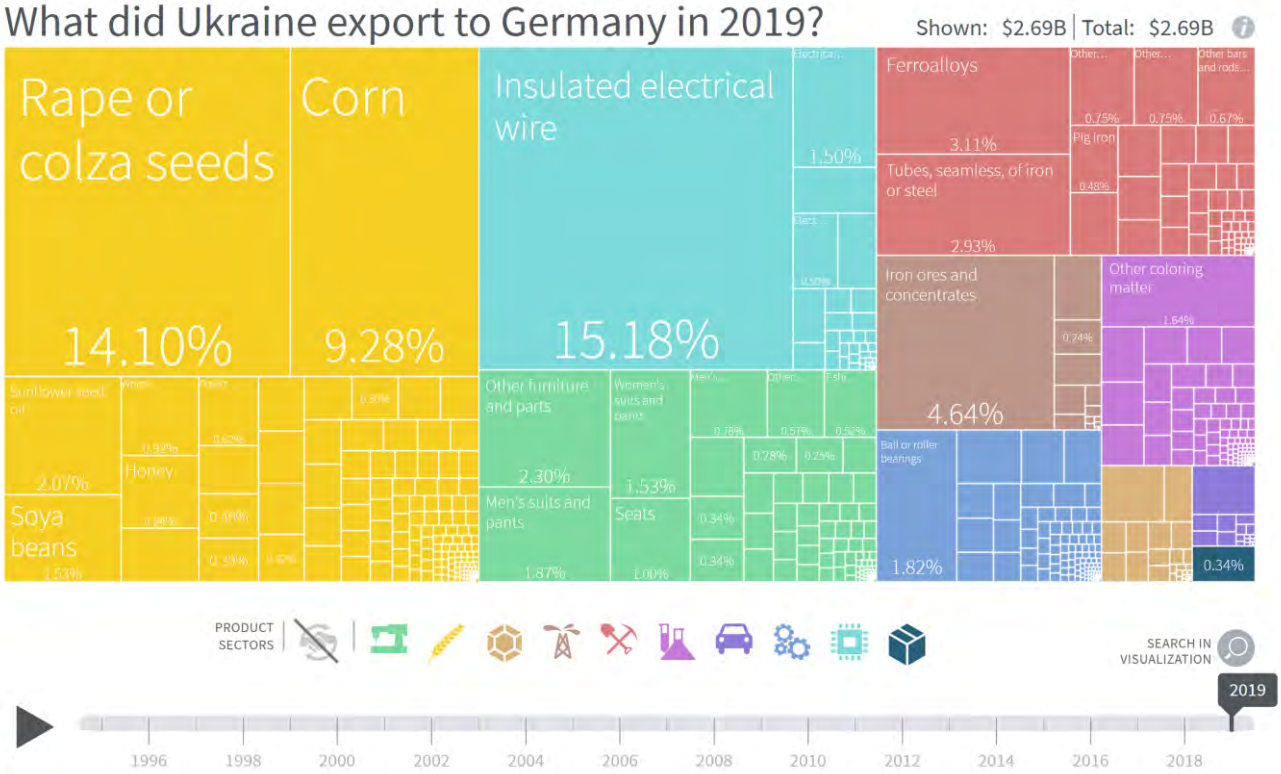
Fig. 1: Change of Ukraine's trade relation with Russia. *Source: M. Hartog, F. Neffke, J.E. Lopez-Cordova, Assessing Ukraine's Role in European Value Chains: A Gravity Equation-cum-Economic Complexity Analysis Approach (No. 129a), Center for International Development at Harvard University, 2020 [2]*

Fact 2: The collapse in Russian trade hit Ukraine's most complex exports

Quantities do not tell the entire story about the shifts in trade that Ukraine experienced in the aftermath of the Euromaidan protests. Historically, Ukraine has exported its most complex products, like cars, trains, aircrafts, and electronics to Russia. Europe, in contrast, mainly imported agricultural goods and basic manufactured products. The shift from Russia to the EU, therefore, also hit Ukrainian exports' complexity. Turning towards Asia is unlikely to be of much help: most of Ukraine's exports to China, its largest trade partner in Asia, are of very low complexity.

The following figures 2a–c show Ukraine's exports to Russia, Germany, and China, respectively, as of 2019. Using the Atlas of Economic Complexity, users can move back in time until 1995 [3,4,5].


What did Ukraine export to Russia in ...
Shown: $3.36B | Total: $3.36B
Flat-rolled iron, width > 600mm, hot-rolled, not clad
7.30%
Semifinished products of iron or nonalloy steel
4.01%
Aluminum oxide
13.91%
Pumps for liquids
1.35%
Gas turbines
1.19%
Machine...
1.05%
Coal
2.86%
Angles of iron or nonalloy steel
3.31%
Flat-rolle...
1.69%
Flat rolled iron, width > 600mm,...
1.23%
Tubes,...
1.08%
Other...
1.00%
Structu...
0.97%
Other bars and rods o...
0.93%
Hot rolled bars of iron
1.72%
Flat-rolled products of other alloy steel, width...
1.91%
0.47%
0.37%
0.35%
Uranium
2.33%
Packing lids
1.43%
Polymers of ethylene
1.09%
Polym...
0.71%
Cycli...
0.66%
Pumps,...
0.80%
Equipm...
0.77%
0.33%
0.31%
Parts of railway locomotives
4.38%
Parts...
0.88%
Railw...
0.68%
0.42%
0.43%
0.62%
0.26%
PRODUCT SECTORS
SEARCH IN VISUALIZATION
2019
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018


What did Ukraine export to Germany in 2019?
Shown: $2.69B | Total: $2.69B
Rape or colza seeds
14.10%
Corn
9.28%
Insulated electrical wire
15.18%
Electrical...
1.50%
Ferroalloys
3.11%
Other...
0.75%
Other...
0.75%
Other bars and rods...
0.67%
Pig iron
0.48%
Tubes, seamless, of iron or steel
2.93%
Iron ores and concentrates
4.64%
0.24%
Other coloring matter
1.64%
Sunflower seed oil
2.07%
Honey
0.88%
Soya beans
1.53%
Other furniture and parts
2.30%
Men's suits and pants
1.87%
Women's suits and pants
1.53%
Seats
1.00%
0.78%
0.57%
0.52%
0.28%
0.25%
0.34%
0.34%
Ball or roller bearings
1.82%
0.34%
PRODUCT SECTORS
SEARCH IN VISUALIZATION
2019
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018

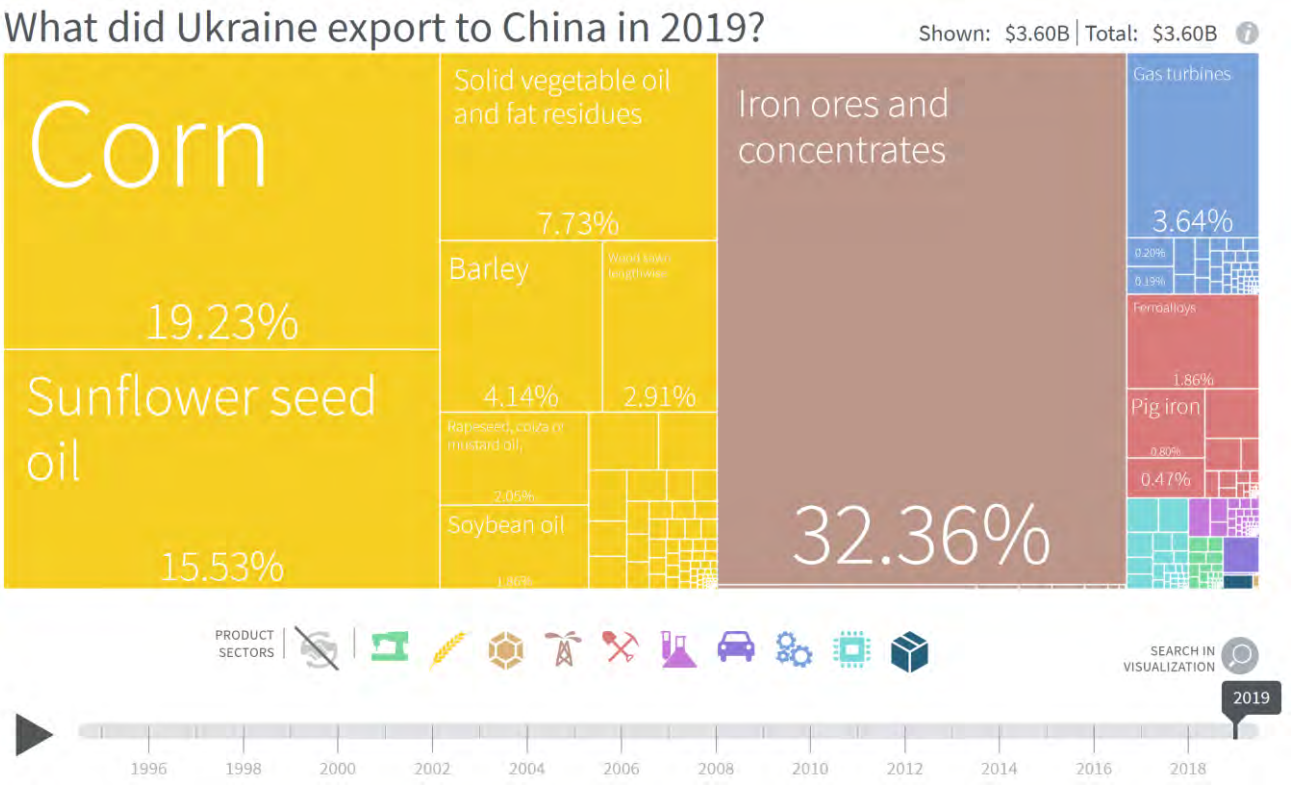


Fig. 2a–c: Ukraine's exports to Russia, Germany, and China in 2019. *Source: Atlas of Economic Complexity [3,4,5].*

Fact 3: Ukraine has started entering European supply chains

In recent years, some interesting shifts have been taking place in Ukraine's exports to the EU. In particular, exports that are likely a part of the supply chain serving European manufacturing hubs in, for instance, Germany, such as electronics have steadily expanded.

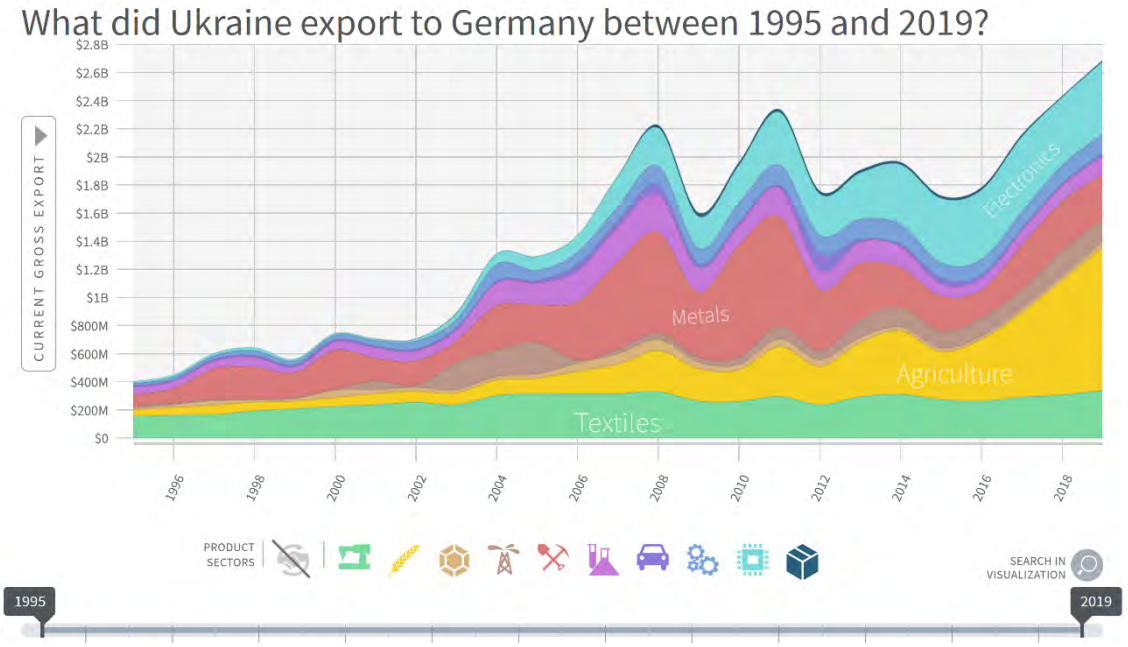


Fig 3: Ukrainian exports to Germany from 1995–2019. *Source: Atlas of Economic Complexity, Harvard Growth Lab [6]*

Fact 4: The shifts in trade towards the EU are mirrored by a shift in foreign direct investments by major European manufacturing countries

The emerging supply chain linkages to Europe are also visible in investments. German companies started investing in manufacturing capacity in Ukraine, integrating the Ukrainian economy into German supply chains. Nowadays, Germany is a major investor in Ukraine, with German companies employing over 10,000 people in Ukraine according to data provided by Dun and Bradstreet, a business analytics company.

But Germany is not the only European investor in Ukraine. On the contrary, as exports shifted towards the EU, so did incoming Foreign Direct Investments (FDI).

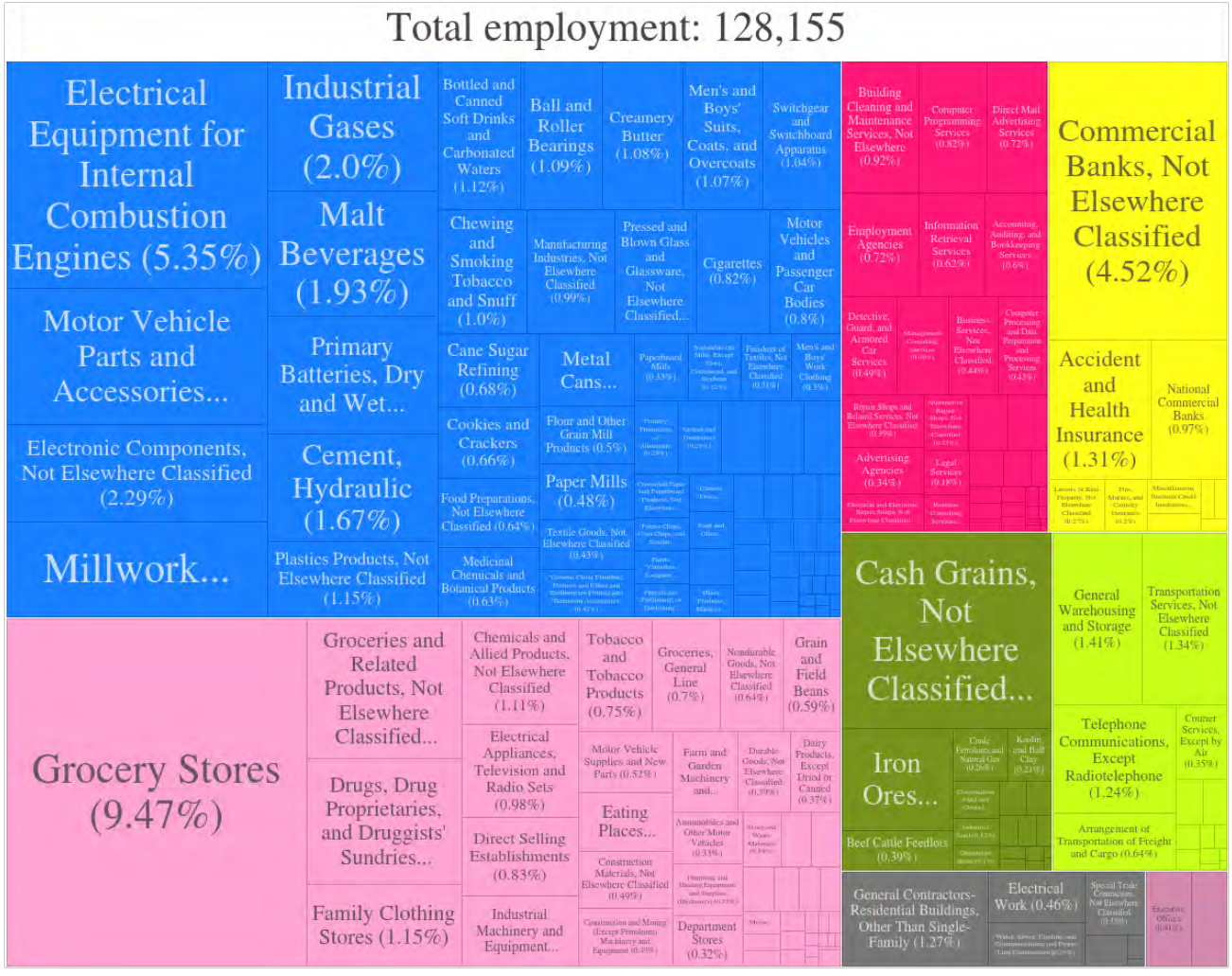


Fig. 4: Employment of German companies in the Ukraine. *Source: Hartog, M., Neffke, F. and Lopez-Cordova, J.E., 2020. Assessing Ukraine's Role in European Value Chains: A Gravity Equation-cum-Economic Complexity Analysis Approach (No. 129a). Center for International Development at Harvard University [2]*

Fact 5. The westward reorientation of Ukraine is reflected in its economic of geography

The east and then westward pulls are so strong that they lead to observable shifts in the economic center of gravity of Ukraine. In the late 1990s and early 2000s, this center of gravity moved towards the Southeast. However it came to a hold with the Orange Revolution of 2004 when Ukraine took a sharp turn to the West politically. At the same time, the country's economic center of gravity reversed direction, moving Northwest, closer to the European Union's center of gravity.

Moreover, there is a striking distance between the centers of gravity of establishments owned by EU firms and by Russian firms, suggesting that these different investments are pulling the Ukrainian economic geography in opposite directions.

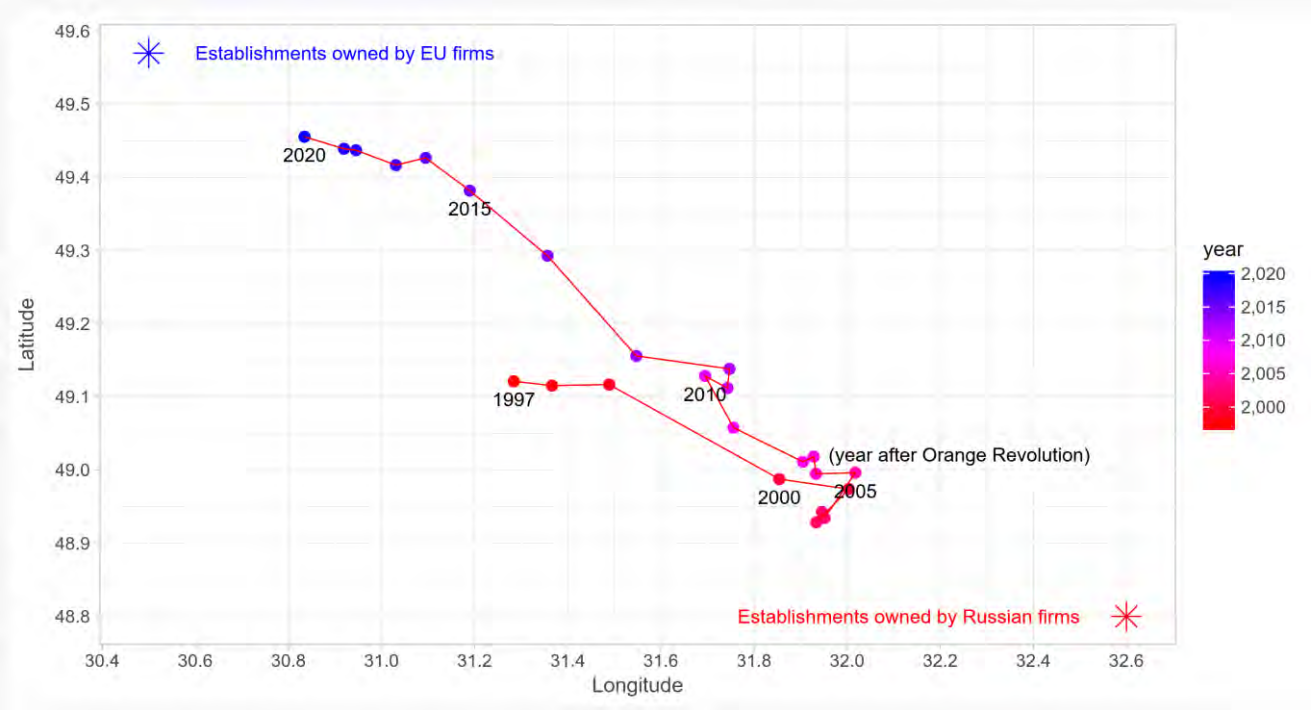


Fig. 5: Center of gravity of the stock of Ukrainian economic establishments. The *figure shows the average latitude and longitude for economic establishments that were founded in each year between 1997 and 2020, weighted by their employment in 2020. Crosses represent the average location of the stock of foreign-owned establishments by firms headquartered in the EU or Russia. Source: Own calculations using Dun and Bradstreet World Base*

Fact 6: The Westward shift represents a shift away from the ethnically Russian population

The move towards Ukraine's Northwest coincides with the geography of the ethnic Russian population in Ukraine. This population has historically concentrated in the country's South and East but represents a small minority in the western-most part of Ukraine that borders the EU.

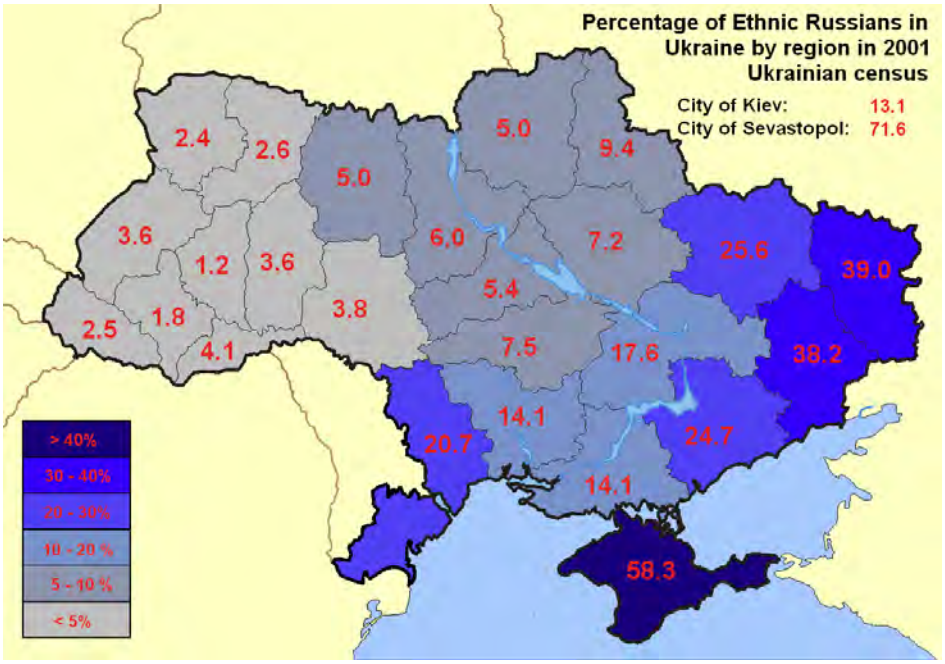
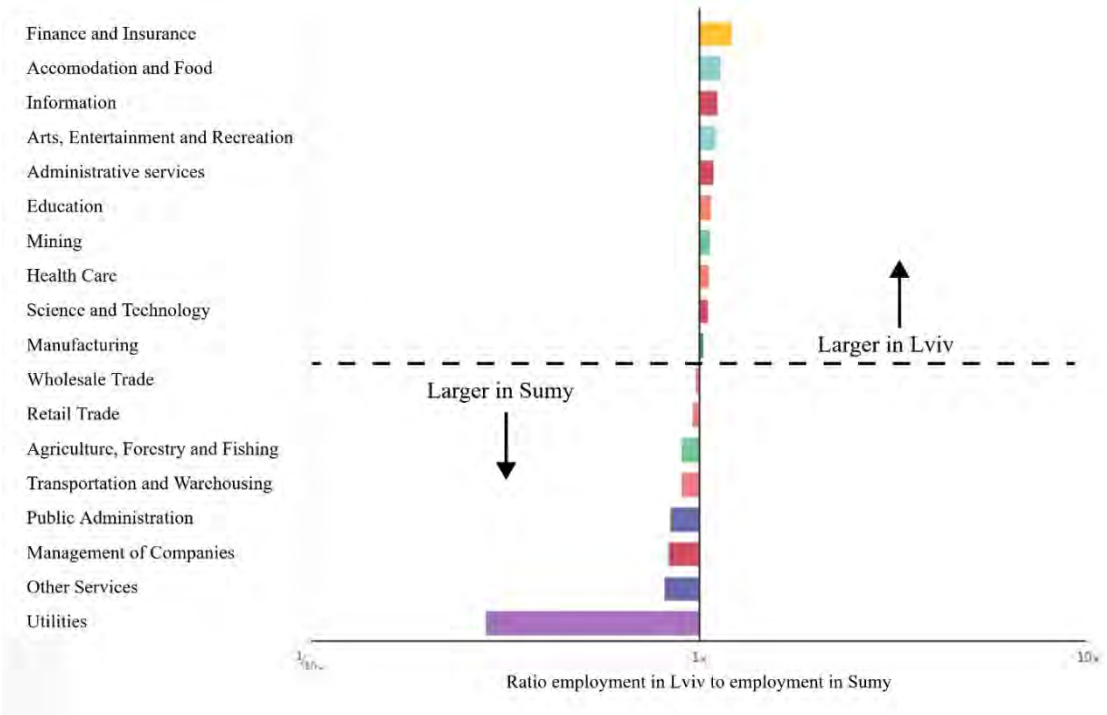


Fig. 6: Center of gravity of the stock of Ukrainian economic establishments. Source [7]

Fact 7. The East–West division is also reflected in what urban economies specialize in

For instance, Lviv in the far West, close to Poland, specializes in modern services and manufacturing such as IT and electronics. In contrast, Sumy in the Northeast, bordering Russia, has a particular strength in more traditional manufacturing activities like steel and machinery.

The following figures 7 a–c show the rate of employment in different sectors in Lviv compared to Sumy.



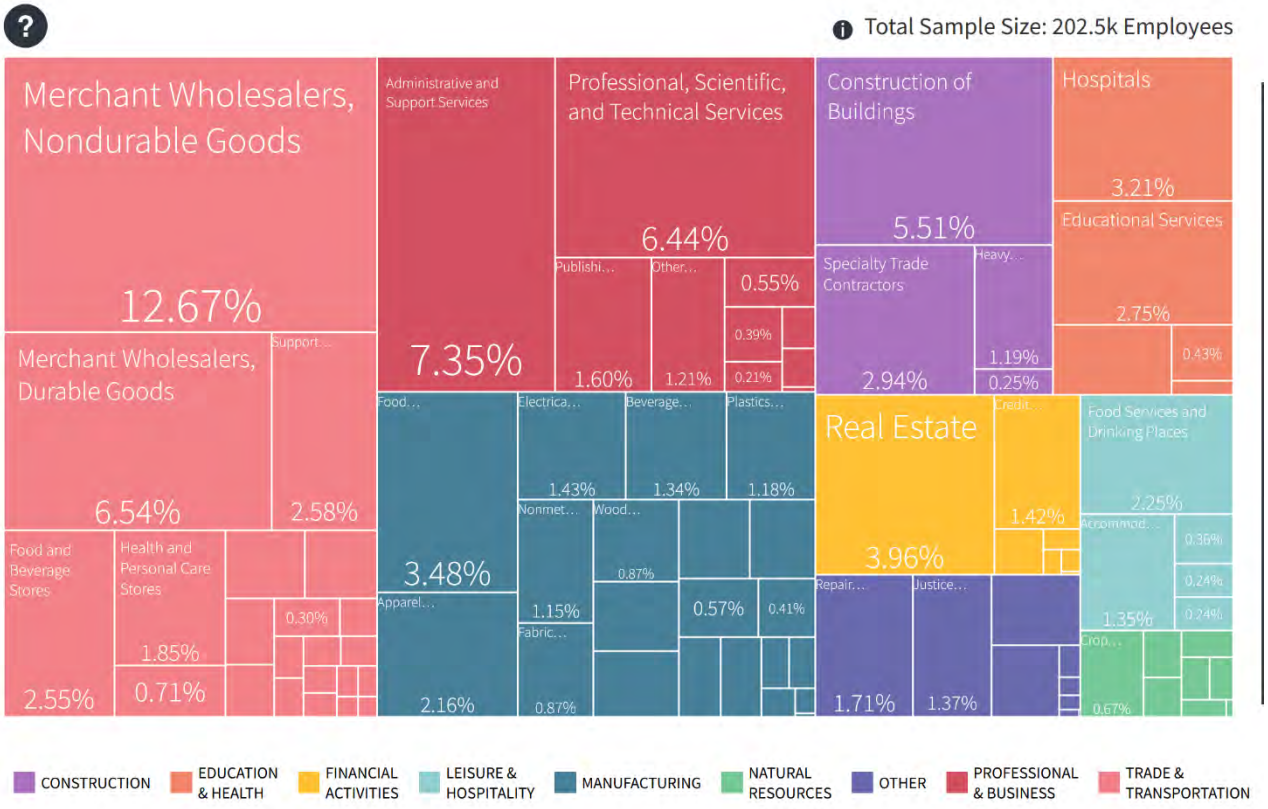


Fig. 7b: Lviv's economic composition. *In 2015, Lviv had a population of 687.1 thousand people and an estimated GDP per capita of $11.3 thousand. Out of the 289 cities covered in Europe, Lviv ranks as the 73rd most populated, and displays the 284th highest GDP per capita. Lviv's labor force consists of about 202.5 thousand workers. The largest sector in Lviv consists of Trade and transportation industries, accounting for 30.37% of employees in the city. A prime example is Merchant Wholesalers, Nondurable Goods, providing 12.67% of the city's employment. Similarly, it shows a large presence in Professional and business services (18.1%), in industries such as Administrative and Support Services (7.35%). Source: Metroverse [8].*

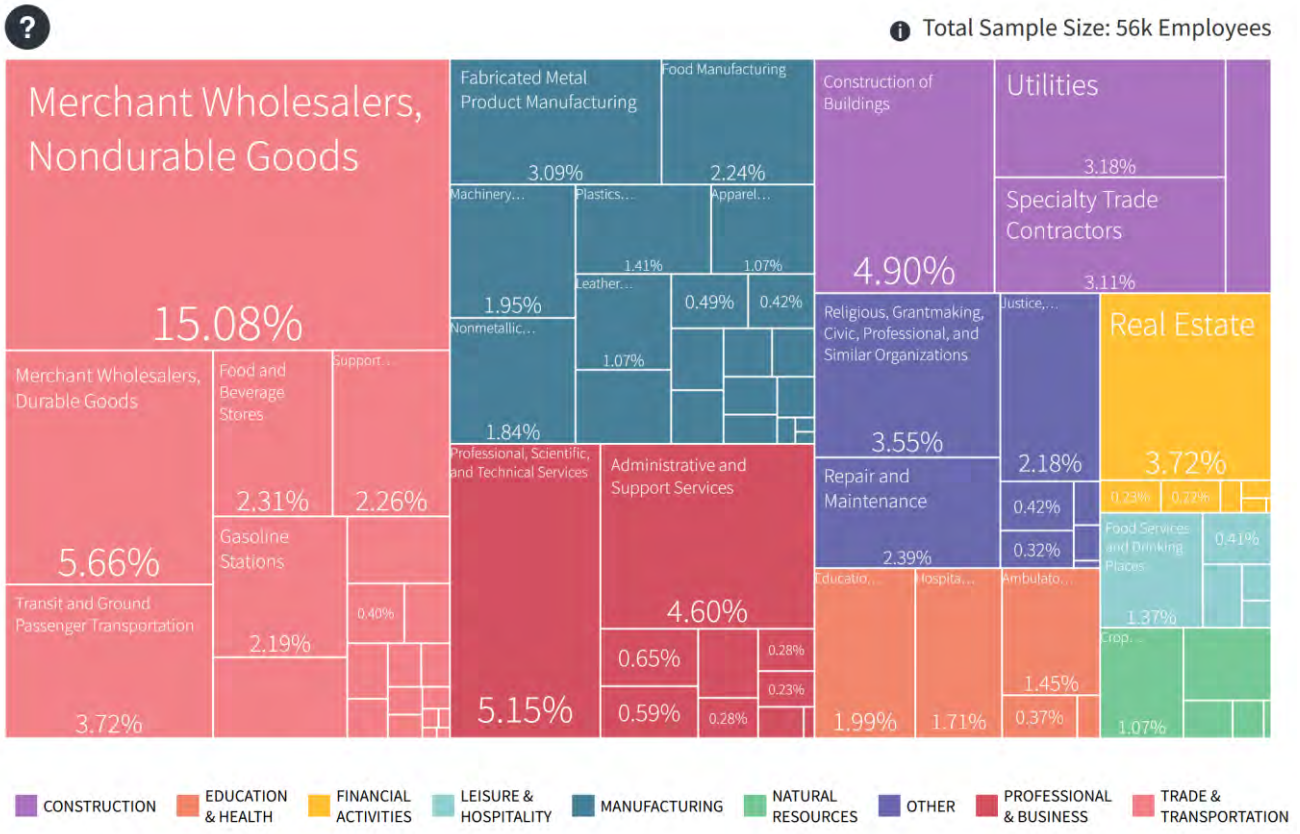


Fig. 7c: Sumy's economic composition. *In 2015, Sumy had a population of 214.4 thousand people and an estimated GDP per capita of $ 9.2 thousand. Out of the 289 cities covered in Europe, Sumy ranks as the 206th most populated, and displays the 287th highest GDP per capita. Sumy's labor force consists of about 56 thousand workers. The largest sector in Sumy consists of Trade and transportation industries, accounting for 35.14% of employees in the city. A prime example is Merchant Wholesalers, Nondurable Goods, providing 15.08% of the city's employment. Similarly, it shows a large presence in Manufacturing (16.32%), in industries such as Fabricated Metal Product Manufacturing (3.09%). Source: Metroverse [9].*

Fact 8: Economic prospects in Ukraine shifted westward

Between 2011 and 2020, eastern regions have mostly shed employment according to our data, whereas many western regions managed to expand employment. Moreover, the industry mix in the West requires higher levels of education than the industries in Ukraine's East.

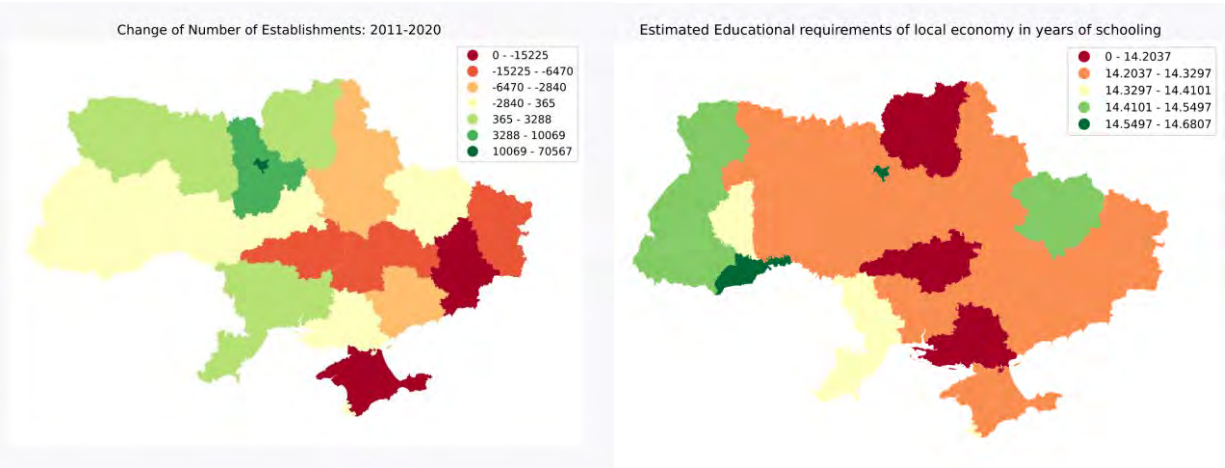


Fig 8: Change of number of establishments in Ukraine 2011–2020 (left) and estimated requirements of local economy in years of schooling (right). *Source: Own calculations using Dun & Bradstreet World Base.*

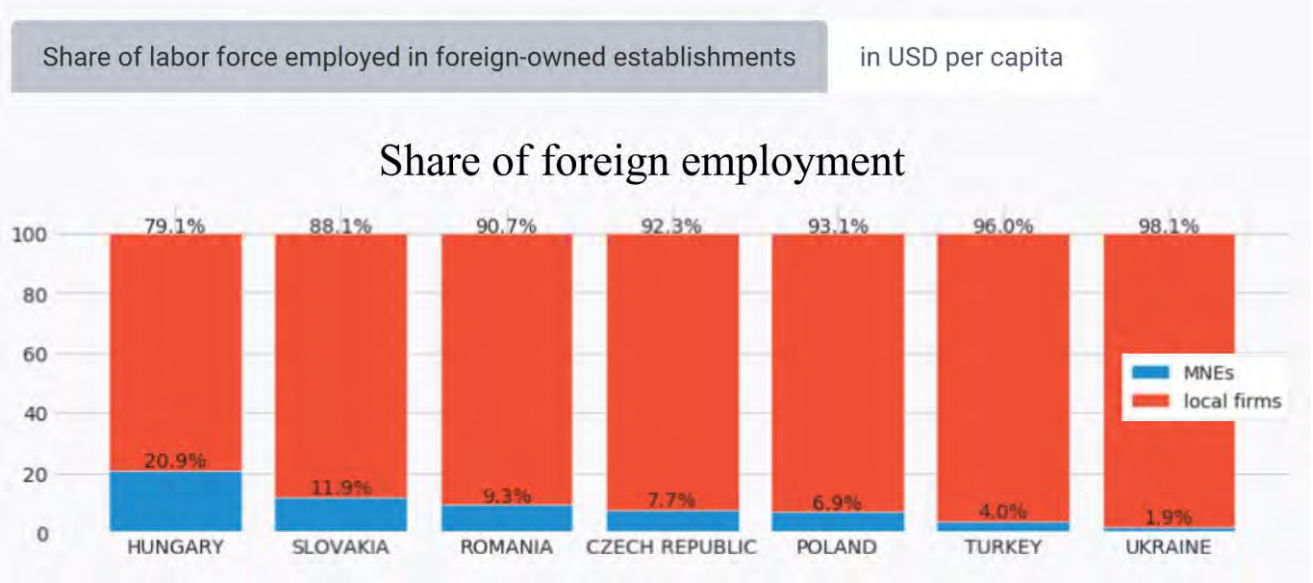
Part 2. Consequences outside Ukraine

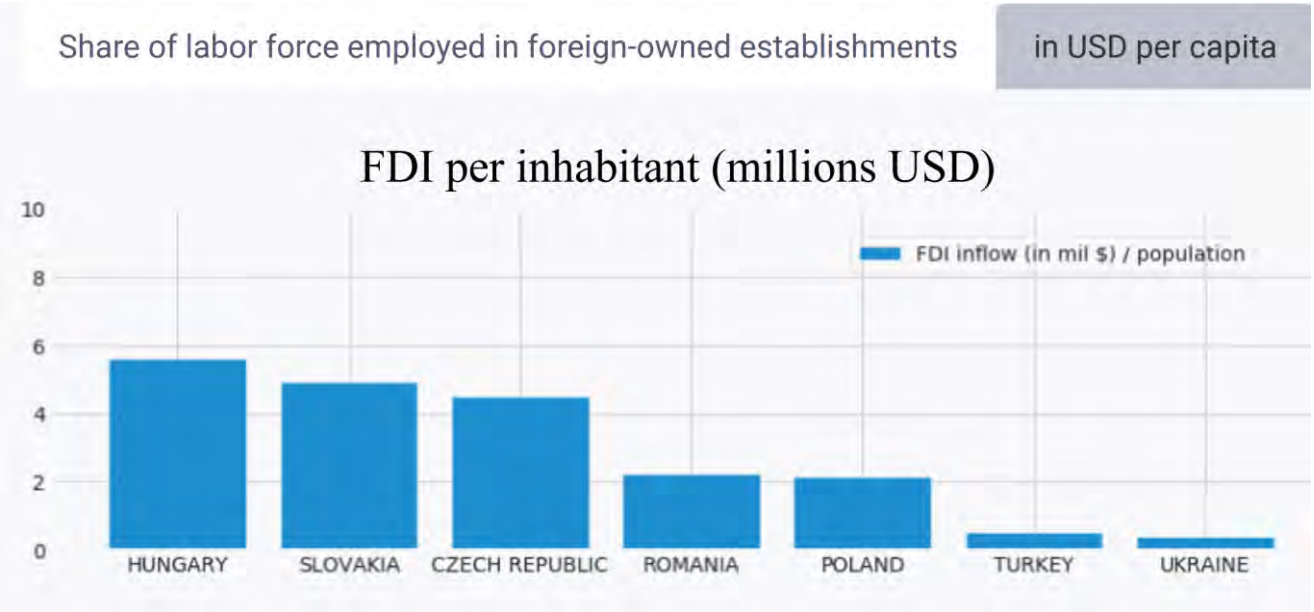
The consequences of the war in Ukraine are felt well beyond its borders. The number of refugees arriving in Poland and other EU countries had reached over 3M people by March 19 [10], meaning that a staggering 7% of the Ukrainian population has fled to the West. Jitteriness of global energy markets and western sanctions have sent oil and gas prices soaring, raising costs for companies in Europe and other places.

Over the past two decades, some western companies set up branch plants in Ukraine and Russia. Now, these firms are experiencing a direct blow, because their Ukrainian establishments had to close due to the war and establishments in Russia are either preemptively closed by western corporations or are at risk of being nationalized by the Russian state.

Fact 9: The overall exposure of Western companies to the loss of branch plants in Russia and Ukraine is small

At a macro level, these losses should not be exaggerated. Ukraine and Russia are simply too far away from the economic center of the European Union and other major investors to have attracted large investments. Compared to other eastern European countries, foreign direct investments are small. For instance, in Hungary, according to our data, one in five employees work for foreign-owned companies. The figure for Ukraine and Russia is closer to one in fifty.



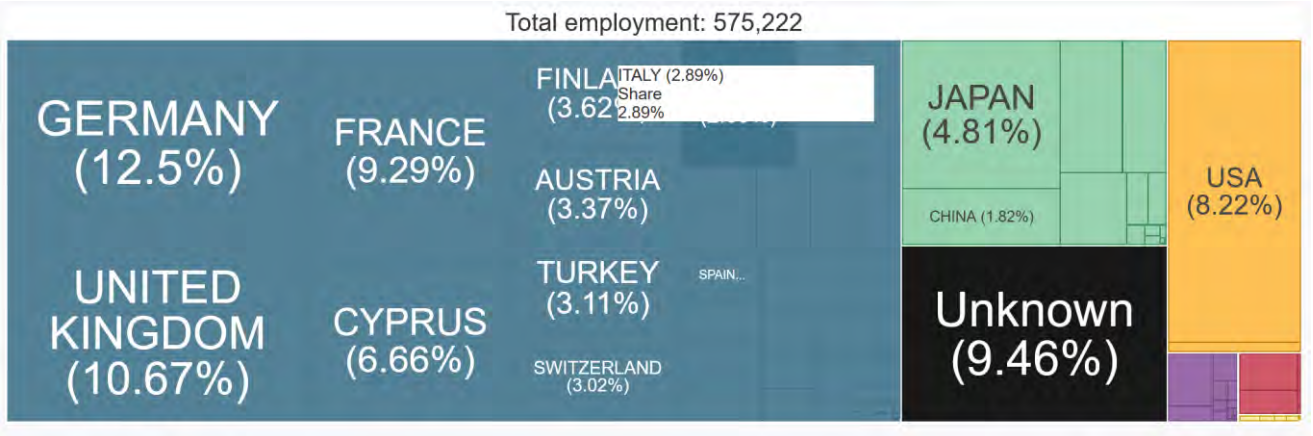


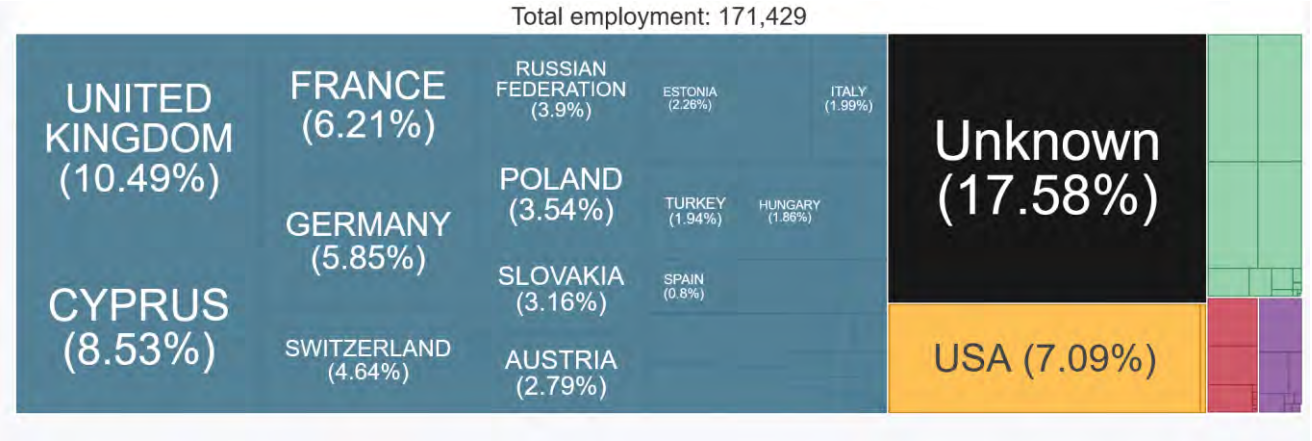
Figs. 9a–b: Share of foreign labor force employment in foreign-owned establishments (a) and in USD per captia (b). *Source: Hartog, M., Neffke, F. and Lopez-Cordova, J.E., 2020. Assessing Ukraine's Role in European Value Chains: A Gravity Equation-cum-Economic Complexity Analysis Approach (No. 129a). Center for International Development at Harvard University [2].*

Fact 10: This exposure is very unequally spread across countries

However the forced write-offs of investments in Ukraine and Russia are very unevenly spread across countries and even regions within countries. The bulk of investments in Russia and Ukraine come from European firms. In contrast, US and Chinese firms are hardly exposed.

The following figures show foreign investments in Russia and the Ukraine, respectively.





Figs. 10a–b: Foreign investors in Russia (a) and Ukraine (b). *Amount of employees in foreign-owned establishments, by headquarter location of their parent firms. Note: Many investments in Russia and Ukraine come from firms whose headquarters are registered in Cyprus and notorious tax haven countries. For many of these firms, we were able to guess the true country of origin, based on their holdings abroad. However, for some firms, this proved impossible, and we decided the headquarter location is "unknown". Source: Own calculations using Dun & Bradstreet World Base.*

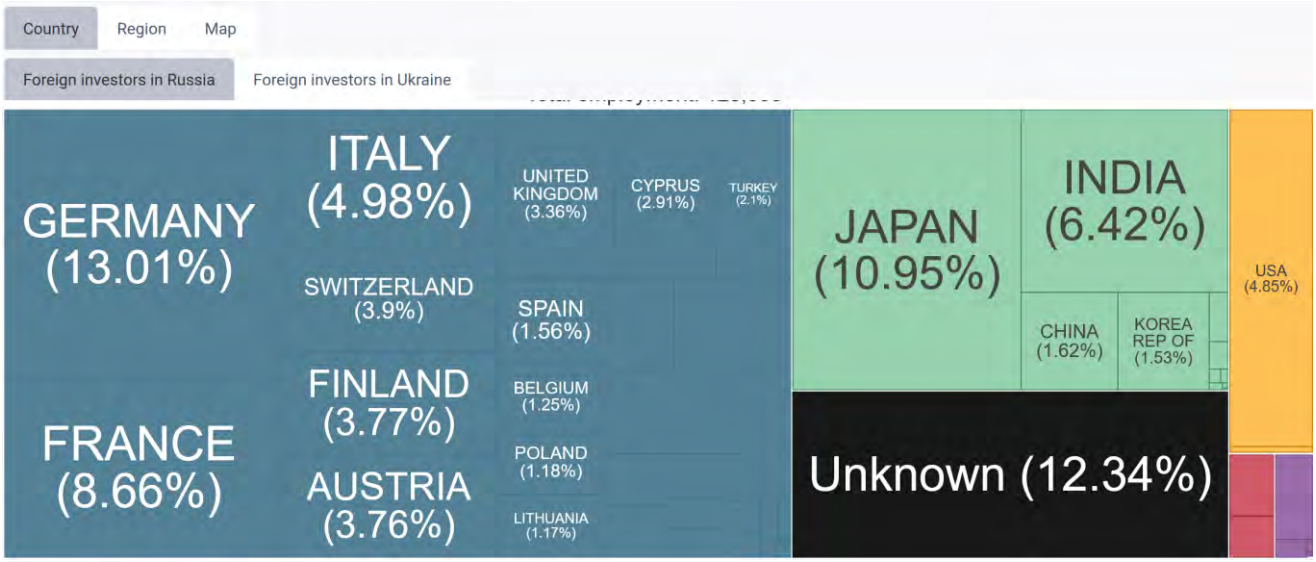
Fact 11: Supply-chain related investments are even more concentrated in a few countries and regions

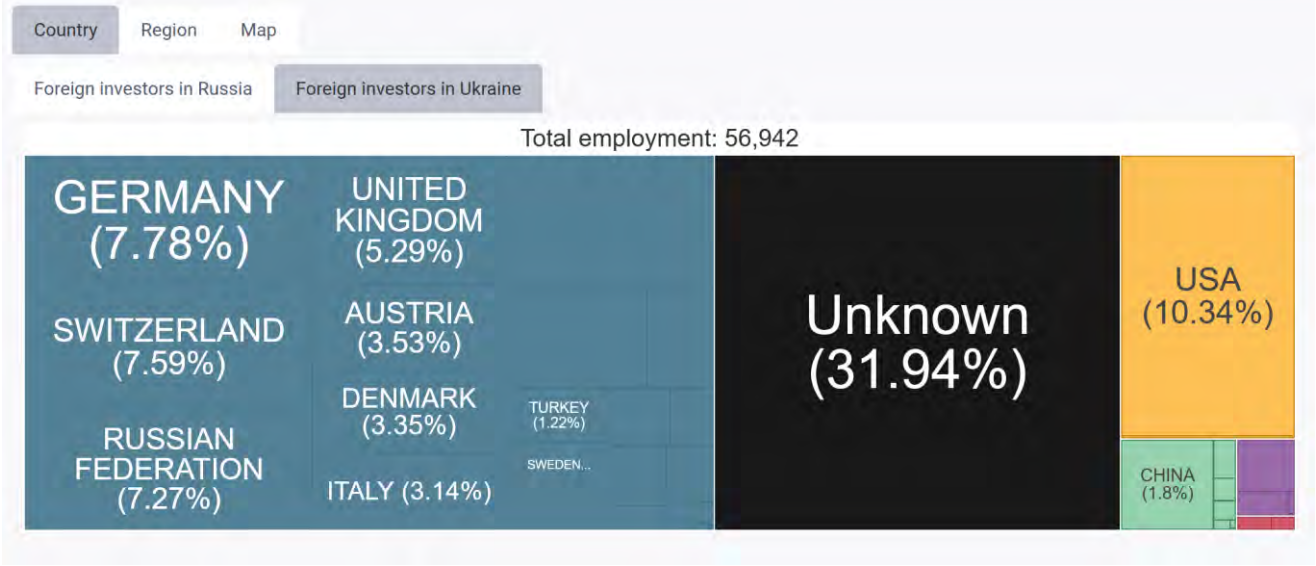
Not all investments are equal. Companies invest abroad, mainly for two reasons. Either they want to sell their goods and services to the local market (market-seeking investments), or they want to exploit local assets, such as an educated, yet relatively low-cost labor market (asset-seeking investments). Losing market-seeking investments will hit sales. Such losses are typically manageable. Companies diversify across global markets precisely to hedge against this kind of volatility. In contrast, the loss of asset-seeking investments can cause severe supply-chain disruptions. We could already witness an early example of this when Volkswagen had to interrupt its production in Germany, because wire harnessing production in Ukraine screeched to a halt.

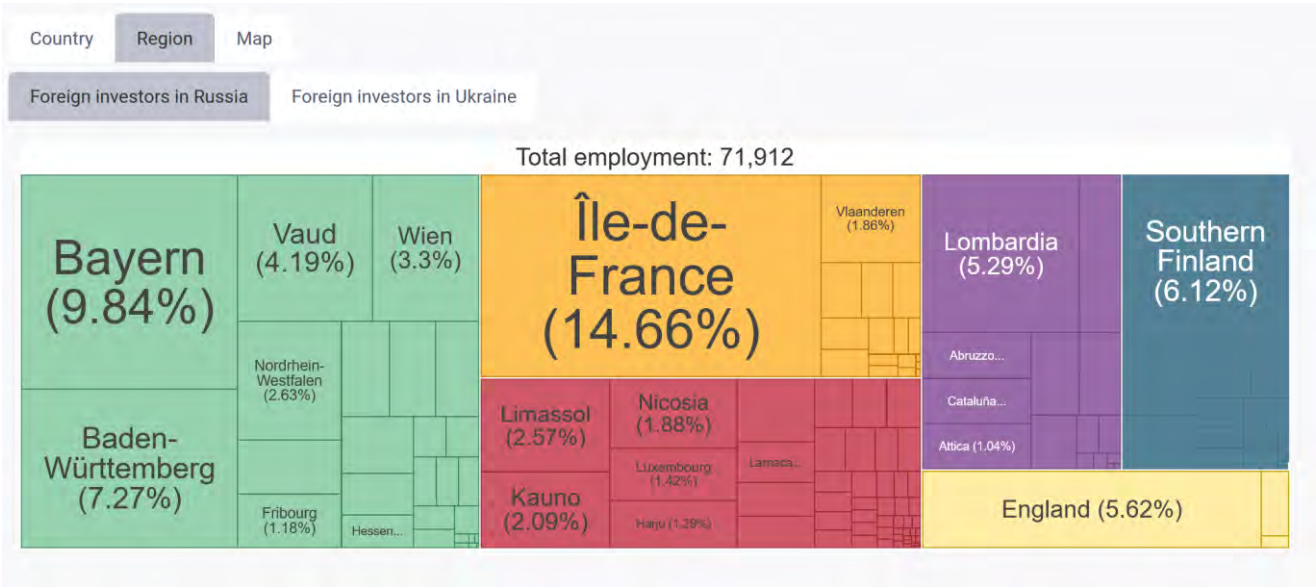
Asset-seeking investments are made over even shorter distances than market-seeking investments. As a result, the potentially serious consequences of having to write off asset seeking investments are mostly felt in Europe and some other neighbors of Russia in Asia, such as Japan.

Even within Europe, there are stark differences in how exposed regions are to potential supply-chain disruptions, with losses concentrating in the South of Germany, Paris, Southern Finland, and Northern Italy.

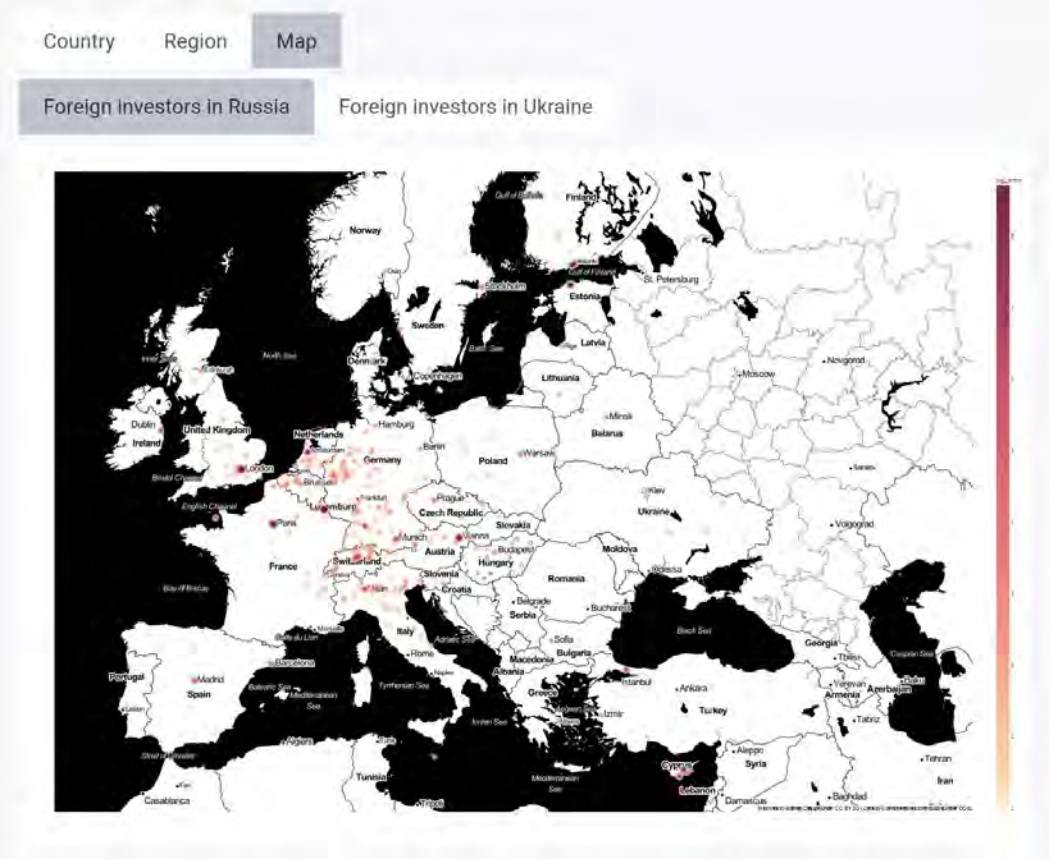
The following figures 11 a–f show amounts of employees in foreign-owned establishments by headquarter location of their parent firms. Where feasible, headquarter locations in tax havens have been moved to firm's principal country of operations. If not, headquarter location is labeled "unknown."


Country
Region
Map
Foreign investors in Russia
Foreign investors in Ukraine
GERMANY (13.01%)
ITALY (4.98%)
UNITED KINGDOM (3.36%)
CYPRUS (2.91%)
TURKEY (2.1%)
SWITZERLAND (3.9%)
SPAIN (1.56%)
FINLAND (3.77%)
BELGIUM (1.25%)
FRANCE (8.66%)
POLAND (1.18%)
AUSTRIA (3.76%)
LITHUANIA (1.17%)
JAPAN (10.95%)
INDIA (6.42%)
USA (4.85%)
CHINA (1.62%)
KOREA REP OF (1.53%)
Unknown (12.34%)


Country
Region
Map
Foreign investors in Russia
Foreign investors in Ukraine
Total employment: 56,942
GERMANY (7.78%)
UNITED KINGDOM (5.29%)
SWITZERLAND (7.59%)
AUSTRIA (3.53%)
DENMARK (3.35%)
TURKEY (1.22%)
RUSSIAN FEDERATION (7.27%)
SWEDEN...
ITALY (3.14%)
Unknown (31.94%)
USA (10.34%)
CHINA (1.8%)


Country
Region
Map
Foreign investors in Russia
Foreign investors in Ukraine
Total employment: 71,912
Bayern (9.84%)
Vaud (4.19%)
Wien (3.3%)
Île-de-France (14.66%)
Vlaanderen (1.86%)
Lombardia (5.29%)
Southern Finland (6.12%)
Nordrhein-Westfalen (2.63%)
Abruzzo...
Cataluña...
Limassol (2.57%)
Nicosia (1.88%)
Attica (1.04%)
Baden-Württemberg (7.27%)
Luxembourg (1.42%)
Larnaca...
Kauno (2.09%)
Fribourg (1.18%)
Hessen...
Harju (1.29%)
England (5.62%)

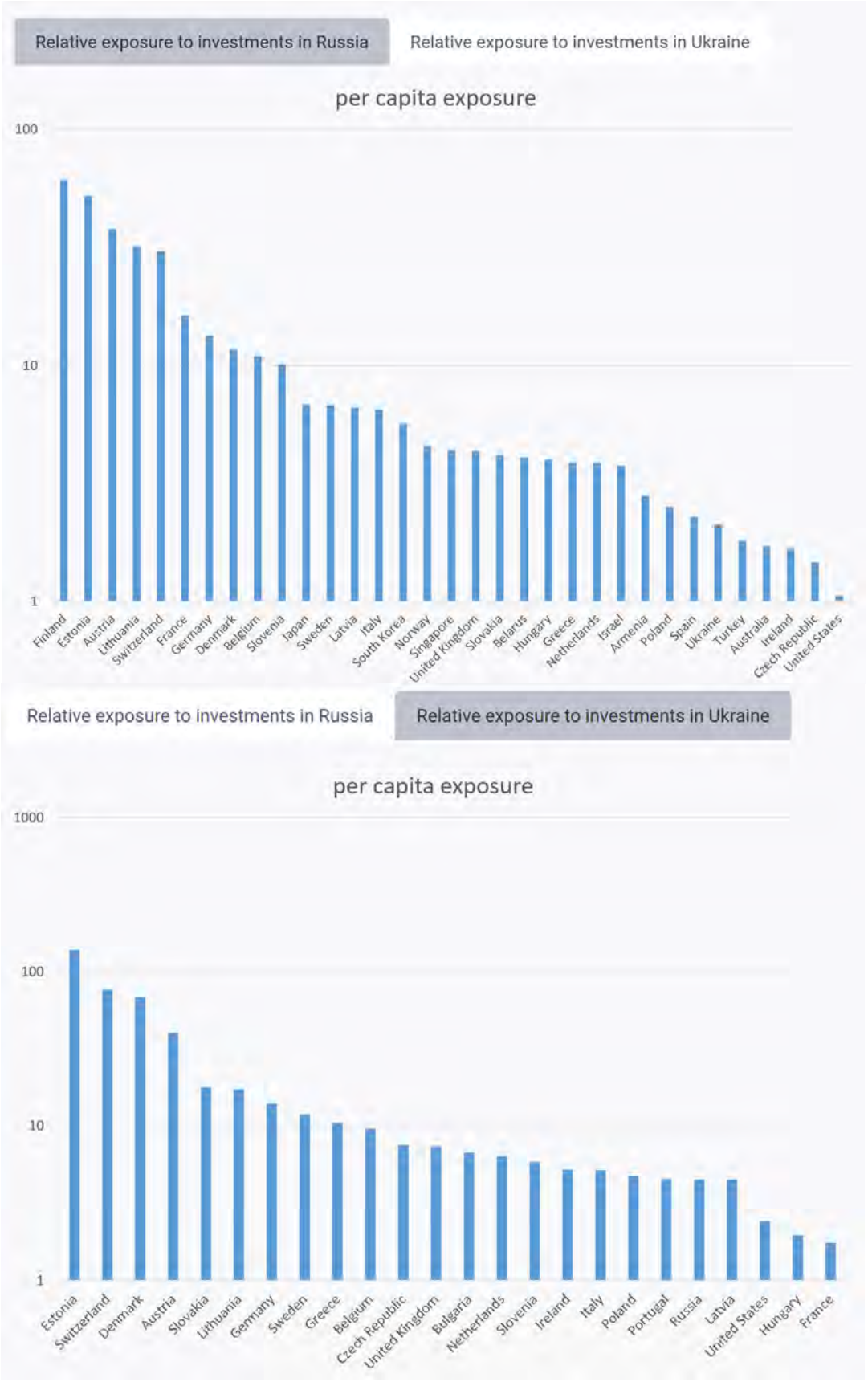

Country
Region
Map
Foreign investors in Russia
Foreign investors in Ukraine
Total employment: 29,505
Baden-Württemberg (7.32%)
Kärnten (4.1%)
Nordrhein-Westfalen (3.82%)
Vaud (6.99%)
Wien (2.21%)
Zürich (2.19%)
Sankt Gallen (4.26%)
Bayern (1.96%)
Moscow City (10.92%)
Harju (4.08%)
Nicosia (2.24%)
Moskva (1.54%)
Limassol (1.64%)
England (9.79%)
Veneto (4.44%)
Attica (2.88%)
Midtjylland (4.67%)
Hovedstaden (1.66%)
Île-de-France (2.54%)
Bruxelles (2.5%)


Country
Region
Map
Foreign investors in Russia
Foreign investors in Ukraine
Norway
Sweden
Finland
Estonia
Latvia
Lithuania
Denmark
Ireland
United Kingdom
Netherlands
Germany
Poland
Belarus
Ukraine
Moldova
Czech Republic
Slovakia
Austria
Hungary
Romania
France
Switzerland
Slovenia
Croatia
Serbia
Italy
Bulgaria
Macedonia
Albania
Greece
Portugal
Spain
Turkey
Georgia
Armenia
Azerbaijan
Syria
Iran
Tunisia
Lebanon
St. Petersburg
Moscow
Volgograd
Tehran
Baghdad

Figs. 11 a –f: Amounts of employees in foreign-owned establishments by headquarter location of their parent firms. *Where feasible, headquarter locations in tax havens have been moved to firm's principal country of operations. If not, headquarter location is labeled "unknown." Source: Own calculations using Dun and Bradstreet World Base.*

Fact 12: On a per capita basis, the heaviest toll is born by smaller European countries

Prime examples are Finland, Estonia, Switzerland, Austria, and Lithuania. These countries are even more exposed than Germany, which, with its large manufacturing sector and strong ties to Russia has been a large investor in Ukraine and Russia. However, also some countries outside Europe are exposed, notably Japan and Korea. In comparison, the per-capita exposure to direct supply chain shocks for the US and China are negligible.



Figs. 12 a–b: Number of employees in foreign-owned Russian and Ukrainian establishments per capita by headquarter location of parent firms divided by global per capita investments in foreign-owned Russian and Ukrainian establishments. *Where feasible, headquarter locations in tax havens have been moved to firm's principal country of operations. Source: Own calculations using Dun & Bradstreet World Base.*

Conclusion | Main Take-aways

1. The Post-Soviet economy of Ukraine has been torn between two main partners, i.e., Russia and the EU. Russia has traditionally been Ukraine's prime trading partner and main market for complex manufacturing products. However, in the past decade, helped by foreign investments and expanding supply chains from major European manufacturing countries such as Germany, this has literary drawn the Ukrainian economy to the West.
2. An unintended consequence of this is that economic opportunity shifted as well, with new economic activity emerging in places away from the ethnically Russian minority in Ukraine.
3. The war in Ukraine risks destroying the investments that western firms have made in Ukraine as well as in Russia. Although, at an overall level, these investments are not particularly large, they disproportionally expose some smaller economies in Europe to potential supply chain disruptions.

Sources:

[1] Metroverse: The Growth Lab's Urban Navigator, https://metroverse.cid.harvard.edu/

[2] Hartog, M., Neffke, F. and Lopez-Cordova, J.E., 2020. Assessing Ukraine's Role in European Value Chains: A Gravity Equation-cum-Economic Complexity Analysis Approach (No. 129a). Center for International Development at Harvard University. https://ideas.repec.org/p/cid/wpfacu/129a.html

[3] Ukraine's total exports to China, https://atlas.cid.harvard.edu/explore?country=228&product=undefined&year=2019&productClass=HS&target=Partner&partner=186&startYear=undefined

[4] Ukraine's total exports to Germany, https://atlas.cid.harvard.edu/explore?country=228&product=undefined&year=2019&productClass=HS&target=Partner&partner=61&startYear=undefined

[5] Ukraine's total exports to China, https://atlas.cid.harvard.edu/explore?country=228&product=undefined&year=2019&productClass=HS&target=Partner&partner=43&startYear=undefined

[6] Ukraine's total exports to Germany between 1995 and 2019, Atlas of Economic Complexity https://atlas.cid.harvard.edu/explore/stack?country=228&year=2019&startYear=1995&productClass=HS&product=undefined&target=Partner&partner=61

[7] Kuban kazak, CC BY-SA 2.5 (Wikimedia Commons) https://de.m.wikipedia.org/wiki/Datei:Russians_Ukraine_2001.PNG

[8] Metroverse Lviv https://metroverse.cid.harvard.edu/city/3351/economic-composition?aggregation=industries

[9] Metroverse Sumy https://metroverse.cid.harvard.edu/city/3680/economic-composition?aggregation=industries

[10] https://www.vox.com/22983230/europe-ukraine-refugees-charts-map

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About the CSH

The Complexity Science Hub Vienna was founded with the aim of using Big Data for the benefit of society. Among other things, the CSH systematically and strategically prepares large data sets so that they can be used in agent-based models. These simulations allow the effects of decisions in complex situations to be tested in advance and systematically assessed. Thus, the CSH provides fact-based foundations for an evidence-based governance.

***CSH Policy Briefs** present socially relevant statements that can be derived from CSH research results.*

About the Harvard Growth Lab

The Growth Lab pushes the frontiers of economic growth and development policy research, collaborates with policymakers to design actions, and shares its insights through teaching, tools and publications, in the pursuit of inclusive prosperity.