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Introduction

The war in Ukraine has caused the largest displacement of people in Europe since the Second World War.¹ Ukraine borders four European Union Member States and its citizens do not need a visa to enter the European Union, being able to freely move in the Schengen area for up to 90 days (Council of the European Union, 2001).² The response of the European Union to those fleeing the war has been unprecedented, with the activation of the Temporary Protection Directive.³ This Directive provides those fleeing the war with a legal status that includes immediate access to a set of rights including housing, education and labour. In such a context – where large movements in a free movement area are coupled with immediate access to services – it is important for the authorities to understand what is driving the flow from Ukraine so as to anticipate the scale of arrivals into a particular country. This is true for national authorities as well as for regional authorities, which have the responsibility of guaranteeing access to the services under their competence.

While the armed conflict drives the displacement of individuals within and out of Ukraine, the presence of a diaspora community is one of the strongest factors underpinning displacement trajectories. This is called a “network effect” and is valid for labour migration as well as for movements of people seeking international protection (Migali et al., 2018). In addition, other important factors can drive migratory flows. The income per capita gap between origin and destination (Ortega and Peri, 2009), the wage differentials between sending country and receiving country (Sjaastad, 1962; Harris and Todaro, 1970) and a shared language (Lanati and Venturini, 2021) are only some examples of such drivers. These are not included in this work, since the aim here is to focus solely on understanding the power of the diaspora to predict the trajectories of the people displaced in the European Union due to the war in Ukraine.

The Ukrainian diaspora is particularly large in the European Union, and even before the war Ukrainians were already among the top ten nationalities of residents not born in the European Union.⁴ This paper aims to understand how the Ukrainian diaspora might be influencing the displacement trajectories of individuals displaced from Ukraine within the European Union and what added value innovative data can have.

The International Organization for Migration (IOM) defines “diaspora” as:

*Migrants or descendants of migrants whose identity and sense of belonging, either real or symbolic, have been shaped by their migration experience and background. They maintain links with their homelands, and to each other, based on a shared sense of history, identity, or mutual experiences in the destination country.*⁵

The diaspora of a country X in a country Y is often measured by the presence of people born in the country X and residing in the country Y. However, in the case of the Ukrainian diaspora, the citizenship criterion is preferred to the criterion of the country of birth to account for the internal mobility that occurred within the Soviet Union (Vakhitova and Fihel, 2020). In line with this, we use the term “Ukrainian diaspora” and “Ukrainian stocks” to refer to Ukrainian citizens living outside Ukraine throughout the paper.

¹ Osnat Lubrani, United Nations Resident and Humanitarian Coordinator in Ukraine, [The war has caused the fastest and largest displacement of people in Europe since World War II](#), 24 March 2022.

² Also see European Commission, [Information for people fleeing the war in Ukraine](#) (accessed 23 November 2022).

³ See European Commission, [Temporary protection](#) (accessed 23 November 2022).

⁴ According to data from Eurostat on [Immigration by age group, sex and citizenship](#).

⁵ IOM, [Glossary on Migration](#), International Migration Law no. 34 (Geneva 2019).

This method for measuring a diaspora is used in the literature (Beine et al., 2011); however, it presents some challenges. First, it does not capture short term movements of people who may not become settled migrants in the destination country, but instead move across the origin and destination countries and have built a transitional network. This is particularly relevant for Ukrainians who, thanks to their visa-free status and liberal labour migration schemes, are among the top nationalities for short-term (less than 12 months) residence permits in the European Union.⁶ Second, it does not include so-called “second generations”, that is, people born in country Y or with the citizenship of country Y but with at least one parent born in country X.

Third, it does not capture whether the persons maintain a link with the homeland and with each other. Despite these limitations, data on the stock of foreign-born residents or foreign citizens are to date the best available large scale comparable data set to measure the diaspora, and will be also used in this paper.

Data on the stock of migrants, however, do not always have the required spatial granularity, nor are they produced with high frequency. The review of Bosco et al. (2022) has shown that innovative data can offer a great geographic and temporal granularity, have a (near) real time availability, and provide extensive coverage suitable for more immediate international comparisons. An innovative way to measure a country’s diaspora is using social media data, such as Facebook’s ties. In particular, Facebook’s Social Connectedness Index (SCI) measures friendship ties of active users to assess the strength of a connection between two areas.

In this paper, we analyse Facebook’s SCI and traditional measures of the diaspora side-by-side. Concretely, we aim to:

1. Understand the role of the diaspora as a predictor of the displacement trajectories of those fleeing during the war in Ukraine; and
2. Test the potential of Facebook’s SCI to predict the stock of Ukrainians in the European Union at detailed spatial resolution.

The rest of this paper is structured as follows: the next section examines the link between the actual flows of people fleeing Ukraine towards the European Union and the Ukrainian diaspora in the 27 European Union Member States; the paper then analyses the relationship between Facebook’s SCI and Ukrainian stocks; and the last section discusses the results and concludes.

Analysis of the driving power of the diaspora for the refugee flows from Ukraine

As previously noted, the diaspora is one of the major drivers of migration and displacement trajectories (Migali et al., 2018). In this section, we assess the power of the diaspora in driving the movements from Ukraine to the European Union. The diaspora is here measured as the stock of residents with Ukrainian citizenship.

Description of the data

To quantify the movements from Ukraine, we use data on the refugees from Ukraine who have registered for temporary protection under the European Union’s Temporary Protection Directive or similar national protection scheme.⁷ This indicator has some limitations, as it does not perfectly

⁶ For instance, according to Eurostats’s *migr_resfirst* series, they were the largest recipient of such permits in 2021.

⁷ UNHCR Operational Data Portal, [Ukraine refugee situation](#).

reflect the number of Ukrainians fleeing the war who are present in the country: some people may have not registered for temporary protection (yet), hoping to return to Ukraine soon or to apply for another permit; others may have registered but moved to another country or come back to Ukraine. Nonetheless, registrations for protection are the best proxy currently available. Data on refugees from Ukraine recorded across Europe account for people who have not registered yet; however, they present even more important limitations than the protection registrations. Specifically, these data do not account for intermediate destinations, thus showing inflated counts (also known as double counts) in transit countries, especially those neighbouring Ukraine. Temporary protection data should therefore give a more likely overview of the actual net flows, since a person who registers for temporary protection in one country shows an intention to settle there for some time, especially considering that a person cannot benefit from temporary protection in more than one country at the same time.⁸ Table 1 shows the difference between the number of temporary protections and recorded refugees.

Table 1. Number of recorded refugees from Ukraine across the European Union and refugees from Ukraine registered for temporary protection (either under the European Union's Temporary Protection Directive or similar national protection schemes)

Country	Recorded refugees	Temporary protection
Austria	78 158	78 158
Belgium	52 245	52 870
Bulgaria	129 437	86 722
Croatia	16 828	16 829
Cyprus	14 989	13 113
Czechia	412 959	413 121
Denmark	31 000	33 000
Estonia	32 077	50 491
Finland	35 240	35 240
France	96 520	96 520
Germany	670 000	971 000
Greece	18 363	18 363
Hungary	28 289	28 289
Ireland	48 672	45 074
Italy	150 261	159 968
Latvia	37 496	36 449
Lithuania	62 444	62 444
Luxembourg	6 263	6 263
Malta	1 284	1 373
Netherlands	68 050	68 050
Poland	1 274 130	1 274 130
Portugal	49 623	49 718
Romania	52 952	84 662
Slovakia	86 834	87 030
Slovenia	7 200	7 200
Spain	133 820	133 913
Sweden	42 250	44 107

Source: UNHCR, n.d. (accessed 23 November 2022).

⁸ European Commission, Information for people fleeing the war in Ukraine (accessed 23 November 2022).

To quantify the diaspora we use data on the number of Ukrainian citizens residing in a specific country from Eurostat,⁹ and, where not available, from the Department of Economic and Social Affairs (DESA).¹⁰ These data sources provide diaspora measurements according to the country of citizenship, which is important since many Ukrainian citizens migrated to the European Union from other countries that were previously part of the Soviet Union (Vakhitova and Fihel, 2020).

Each European Union country was categorized as belonging to one of two classes: “old” diaspora countries, and more recent (“new”) diaspora countries. Old diaspora countries are defined as those where the rate of immigration of Ukrainians used to be higher in the past and has decreased recently; new diaspora countries are those that have received a stable or increasing number of migrants from Ukraine. The reason for distinguishing between a new and an old diaspora is that connections with the country of origin may deteriorate over time, so that people who migrated a long time ago may have a smaller network in the country of origin than people who migrated only recently, and may thus be less of a driver for current movements. To distinguish between the new and the old diaspora we looked at the historical annual migration flows. We used data from Eurostat on long-term Ukrainian immigrants – disaggregated by age group, sex, and citizenship – arriving into the reporting country.¹¹ Where these data were not available, we used the International Migration Database of the Organisation for Economic Co-operation and Development (OECD)¹² or the residence permits issued for at least 12 months from Eurostat.¹³ For this analysis, we selected the period 2008–2019, since 2008 is the first year for which data are complete. We excluded the year 2020 from the analysis since the COVID-19 pandemic would likely bias the final results.

Results

We split the historical Ukrainian immigration time series at the end of 2013 to obtain two main periods, each six years long: 2008–2013 and 2014–2019. We then compared the number of Ukrainian immigrants in each country before and after 2013 and classified each country as having a new diaspora if (i) the number of immigrants was greater in 2014–2019 than in 2008–2013, and (ii) the general trend of the time series was found to increase in the last period. Otherwise, the country was classified as having an old diaspora. Figure 1 (please see next page) shows the data used to classify each country.

⁹ Population on 1 January by age group, sex and citizenship.

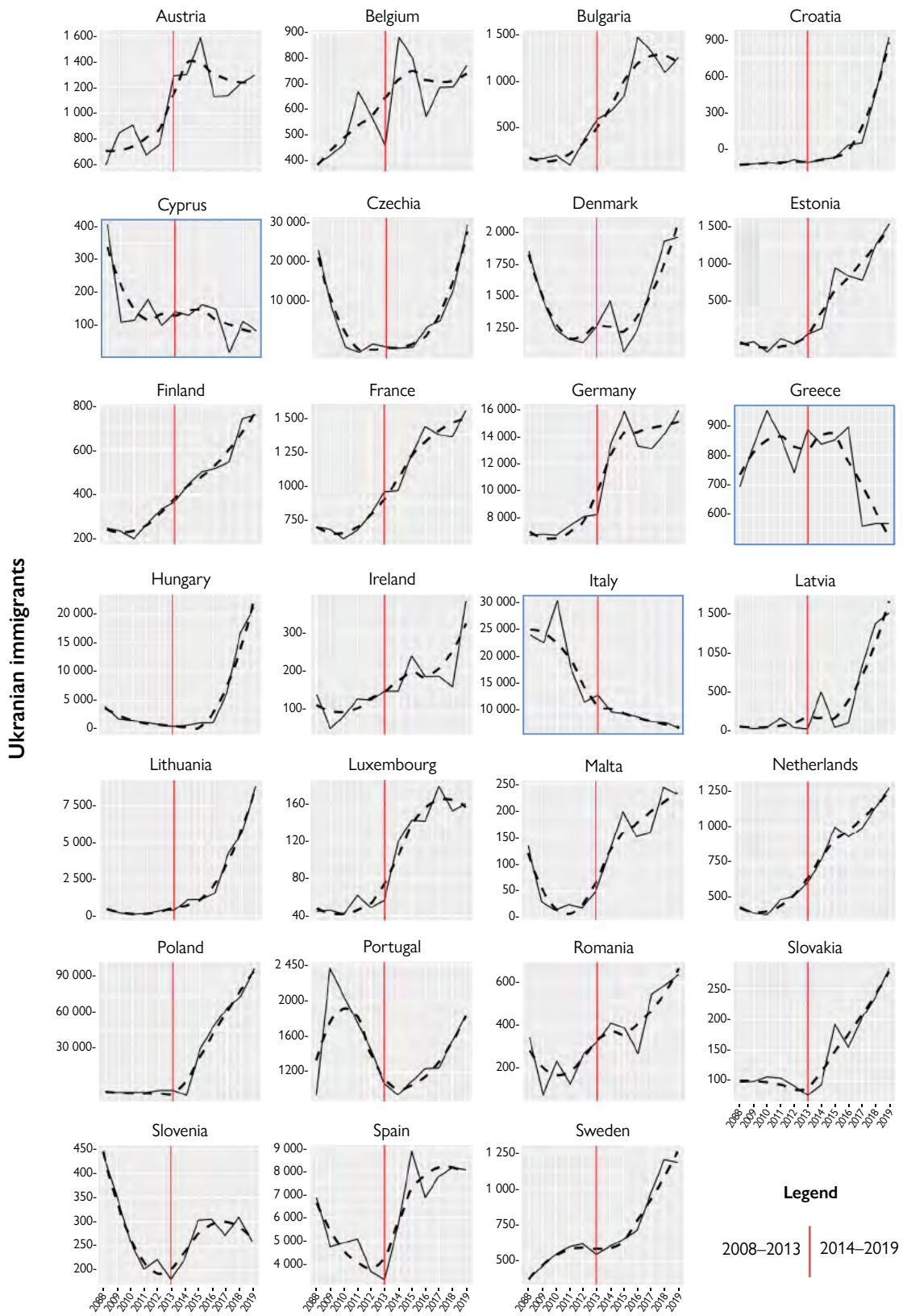
¹⁰ International migrant stock.

¹¹ Immigration by age group, sex and citizenship.

¹² International Migration Database, accessed through OECD.Stat.

¹³ First permits by reason, length of validity and citizenship.

Figure 1. Number of Ukrainian immigrants by Member State, 2008–2019 (yearly data)



Source: EUROSTAT, *Immigration by age group, sex and citizenship* (accessed 23 November 2022); OECD, *International Migration Database* (accessed 23 November 2022).

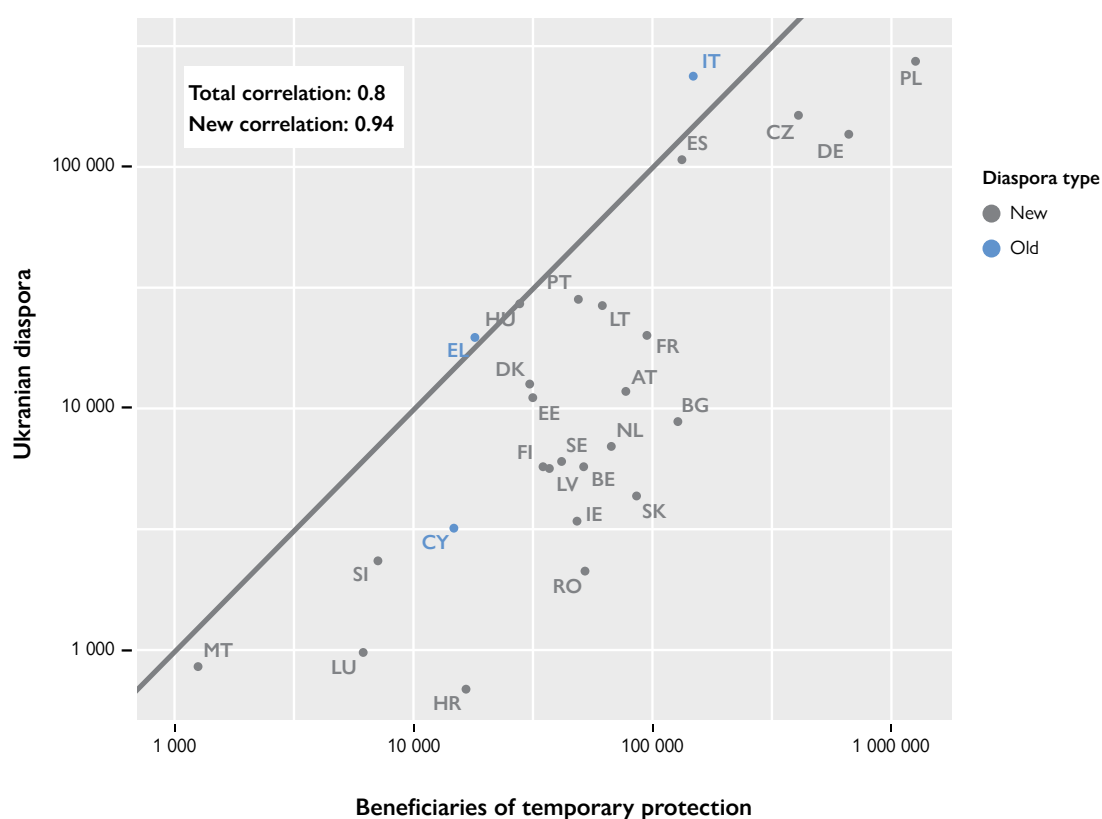
Note: The dashed line represents a smoothed version of the time series to better show the patterns. The vertical red line divides the time series into two periods (2008–2013, 2014–2019). Blue boxes highlight the countries classified as old diaspora.

In Figure 1 we have highlighted the countries classified as having an old diaspora with a blue box. These are Cyprus, Greece and Italy.

To assess whether the diaspora drives the current movements from Ukraine we correlated the stock of Ukrainian citizens residing in the Member States before the war with the protection registrations from people fleeing Ukraine. The vast majority of these are Ukrainian citizens.¹⁴

The correlation coefficient is already high with regard to all the countries, regardless of whether the Member State is an old or a recent destination country (Pearson's $r=0.80$, $p<0.0001$). When we focus only on the countries with a new diaspora, the correlation coefficient increases to 0.94.

Figure 2. Number of temporary protection beneficiaries versus stock of Ukrainian citizens residing in the Member States before the war



Source: UNHCR, n.d. (accessed 23 November 2022); Eurostat, [Population on 1 January by age group, sex and citizenship](#) (accessed 23 November 2022); DESA, [International migrant stock 2020: Destination and origin](#) (accessed 23 November 2022).

Note: The solid line represents the bisector: Axes in logarithmic scale. AT: Austria; BE: Belgium; BG: Bulgaria; CY: Cyprus; CZ: Czechia; DE: Germany; DK: Denmark; EE: Estonia; EL: Greece; ES: Spain; FI: Finland; FR: France; HR: Croatia; HU: Hungary; IE: Ireland; IT: Italy; LT: Lithuania; LU: Luxembourg; LV: Latvia; MT: Malta; NL: Netherlands; PL: Poland; PT: Portugal; RO: Romania; SE: Sweden; SI: Slovenia; SK: Slovakia.

¹⁴ Beneficiaries of temporary protection at the end of the month by citizenship, age and sex – monthly data.

In Figure 2, we can see that amongst the countries defined as having an old diaspora (shown in red), Italy plays an important role, since it is the country with the largest stock of Ukrainian citizens after Poland,¹⁵ but the ratio between its temporary protection registrations and the stock of Ukrainian citizens living there is relatively small compared to the other top five diaspora countries (Czechia, Germany, Poland and Spain).

This can be clearly seen in the scatter plot of Figure 2, where Italy lies above the bisector line whereas the rest of the countries are below. The only other country that lies above the line is Greece, another country classified as having an old diaspora. This is an indication that despite having a strong historical Ukrainian diaspora, Italy and Greece seem less attractive for refugees than other countries with a more recent diaspora. This is likely related to other factors as well, such as economic, social and political ones.

Analysis of the relationship between Facebook’s Social Connectedness Index and the Ukrainian diaspora

The findings of the previous section show that the diaspora can be used to anticipate the trajectory of displacement flows. This is true at national levels and it is reasonable to expect that it will also be true at a more granular level. While data on residents by citizenship at the regional level are provided for some Member States by the relevant national statistical offices, we do not have a harmonized and complete data set at this spatial granularity. In this section we therefore assess the potential of Facebook’s SCI to fill this gap.

Description of the data

We collected diaspora data at the regional level (specifically, at the third level of nomenclature of territorial units for statistics, or NUTS-3) from various national statistical offices, focusing on those European Union countries where the Ukrainian diaspora is the largest: Italy, Spain, Germany, Czechia, and Portugal. Unfortunately, we were not able to include data for Poland, the country with the largest stock of Ukrainian citizens in the European Union, since these were not available at the same spatial resolution as the other countries and Facebook’s SCI.

We used Facebook’s SCI¹⁶ (Bailey et al., 2020) before the start of the conflict in Ukraine and the total population of the countries of destination¹⁷ to evaluate their potential to predict human diaspora: the response variable of our analysis. Facebook’s SCI uses a snapshot of Facebook users and their friendship networks to measure the intensity of connectedness between locations in a specific time. Locations are assigned to Facebook users based on their information and activity on Facebook, including the stated city on their Facebook profile, and device and connection information. These locations do not imply a user is a citizen of that country. Facebook’s SCI between two locations i and j is calculated as:

$$Social\ Connectedness_{ij} = \frac{FB\ Connections_{ij}}{FB\ users_i * FB\ users_j} \quad (\text{Equation 1})$$

¹⁵ According to data from Eurostat and DESA.

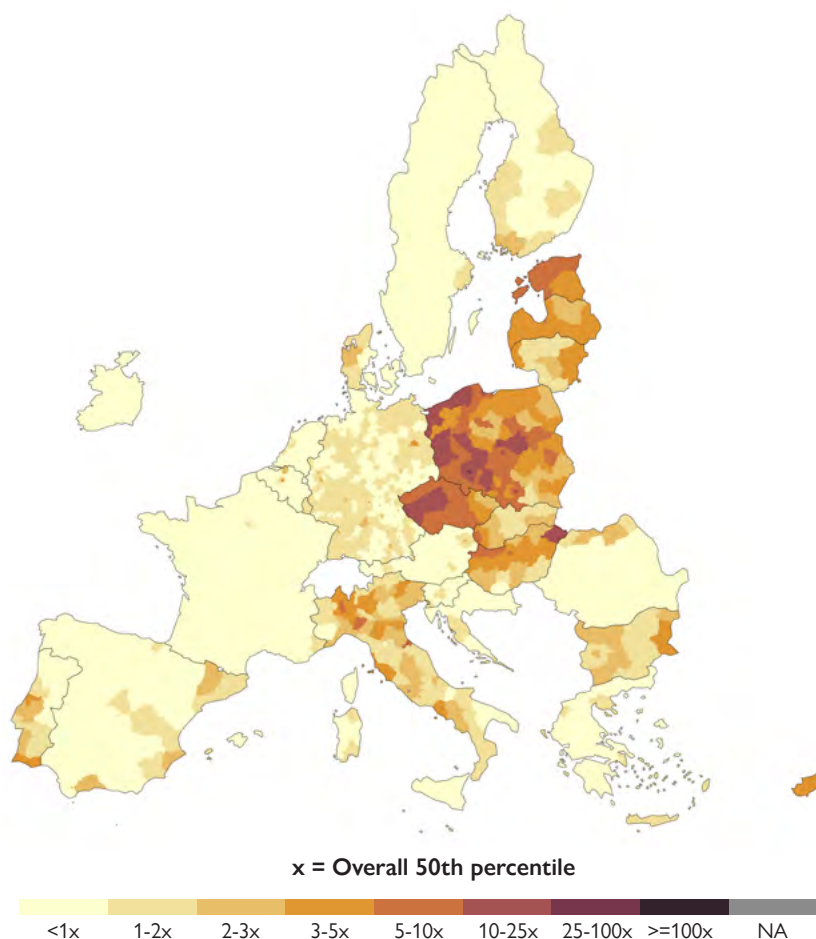
¹⁶ Meta, Social Connectedness Index.

¹⁷ Eurostat, Population on 1 January by broad age group, sex and NUTS 3 region.

$FB\ users_i$ and $FB\ users_j$ are the number of Facebook users in locations i and j , and the quantity $FB\ Connections_{ij}$ is the number of Facebook friendship connections between the two. The indicator $Social\ Connectedness_{ij}$, therefore, is proportional to the likelihood that a Facebook user in location i is friend on Facebook with a given user in location j .

Figure 3 shows the connections between Ukraine (considering the whole country), and each NUTS-3 area within the European Union.

Figure 3. Facebook's Social Connectedness Index (Ukraine to EU27 NUTS-3)



Source: Eurostat, [Administrative units/statistical units](#). © EuroGeographics for the administrative boundaries.

Note: This map is for illustration purposes only. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the International Organization for Migration.

Results

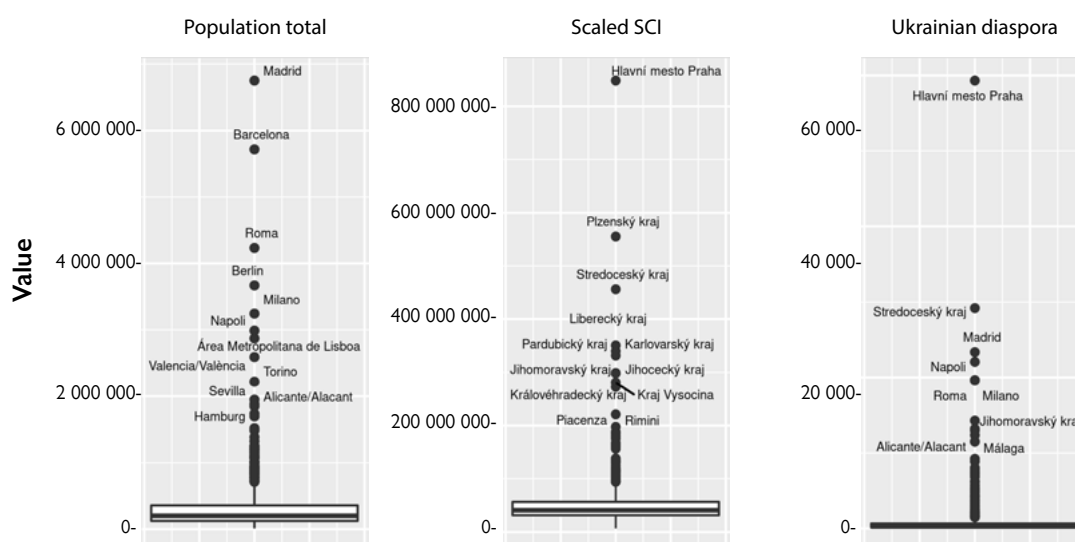
To test the hypothesis that the virtual connections (Facebook friendship ties) between Ukraine and regions of the European Union resemble the Ukrainian diaspora within the European Union, we examined the correlation between Facebook's SCI and Ukrainian diaspora at NUTS-3 level; however, the strength of this correlation varies significantly among countries (see Table 2). Therefore, we introduced the total population and the geographic position of each region as additional covariates in the analysis, as intuitively these are potentially linked to the diaspora. Indeed, the selected variables proved to be very good predictors for the diaspora.

Table 2. Correlation coefficients of Facebook's Social Connectedness Index and Ukrainian diaspora by country

Country	Correlation coefficients (p<0.0001)
Czechia	0.87
Germany	0.47
Spain	0.65
Italy	0.43
Portugal	0.54

The Ukrainian diaspora, Facebook's SCI, and the total population data sets all present a right-skewed distribution, meaning that each of these data sets have very few observations with very high values (compared to the mean), and these represent the capitals or other important areas (Figure 4).

Figure 4. Distribution of total population (left), Facebook's Social Connectedness Index (middle), and Ukrainian diaspora (right)



Source: Data for total population based on Eurostat, [Population on 1 January by broad age group, sex and NUTS 3 region](#) (accessed 23 November 2022).

In other words, usually the most populated NUTS-3 are also those with a larger diaspora or a higher level of social connectedness. As such, even though they are very few, their potential to attract people fleeing the war is much greater than the other NUTS-3 areas. This is why we introduced a weight variable in the analysis based on the interaction between Facebook's SCI and the total population. We derived our weights as the product between the two variables normalized between 0 and 1 through a min-max approach.

$$W = \tilde{P} \cdot \tilde{S} \text{ (Equation 2)}$$

In Equation 2, \tilde{P} and \tilde{S} represent the normalized vectors of total population and Facebook's SCI respectively, and W is the vector of the resulting weights.

Finally, we used the following model to evaluate the predictive power of the chosen variables:

$$\log(ukr_stoc) = \alpha + \beta_1 \log(scaled_sci) + \beta_2 \log(pop_tot) + \beta_3 latitude + \epsilon$$

(Equation 3)

In equation 2, $\log(ukr_stock)$ is the logarithm of the Ukrainian diaspora values, $\log(scaled_sci)$ of Facebook's SCI, $\log(pop_tot)$ of the total population, $latitude$ is the original scale, β_1 to β_3 are the correlation coefficients of the predictors, α is the intercept and ϵ is the random error.

We randomly selected 70 per cent of the total 594 observations to build a sample to train the model, and we used the remaining set to evaluate its performance. The explained variance (r^2 , calculated on the validation set using the formula found in Bosco et al. (2017)) is 0.92, and all predictors have a highly significant p -value (<0.01). Figure 5 shows the scatter plot of the observed diaspora values versus the ones predicted by the model, where each colour represents one of the countries available in the data set.

Figure 5. Scatter plot of the observed diaspora values (y-axis) versus the ones predicted by our model (x-axis) coloured by country



Note: Axes in logarithmic scale.

Discussion and conclusions

The war in Ukraine has provoked the largest human displacement in Europe in recent years. As a response, the European Union has activated the Temporary Protection Directive, which provides for immediate access to a variety of services to its beneficiaries. In this context, it becomes paramount for authorities to be prepared and to anticipate how many people will be arriving, in order to ensure adequate reception conditions. This is true for national as well as for local authorities that are responsible for several of the services covered by the Directive.

The literature shows that the diaspora is a key driver of migration via a network effect (Migali et al., 2018). In this paper, we first verified the power of the diaspora to anticipate the population movements of Ukrainians following the Russian invasion. Second, we explored the potential of innovative data – specifically Facebook’s SCI – to measure the diaspora.

The main results of this analysis are the following:

First, the diaspora is confirmed to be an important driver of migration trajectories, especially when the diaspora is the result of migration movements that have increased in number more recently or have not decreased over time. The correlation between the number of Ukrainian citizens residing in European Union countries (as a proxy for the diaspora) and the number of registrations for temporary protection under the European Union Temporary Protection Directive or similar national schemes (as a proxy for displacement movements) is high and significant, especially when old diaspora destination countries are excluded. This is consistent with the hypothesis that people who migrated long time ago may have a smaller or weaker network with people in their country of origin than those who migrated more recently.

Second, Facebook’s SCI, along with data on total population and the geographical position of the regions, can be used to measure the diaspora at a granular spatial resolution (NUTS-3). This is useful because, while there is a need to anticipate arrivals at regional levels, spatially detailed data on the diaspora are often not available in a systematic manner. Innovative data can be used to fill this gap.

This paper paves the way for potential future research. In particular, the use of Facebook’s SCI to measure the diaspora can be further explored. Besides more granular information at the spatial level, Facebook’s SCI can also provide information at high temporal frequency. This can be used to monitor and anticipate changes in the migratory flows in a more timely manner, before the publication of official statistics.

Moreover, Facebook’s SCI can be used in complementarity with the data on migrant stock to provide a more comprehensive analysis of the diaspora. While widely used in the literature, the migrant stock cannot capture all the defining elements of the diaspora, in particular whether meaningful links with the country of origin exist. Facebook’s SCI can indicate the presence of such links, although it does not tell us whether the links indicate a “shared sense of history, identity, or mutual experiences”, nor whether they have been forged by a migration experience that occurred in the current or previous generations. In addition, other important factors can influence migratory flows. The income per capita gap between origin and destination, wage differentials between sending country and receiving country, and a shared language are only some examples of such drivers. Therefore, our future research will focus on the inclusion of Facebook’s innovative indicator in a more complex model to predict migration movements, in addition to data on the diaspora and other traditional indicators, also going beyond the Ukrainian case.

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