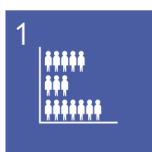


## 8.

Using big data to estimate migration  
“push factors” from AfricaConstantinos Melachrinos,<sup>1</sup> Marcello Carammia,<sup>1</sup>  
Teddy Wilkin<sup>1</sup>

DATA



ADVERSE DRIVERS

**Abstract:** This chapter explores the use of big data to estimate monthly country-level “push factors” of asylum-related migration. It also looks at whether estimates of push factors in countries of origin correlate with traditional data on irregular migration on the Central Mediterranean Route and asylum applications lodged in Italy. The frequency of negative and disruptive events in individual countries was aggregated into a composite Push Factor Index, which strongly correlates with applications for asylum in Europe in 2016 and 2017. However, following the effective closure of the Central Mediterranean Route in 2018 and 2019, this correlation was no longer apparent, showing that the explanatory power of the Push Factor Index is dependent on enabling factors.

**COVID-19 update\***

The European Asylum Support Office (EASO) has invested heavily in modern systems for forecasting asylum-related migration – big data are harvested and analysed with machine learning and, in 2019, a major scenario exercise brought together experts to create scenarios of how international protection may look in the years ahead. No matter how sophisticated the technology or how insightful the participants, neither of these approaches was able to predict the pandemic or its effects on displacement and international protection, nor can they be invoked to simulate the post-COVID-19 world. All forecasting techniques depend on reliable data to feed into quantitative systems, but at the moment, such data are lacking, especially from low-capacity or non-transparent countries. Equally, scenarios require experts to have some knowledge and involvement in similar situations, but the features of this pandemic are unique, and disparate processes are already interacting with each other in complex and unpredictable ways. As a result, predictions are befittingly rare and cautious, but speculative trends are already emerging.

Complete lockdowns were relatively easy to implement – short, sharp, shocks that united entire continents in the face of adversity. Now the challenge in the short term is how to implement and manage divergent easing of the lockdowns across some countries, while others struggle with the virus still taking hold, with potentially divisive effects on displacement, mobility and protection needs. This analysis suggests that two diametrically

\* EASO Special Report Asylum Trends and COVID-19 - Issue 2", published June 2020, available at [www.easo.europa.eu/publications/easo-special-report-asylum-trends-and-covid-19-issue-2](http://www.easo.europa.eu/publications/easo-special-report-asylum-trends-and-covid-19-issue-2).

<sup>1</sup> European Asylum Support Office (EASO).

opposed forces seem to be at work: on the one hand, interrelated effects of the pandemic – such as contracting economies, food insecurity, social unrest, political tensions, hardening societies and deepening divisions between population groups – could result in massive displacements and possibly onward movement towards Europe, including many persons with international protection needs. On the other hand, migration patterns will likely remain highly disrupted, due to restrictions on mobility, possibly coupled with increased digital surveillance. Combined, these two forces raise important questions about the number of people likely to be in need of international protection, and their ability to access protection services, whether or not this occurs in Europe or elsewhere.



## 8.1. Introduction

Events such as conflict, economic hardship, poor governance, deteriorating political situations and social exclusion of marginalized groups have the potential to internally displace entire communities or force them to leave their homes to seek refuge in other countries. The European Asylum Support Office (EASO) uses big data on media-covered events<sup>2</sup> to monitor such events, which are selected and weighted according to the magnitude of the effect they are likely to have on asylum-related migration. In the interests of simplification, and for analytical purposes, these data have been aggregated into a composite indicator for each country of the world, the Push Factor Index (PFI).

The aim of this chapter is to examine whether big data can be exploited to estimate country-level “push factors”<sup>3</sup> of asylum-related migration, and whether such estimates of push factors in countries of origin correlate with irregular migration in the Central Mediterranean Route (CMR). Comparing the PFI with traditional data on asylum-related migration, such as the number of lodged asylum applications, is necessary to ascertain the extent to which signals in the PFI reflect real-world events. The chapter shows that the PFI is a good first step in combining big data with traditional data and extracting insights that are practically useful in the field of asylum-related migration. However, more work is needed to further refine the PFI and better explain the relationship with migration and asylum processes, as described by administrative indices.

This analysis proceeds in the following way. Firstly, in the interests of context, the first section presents a general overview of the situation of asylum-related migration on the CMR in 2019. Subsequently, we introduce the PFI, show recent push factors for African countries, and analyse their relationship with asylum applications and recognition rates in receiving countries that implement the Common European Asylum System as of 2019, that is 27 European Union member States plus Norway and Switzerland (EU+). The final section presents an analysis of push factors in Libya and asylum applications in Italy. The conclusion reappraises the findings and raises questions for future research.

## 8.2. Asylum-related migration along the Central Mediterranean Route in 2019

The CMR<sup>4</sup> is one of the most dangerous migratory routes, as evidenced by the number of deaths recorded by the IOM Missing Migrants Project,<sup>5</sup> with Libya often as the main point of departure. The European Border and Coast Guard Agency (EBCGA) receives data on registered irregular arrivals along the Mediterranean routes.<sup>6</sup> The main nationalities of migrants travelling<sup>7</sup> on each route in 2019 are illustrated in Figure 8.1, which suggests that migrants tended to follow the shortest route towards the European Union. For example, Tunisians and sub-Saharan Africans were mostly registered after arriving on the CMR, whereas Algerians and Moroccans primarily used the Western Mediterranean, and Syrians, Iraqis and Afghans the Eastern Mediterranean route.

<sup>2</sup> The Global Database on Events, Language and Tone (GDELT) Project. Available at [www.gdeltproject.org/](http://www.gdeltproject.org/).

<sup>3</sup> By “push factors” we mean events in countries of origin that have the potential to generate migration or displacement. By using this expression we do not intend to adhere to the push and pull factors framework (Lee, 1966), we just refer to terms of practical use among migration practitioners and analysts.

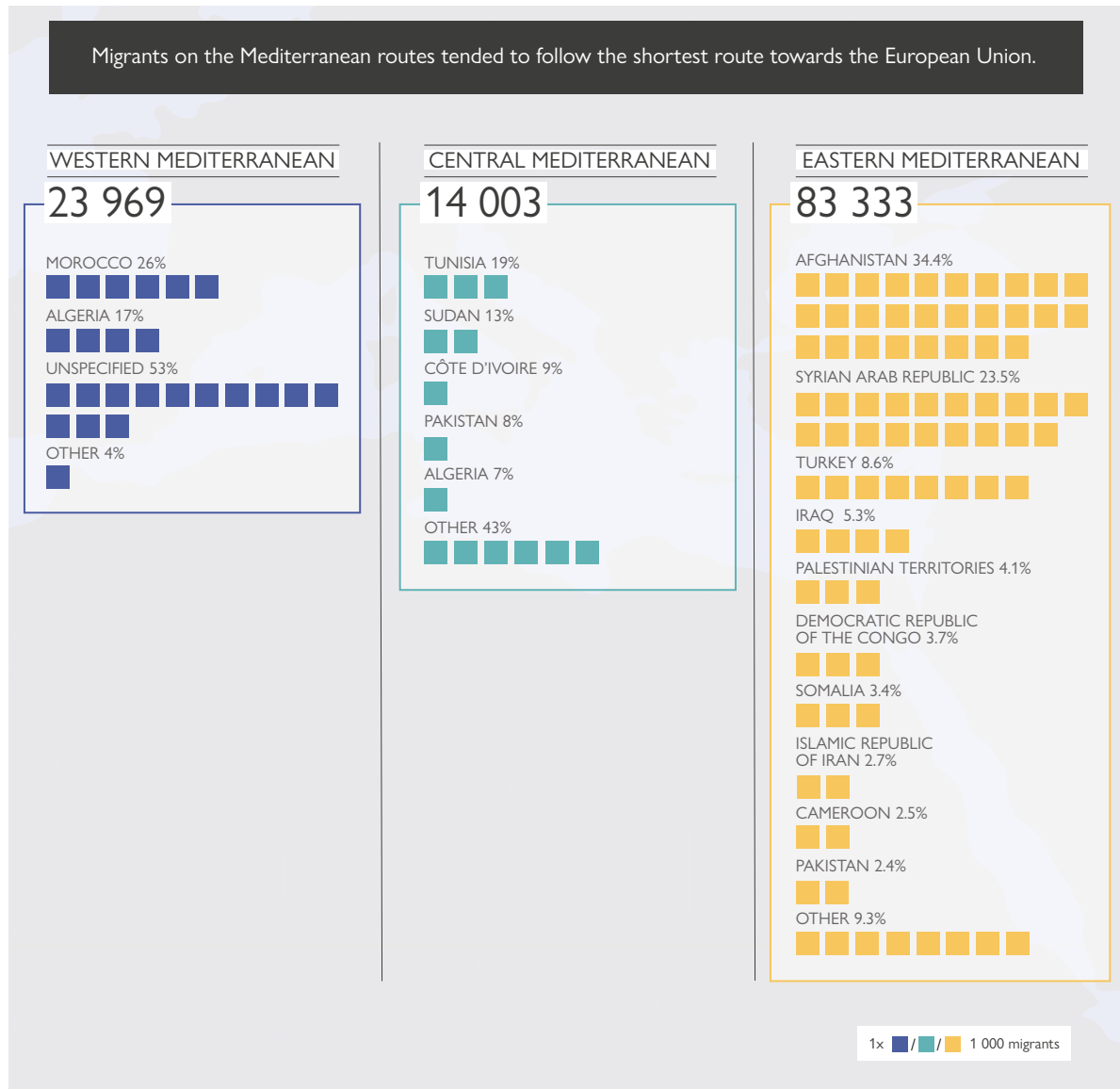
<sup>4</sup> CMR is defined as the route from sub-Saharan Africa to North Africa and then across the Mediterranean Sea, mostly to Italy and to a lesser extent also to Malta (UNHCR, 2018).

<sup>5</sup> Available at <https://missingmigrants.iom.int/region/mediterranean>.

<sup>6</sup> Available at <https://frontex.europa.eu/along-eu-borders/migratory-map/>.

<sup>7</sup> Throughout the paper, any discussion regarding travelling across the CMR refers to detections of arrivals, according to EBCGA.

**Figure 8.1.** Registrations of irregular arrivals in 2019 across the Western, Central and Eastern Mediterranean routes, by citizenship



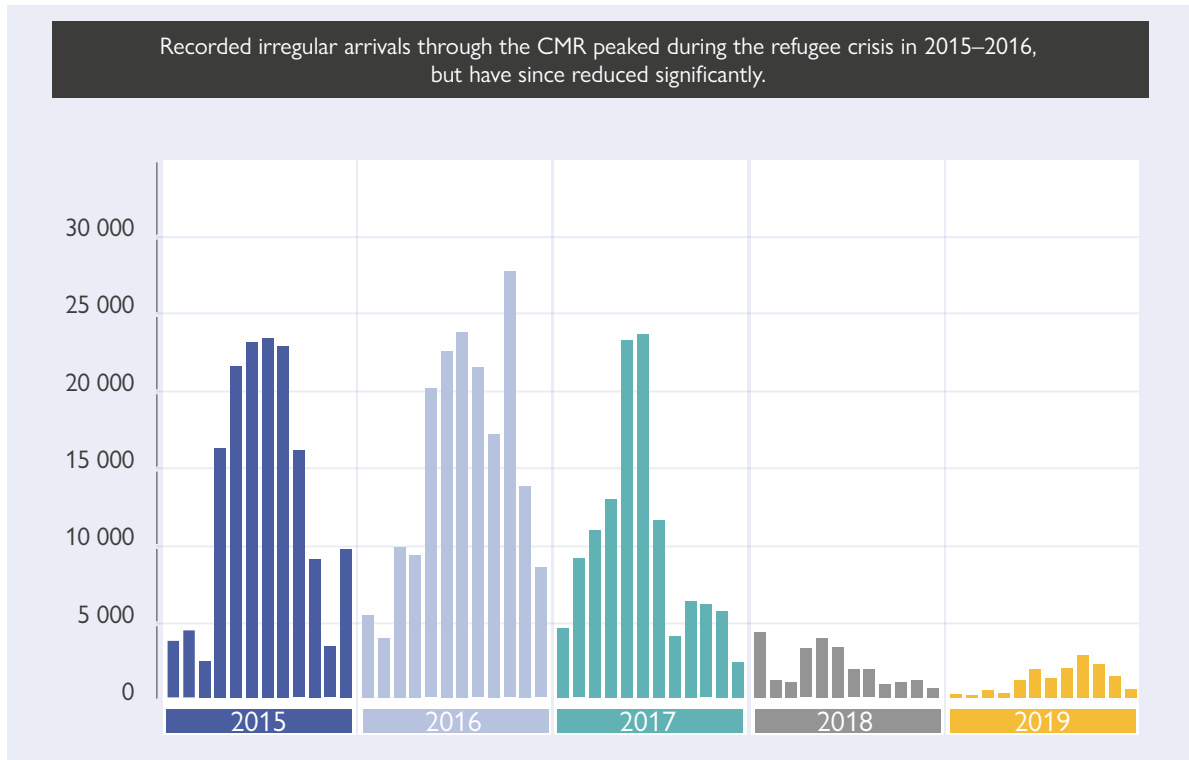
Source: EBCGA.

Note: Percentages refer to the percentage of detections of nationals of each citizenship along each route.

### 8.2.1. Irregular arrivals

Recorded irregular arrivals through the CMR peaked during the refugee crisis in 2015–2016, but have since reduced significantly, as shown in Figure 8.2.

**Figure 8.2.** Monthly flows in the Central Mediterranean Route declined in 2018–2019, due to increased patrolling by Libyan coast guard and decreased search and rescue operations



Source: EBCGA.

In 2019, far fewer irregular arrivals were recorded on the CMR than in 2018 (Figure 8.3), following increased patrolling by the Libyan authorities<sup>8</sup> and restrictions on search and rescue operations in the region. Tunisia also emerged as an important departure country towards the end of 2018<sup>9</sup> when irregular arrivals plunged by 80 per cent, to their lowest level since 2012.<sup>10</sup> In 2019, irregular arrivals on the CMR fell by another 41 per cent, to just 14,000.<sup>11</sup>

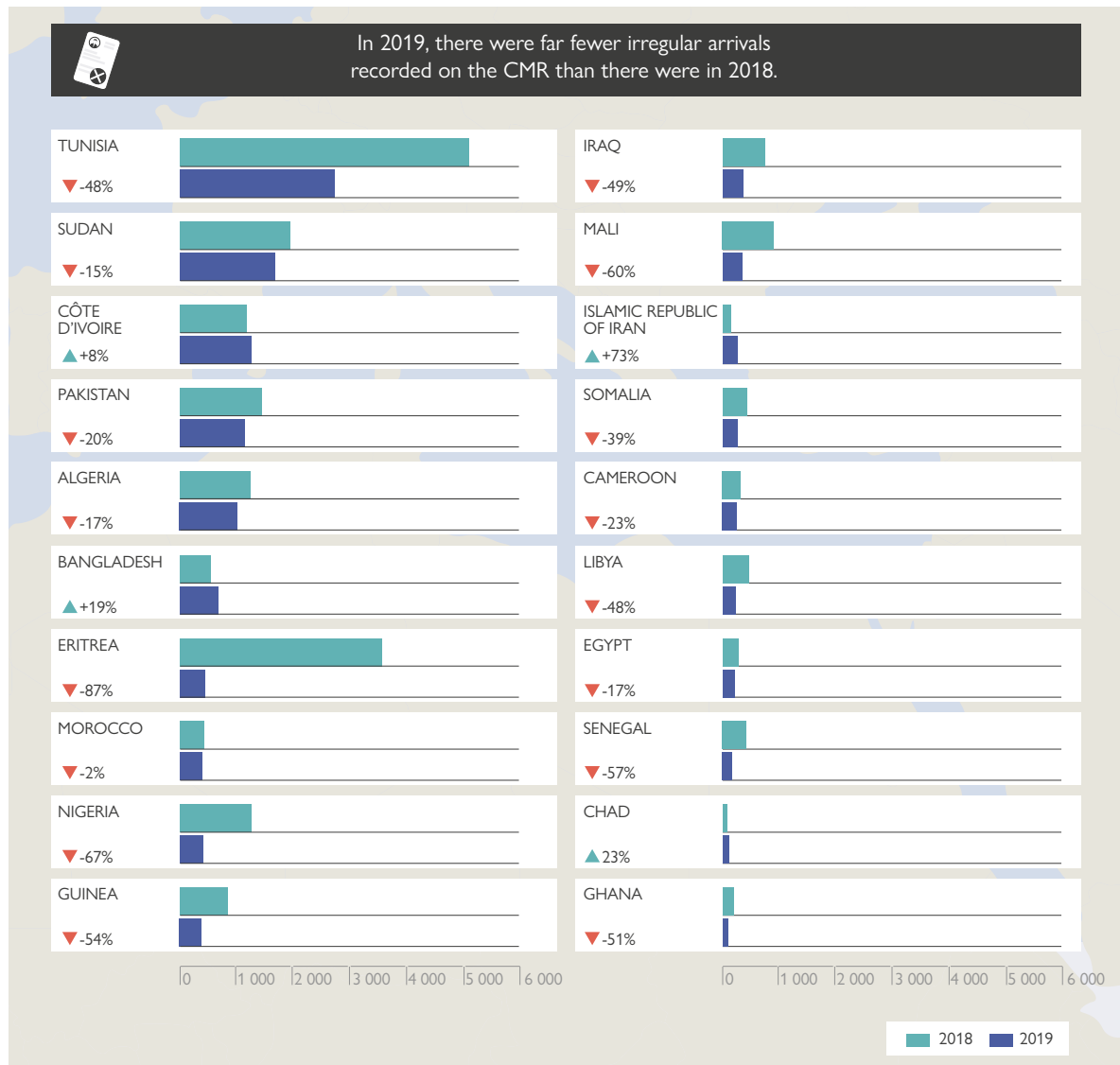
In 2019, the top 20 countries of origin of migrants arriving via the CMR included Northern African, as well as sub-Saharan African countries. Nationals from Tunisia, Eritrea, Nigeria and Mali arrived in lower numbers in 2019 compared with the year before. According to media reports, Tunisians tended to arrive in Sicily (Reuters, 2007), while Algerians tended to arrive in Sardinia (InfoMigrants, 2019; WorldCrunch, 2017), due to geographical proximity. Nationals of sub-Saharan African countries travelled through Libya, while citizens from the Middle East (Islamic Republic of Iran, Iraq) typically arrived on sailing boats from Greece towards Puglia (ANSA, 2019). Citizens of Bangladesh used to arrive in even larger numbers through Libya, whereas Pakistani nationals were split between the Eastern and Central Mediterranean routes, before being diverted via the Western Balkans and Slovenia since the closure of the Central Mediterranean route in 2017.

<sup>8</sup> Frontex FRAN Q2 2018, available at <https://frontex.europa.eu/publications/fran-q2-2018-EkjTNR>.

<sup>9</sup> Frontex Risk Analysis for 2019.

<sup>10</sup> Frontex Migratory Routes, available at [www.frontex.europa.eu](http://www.frontex.europa.eu).

<sup>11</sup> Frontex News Release, 8 January 2020.

**Figure 8.3.** Recorded irregular arrivals in 2018 and 2019 on the Central Mediterranean Route and percentage change between years

Source: EBCGA.

### 8.2.2. Asylum applications

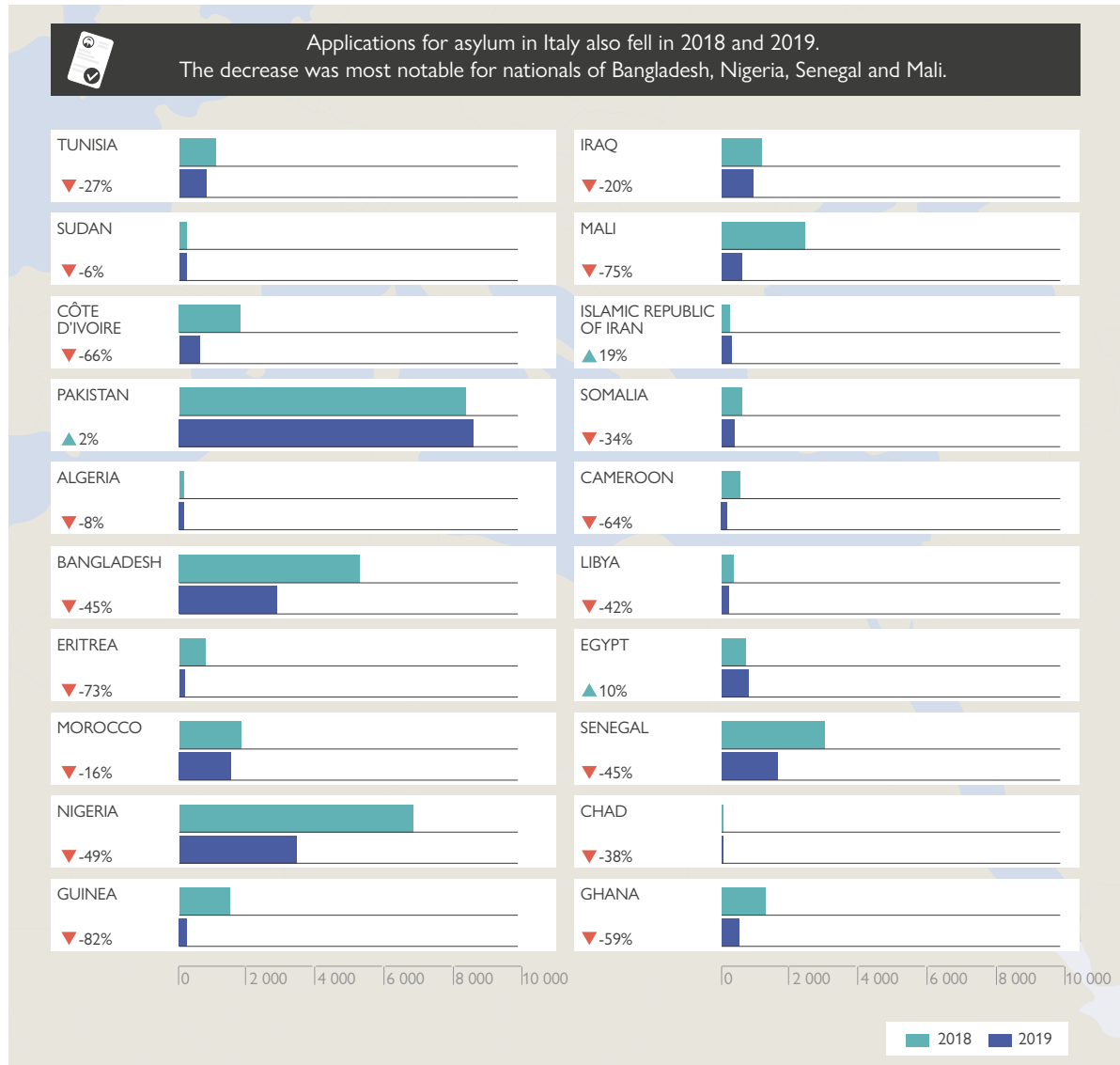
Applications for asylum in Italy also fell in 2018 and 2019. Figure 8.4 illustrates the extent to which nationals of the main countries of origin applied for asylum in Italy, according to public data from Eurostat.<sup>12</sup> The decrease was most notable for nationals of Bangladesh, Nigeria, Senegal and Mali.

Pakistanis lodged similar numbers of applications in 2018 and 2019, but they were not recorded in high numbers on the CMR, which suggests that they arrived via different means. In contrast, asylum applications from nationals of Nigeria and Bangladesh decreased sharply in the period, around 50 per cent. Libyan nationals applied for asylum in much reduced numbers, following the decrease of irregular arrivals on the CMR, suggesting that Libyans may now stay in their country, or seek asylum in neighbouring countries in Africa.

<sup>12</sup> Eurostat data on asylum, comparing annual figures for both years. Available at [https://ec.europa.eu/eurostat/statistics-explained/index.php/Asylum\\_statistics](https://ec.europa.eu/eurostat/statistics-explained/index.php/Asylum_statistics) (accessed 20 March 2020).

Sub-Saharan migrants from countries such as Guinea, Côte d'Ivoire, Cameroon, Mali and Eritrea also arrived in Italy via the CMR in lower numbers (>50%), possibly as a result of the increased interceptions and returns by the Libyan Coast Guard, fewer search and rescue operations in the Central Mediterranean, or both.

**Figure 8.4.** Asylum applications in Italy in 2018 and 2019, with percentage change between the years



Source: Eurostat.

### 8.2.3. Relationship between arrivals on the Central Mediterranean Route and applications for asylum in Italy

Irregular arrivals on the CMR tend to co-vary with asylum applications in Italy, since asylum applications are often lodged upon arrival. Figure 8.5 shows the most commonly recorded citizenships on the CMR and the extent to which their arrivals in 2019 correlate with asylum applications lodged in Italy.<sup>13</sup> Nationals of countries close to the dotted 50:50 diagonal line tended to apply for asylum in Italy in similar numbers as they arrived via the CMR. The

<sup>13</sup> Ibid.

strength of the correlation has been reduced in recent years, pointing to a gradual decoupling of the trends; that is, arrivals who did not apply for asylum and/or applications lodged by those who did not arrive via the CMR.<sup>14</sup>

Tunisia, the Sudan and Côte d'Ivoire occur in the analytical space above the 50:50 diagonal line in Figure 8.5, which suggests that nationals of these countries tended to cross the CMR more often than they applied for asylum in Italy. This could imply that they were not in need of international protection, or they immediately moved to another European Union member State and applied for asylum there instead. In contrast, Pakistan, Nigeria, Bangladesh, Morocco and Senegal occur in the analytical space below the 50:50 diagonal line, which suggests that they tended to apply for asylum in Italy much more often than they were recorded arriving on the CMR, further supporting the hypothesis that they arrive through different routes to Italy, although the lodging of repeated applications may lessen the strength of this conclusion.

**Figure 8.5.** Asylum applications in Italy compared with irregular arrivals on the Central Mediterranean Route in 2019, for selected nationalities



Note: The 50:50 diagonal line denotes equal numbers of asylum applications in Italy and irregular arrivals across the Central Mediterranean Route.

<sup>14</sup> The correlation went down from 0.79 in 2016, to 0.76 in 2017, 0.42 in 2018, and 0.39 in 2019. The interpretation of this finding is not straightforward, as these are different data collections, and do not necessarily point to the same underlying populations.

### 8.3. Big data and “push factors”

Events such as conflict, economic hardship, deteriorating governance, political tensions and social exclusion of marginalized groups have the potential to forcibly displace groups of individuals, or even entire communities, either to other areas within their country of origin, or to other countries where they seek refuge. EASO uses GDELT (see footnote 2), where global print and electronic media reports in more than 100 languages are geolocated and categorized according to their type, as a quantitative source, near to real-time data on geolocated events. These data describe all events in near to real time, once they are reported in the media.

Because not all events have the potential to generate migration, we selected 240 types of events and weighted them according to their severity and their potential effects on outward migration. Events were then placed in five macro categories: political, social, conflict, economic and governance. Examples of political events include demands for release of persons or property, threats, arrests, expulsion and deportation of individuals. Social events include protests, demonstrations and strikes. Conflict events commonly include, among others, the use of conventional military force, mass killings and military occupation. Economic and governance events include trade embargoes or economic sanctions and demands for change in leadership or policy change, respectively. To prevent overestimating the impact of some events due to preferential media coverage, each event is counted once per day, irrespective of the number of articles or mentions of articles referring to that event in the same day. As a result, our estimation of the push factors represents the magnitude of events and not their media coverage. To enable simplification and further analyses, we then aggregated these events to create a country-level composite indicator for each country of the world, the Push Factor Index (PFI).

Although big data may to some extent sacrifice accuracy in the interests of timeliness and coverage, they can provide useful complements to traditional data sources, or cover gaps in administrative collections. The World Bank’s Statistical Capacity Indicator<sup>15</sup> also a composite score, but in this case it describes the capacity of a country’s statistical system. It is based on a diagnostic framework assessing methodologies, data sources, periodicity and timeliness. According to the Statistical Capacity Indicator, there are significant data gaps in migration topics for some countries in Africa, due to either the lack of capacity, lack of resources, or both. The PFI is specifically designed to avoid these gaps altogether, because it can be produced for every country in the world, independently of infrastructure and/or capacity of the national statistical offices.

The 2019 PFI for each country in Africa is shown in Figure 8.6 (left panel). Countries with high PFI include Nigeria, the Sudan, Egypt, Libya and South Africa. However, it is not unreasonable to assume that PFI may depend to some extent on a country’s population size since, in general, more events are generated (and reported in the media)<sup>16</sup> by larger populations. This does not necessarily bias the indicator, as larger populations also generate larger migration potential. When adjusting for the country’s population size, as shown in Figure 8.6 (right panel), Libya, Namibia and Somalia instead are the most prominent, and therefore carry the strongest signal of conflict and disruptive events per capita.

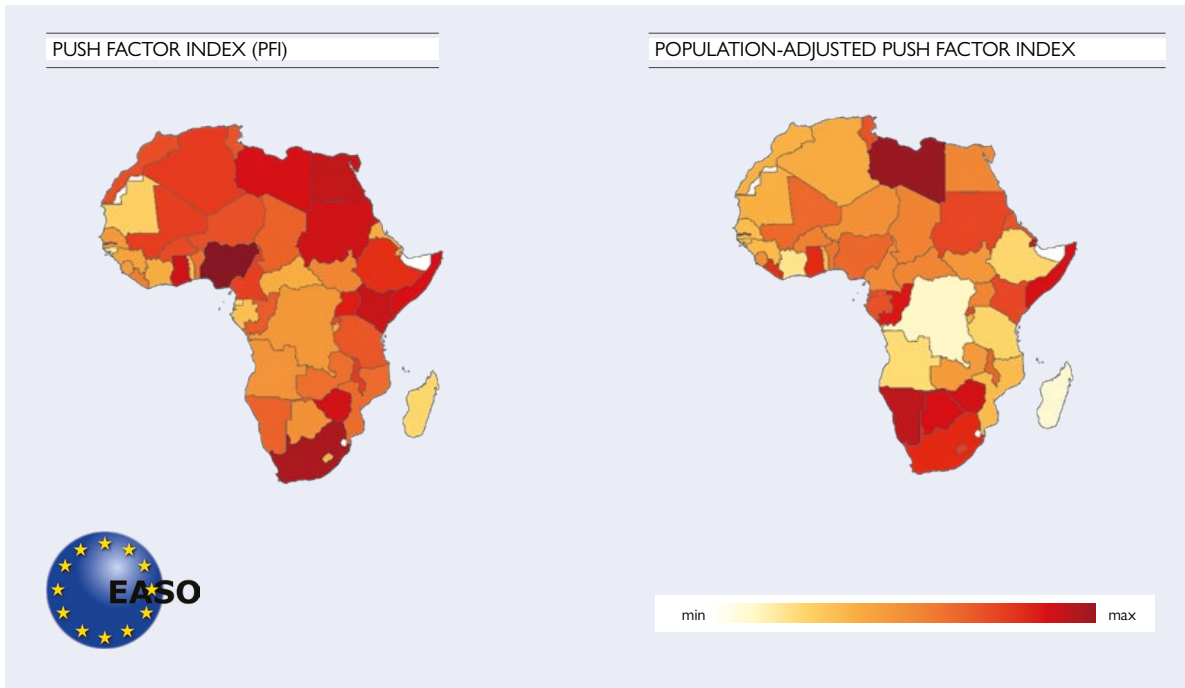
Higher PFI suggests that these countries face more conflict events, social uncertainties or economic hardship that may prompt their citizens to migrate. Be that as it may, whether they do migrate depends on a range of additional factors within and outside of countries of origin, including the willingness and ability to travel, the existence of accessible routes or smuggling networks, diasporas or migration networks, as well as the financial resources needed for the trip.

<sup>15</sup> Available at <http://datatopics.worldbank.org/statisticalcapacity>.

<sup>16</sup> The impact of possible media reporting gaps on the PFI is beyond the scope of this study.



**Figure 8.6.** EASO Push Factor Index in Africa for 2019 (left panel) and population-adjusted Push Factor Index for 2019 (right panel), with darker shades indicating higher values of the Index

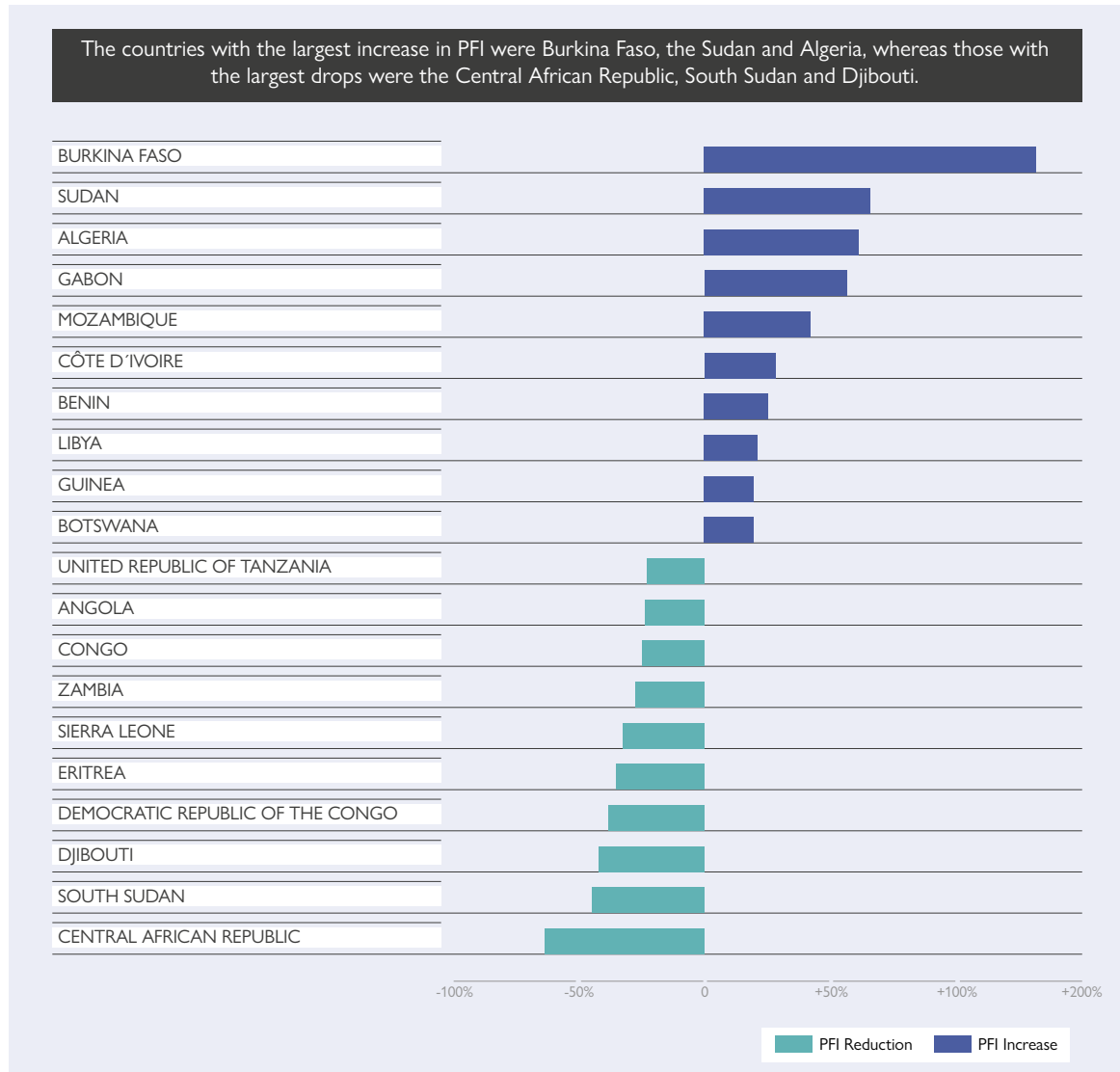


Note: This map is for illustration purposes only. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the International Organization for Migration.

In 2019, the PFI for Africa as a whole decreased by just five percentage points from 2018, down in 28 countries, but up in 13 countries. The countries with the largest increase in PFI, as shown in Figure 8.7, were Burkina Faso, the Sudan and Algeria, whereas those with the largest drops were the Central African Republic, South Sudan and Djibouti.

A PFI rise in these countries could be associated with a deterioration in the security situation, as in Burkina Faso. After the collapse of the regime and the people power revolution in 2014 (Council on Foreign Relations, 2019), hundreds of attacks have been registered in the country (The New Humanitarian, 2019a), which since 2019 is facing a surge in violence caused by terrorism activities spilling over from neighbouring countries and indigenous militia (The New Humanitarian, 2019b; BBC, 2020a). In 2019, peace talks resumed in the Sudan after a standstill of about two months. Still, there are 2 million people internally displaced, the economic situation continues to be critical, and violence has erupted between communities in West Darfur (The Economist, 2019; IOM, 2019; UN News, 2019; UNHCR, 2020). In Mozambique, 1.6 million people are facing severe food insecurity, due to two major weather-related disasters that affected the country. In addition to that, economic grievances and political powerlessness to face internal security threats have put the country's stability at risk (FAO, 2019; RFI, 2020). Gabon, one of Africa's richest countries, thanks to its natural resources, foiled an attempted military coup against President Ali Bongo, who has ruled the country for over four decades (BBC, 2019; RFI, 2019; Human Rights Watch, 2020). Civil protests can also influence the PFI, as was the case in Algeria. A peaceful civilian movement took to the streets of several cities for Friday protests, marching against the ruling class and asking for new elections and the reshaping of the entire governing system (Foreign Policy, 2019).

**Figure 8.7.** Push Factor Index percentage change between 2018 and 2019 for the countries with the biggest change in Africa

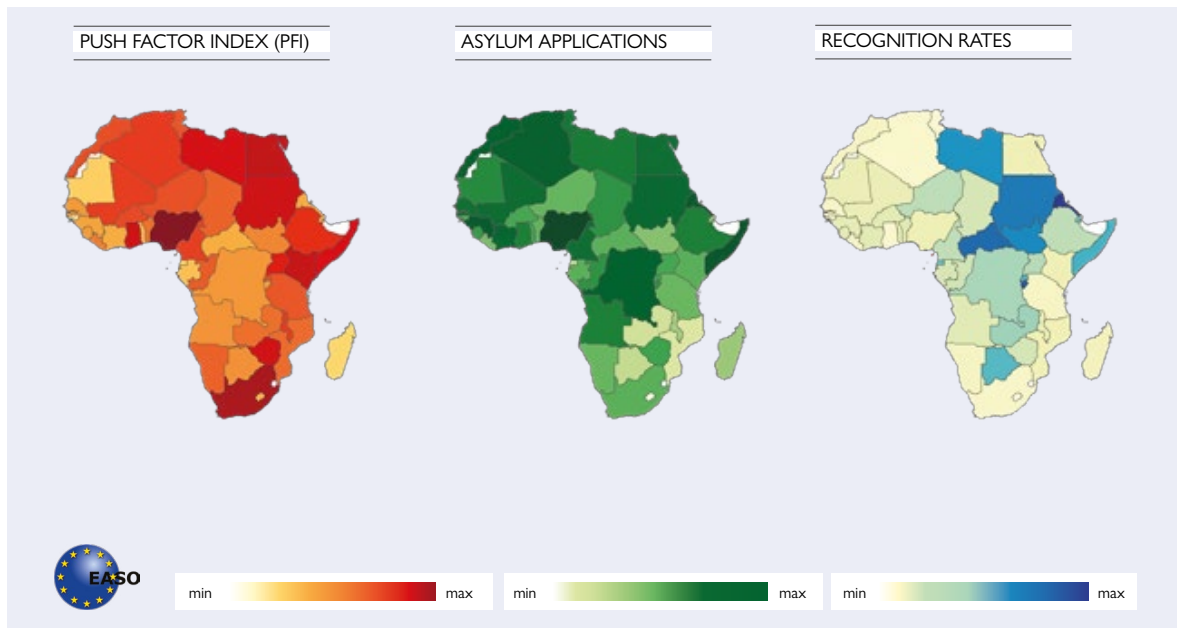


### 8.3.1. The big data PFI and its relationship with asylum applications and recognition rates in the EU+

The big data PFI is again shown in Figure 8.8 (left panel), but this time alongside the number of asylum applications lodged in the EU+ by nationals of each country (middle panel) and their European Union-regulated recognition rate<sup>17</sup> in 2019 (right panel). Despite the many other factors that affect asylum-related migration, and even though there is a time lag between departure, application and decision, nationals of countries with high PFIs tend to lodge more asylum applications, and their applications tend to have a higher recognition rate. This is an important finding, pointing to the reliability of the PFI as a measure of migration-generating events in countries of origin, and to the usefulness of monitoring those events.

<sup>17</sup> Asylum recognition rate is defined as the share of positive decisions in the total number of asylum decisions at first instance. See [https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Asylum\\_recognition\\_rate](https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Asylum_recognition_rate).

**Figure 8.8.** The Push Factor Index (left panel), asylum applications (middle panel) and recognition rates (right panel) for African countries for 2019, with darker shades indicating higher values.



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.

For example, Libya and the Sudan had high PFIs, mostly due to conflicts taking place in these countries, plus nationals lodged many asylum applications in the EU+ and had high recognition rates. In these cases, changes in the PFI may even be used to foresee movements of populations in need.

In Nigeria and Egypt, the PFI was also high, and citizens of these countries lodged many asylum applications in the EU+, but the recognition rate tended to be low. This might be because the PFI was largely generated by economic or political issues rather than those clearly indicating a possible need for international protection.

Nevertheless, some exceptions occur. The PFI was low in South Sudan, the Central African Republic and Eritrea, even though citizens of these countries had high recognition rates; moreover, Eritrean was the only citizenship in this group lodging many asylum applications. This may indicate that nationals from these countries faced more push factors in the past, and that there was a considerable time lag between departure, arrival in the European Union and decision; or that there were additional push factors not considered in the PFI, or that media coverage was more limited compared with other countries in Africa, and/or that nationals from these countries may not have been able to migrate, or migrated to other destinations outside the EU+.

Figure 8.9 shows how PFI correlates with the number of applications for asylum in EU+ for African citizenships<sup>18</sup> for each year from 2016 to 2019. Overall, the relationship is positive. In other words, countries with higher PFI tend to have citizens who lodge more applications for asylum in the EU+, and vice versa.

Although the extreme complexity of asylum-related migration means that no single indicator can entirely explain or predict the phenomenon, the PFI, which can be updated on a daily basis, provides a useful estimation of the root causes of asylum-related migration, and it delivers a sensible framework for predictive analyses. Comparing PFI in 2016 and 2017 with number of asylum applications lodged by nationals of African countries, some 21 per cent of the variation in applications is explained by differences in push factors. However, in 2018 and 2019, this drops to just 7 per cent.<sup>19</sup> The decoupling between the PFI in African countries and migration to EU+ points to the potential effect of relevant factors different from events in countries of origin, including events or policies in countries of transit

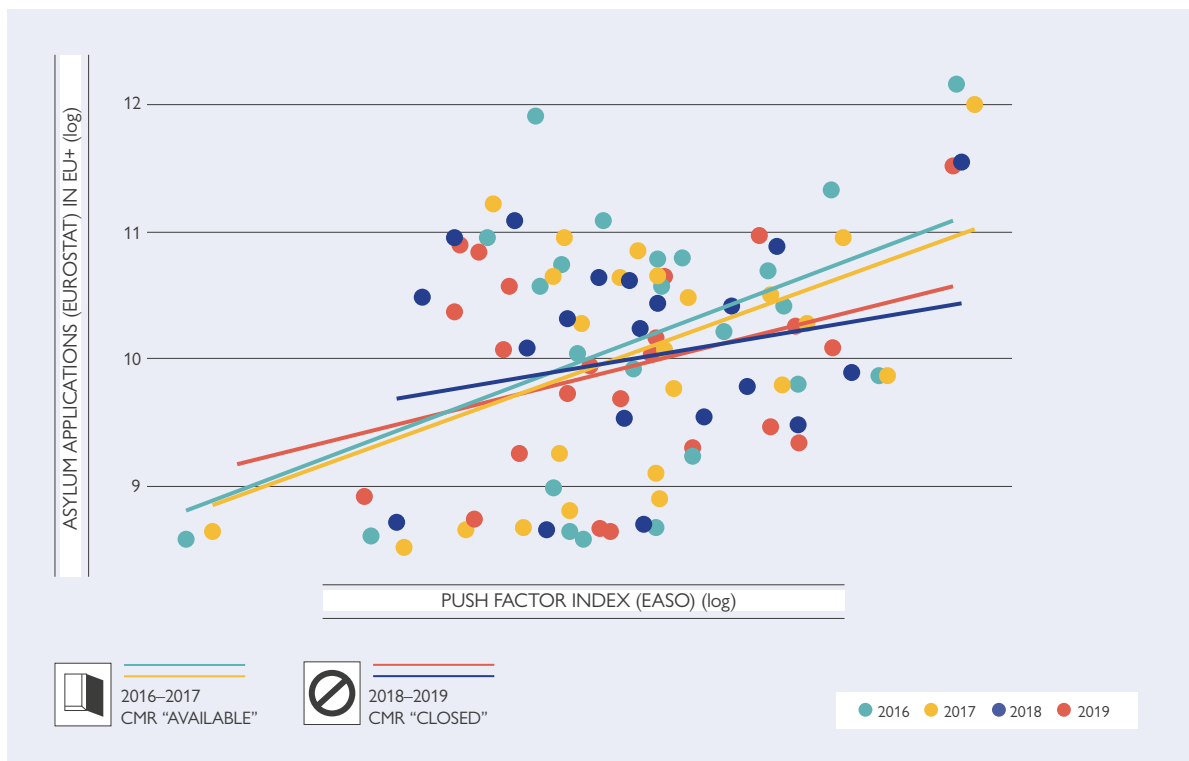
<sup>18</sup> African citizenships with more than 1,000 asylum applications in the EU+ in 2019 are included in the sample.

<sup>19</sup> The correlation coefficient decreased from 0.45 ( $R^2$  0.21) in 2016 and 0.46 ( $R^2$  0.21) in 2017, to 0.24 ( $R^2$  0.06) in 2018 and 0.27 ( $R^2$  0.07) in 2019.

and destination. This seems to have been the case for increased patrolling by the Libyan coast guard and reduced search and rescue operations along the CMR, which had the effect of decreasing the explanatory power of the PFI in the CMR: flows through this route have decreased substantially, despite the persistence of the push factors at home.

This illustrates the importance of the CMR for asylum-related migration into the EU+ from African nationals. At the same time, it shows that the PFI, itself an aggregation of push factor events covered in the media, can contribute to the understanding of asylum-related migration, when the route is available. Further studies are needed to establish alternative or complementary explanations, such as whether asylum seekers are looking for alternative routes, arriving to the EU+ later; whether they seek alternative destinations outside the EU+; or whether they are stuck in Libya or returned to their countries for lack of an available route to asylum.

**Figure 8.9.** Push Factor Index of African countries correlated with the number of asylum applications lodged in the EU+, 2016–2019



Note: PFI of African countries was generally correlated with the number of asylum applications they lodged in the EU+. However, the relationship was strong in 2016 and 2017, when the CMR was available, and was weaker in 2018 and 2019, when the Route became much less available. Each bullet denotes a different African citizenship in each year.<sup>20</sup>

## 8.4. Libya in the Central Mediterranean Route

Libya is the main country of embarkation on the CMR and has been a destination country for many migrants within and beyond the region (European Council, n.d.), even in recent years, when the present civil war has escalated.

Since 2011, rival governments have been competing for power over the country. On one side, the western-based, Tripoli-led, internationally recognized Government of National Accord (GNA) controls the western regions, while a coalition called the Arab Libyan Armed Forces, formerly known as the Libyan National Army, holds most of the oil-producing wells in the eastern districts (Reuters, 2019a). Outside parties – namely Turkey and the Russian Federation,

<sup>20</sup> PFI is a composite index aggregating big data from media reports; hence it does not make sense to add scale.

each supporting opposite factions, but also other Arab countries such as Saudi Arabia and Egypt – are also currently involved in the conflict, with possibly common economic geostrategic interests in the area (International Crisis Group, 2020a). Turkey authorized the deployment of forces to support the GNA, which was losing strength against the Haftar-led troops (The Guardian, 2020) and led to Sirte being seized by Haftar forces in January 2020, soon after Turkey deployed troops in support of the GNA (BBC, 2020b). Still, Turkey and the Russian Federation called for a ceasefire agreement at the beginning of 2020, getting support from both Libyan sides before the Arab Libyan Armed Forces leader refused to sign at the last moment (International Crisis Group, 2020b). In the meantime, the escalating instability and insecurity in the country exposes migrants and asylum seekers – as well as Libyan citizens, who may have to find international protection outside their country – to high risks and casualties, such as the fatal airstrike on a detention centre in July 2019, when 53 people were killed and more than 80 were injured (UN News, 2020).

#### 8.4.1. Push Factor Index in Libya and asylum applications in Italy

Push factors in transit countries are expected to influence asylum applications in the EU+, more notably countries of first arrival/disembarkation, such as Italy and Malta, regarding the CMR. To investigate this hypothesis, it is possible to compare the PFI within Libya, the main country of departure in the CMR, and the asylum applications lodged by nationals of the main countries of origin that pass by or reside in Libya.

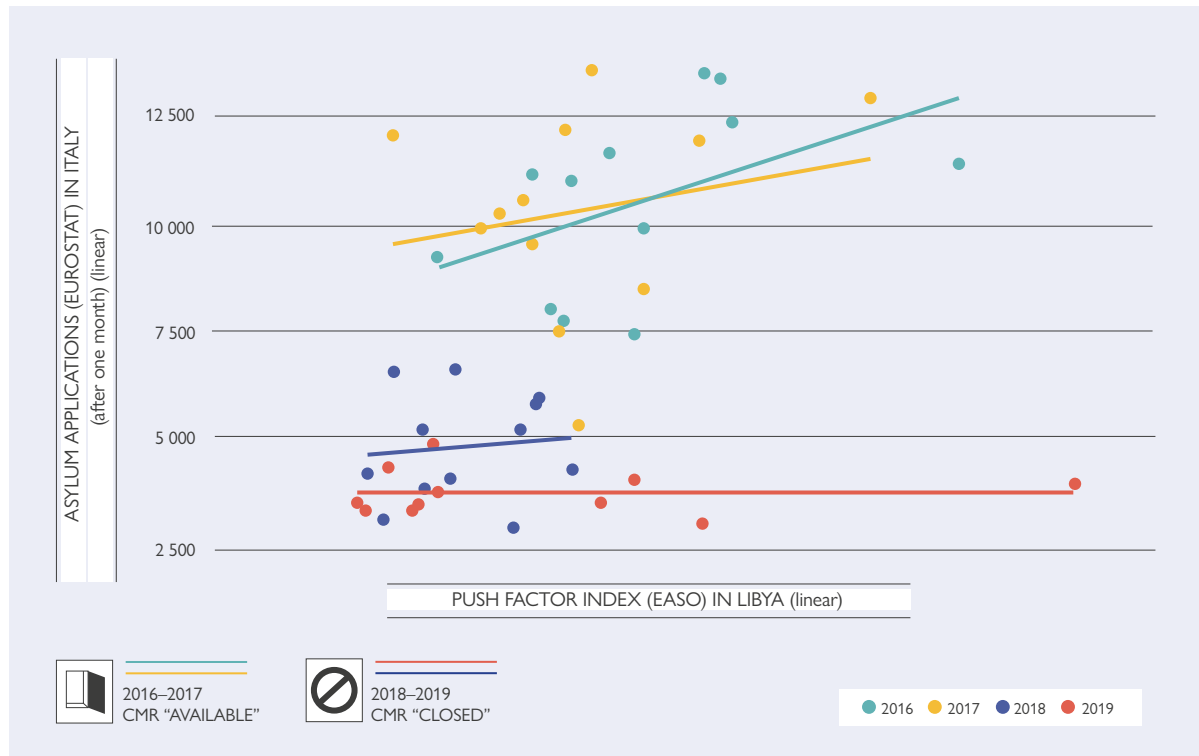
Figure 8.10 shows the relationship between PFI in Libya during one month, and asylum applications in Italy during the following month since January 2016, separated by year. The PFI in Libya and asylum applications are correlated in 2016 and 2017, suggesting that an increase in push factors in Libya may lead to an increase in the number of asylum seekers entering Italy and applying for asylum there; however, the correlation falls off in 2018 and 2019. Quantitatively, and despite the multitude of factors affecting migration, push factors in Libya explained 22 per cent of the number of asylum applications in Italy in 2016, but this decreased to 4 per cent in 2017 and virtually 0 per cent in 2018–2019.<sup>21</sup> This suggests that, while the PFI in Libya could partly explain the number of asylum applicants in Italy for as long as the CMR was available, it has no longer done so since 2018, when search and rescue operations decreased in the region and the route was closed.

These results further reinforce the explanatory power of the PFI towards asylum-related migration in the EU+, by focusing on the PFI in a country of embarkation (Libya) and the asylum applications in a country of first arrival (Italy) with a lag of one month, as shown for 2016 and 2017.<sup>22</sup> Since the closure of the CMR, however, the explanatory power of the PFI has been reduced. This may be because asylum seekers no longer use this route to enter the EU+ and need to seek alternative routes or alternative destinations, which would take longer than the one-month lag to manifest. Further investigation is necessary to investigate the role of these and other confounding factors.

<sup>21</sup> The correlation coefficient decreased from 0.47 ( $R^2$  0.22) in 2016, to 0.20 ( $R^2$  0.04) in 2017, 0.12 ( $R^2$  0.01) in 2018, and -0.01 ( $R^2$  0.0001) in 2019.

<sup>22</sup> We also analysed different time lags, notably of 1, 3, 6 and 12 months.  $R^2$  are 0.16, 0.13, 0.14 and 0.25 for all years together. The 12-month delay seems to maximize the relation, but it does not include 2019, when the route was effectively closed and the  $R^2$  was especially low. Doing the numbers per year shows a similar picture to the one month (0.22, 0.04, 0.01, 0.001 for 1-month; versus 0.19, 0.00, 0.13, 0.12 and very low correlations for 3 months; versus 0.04, 0.01, 0.04, 0.43 and negative correlation in 2016 for 6 months; versus 0.03, 0.11, 0.07 for 12 months). The year 2019 had relatively stable asylum applications, so including it is what makes the  $R^2$  lower for the lag of one month. Overall, it makes sense as a lag considering the travel time from Libya to Italy.

**Figure 8.10.** Push Factor Index in Libya correlated with the number of asylum applications lodged in Italy, 2016–2019

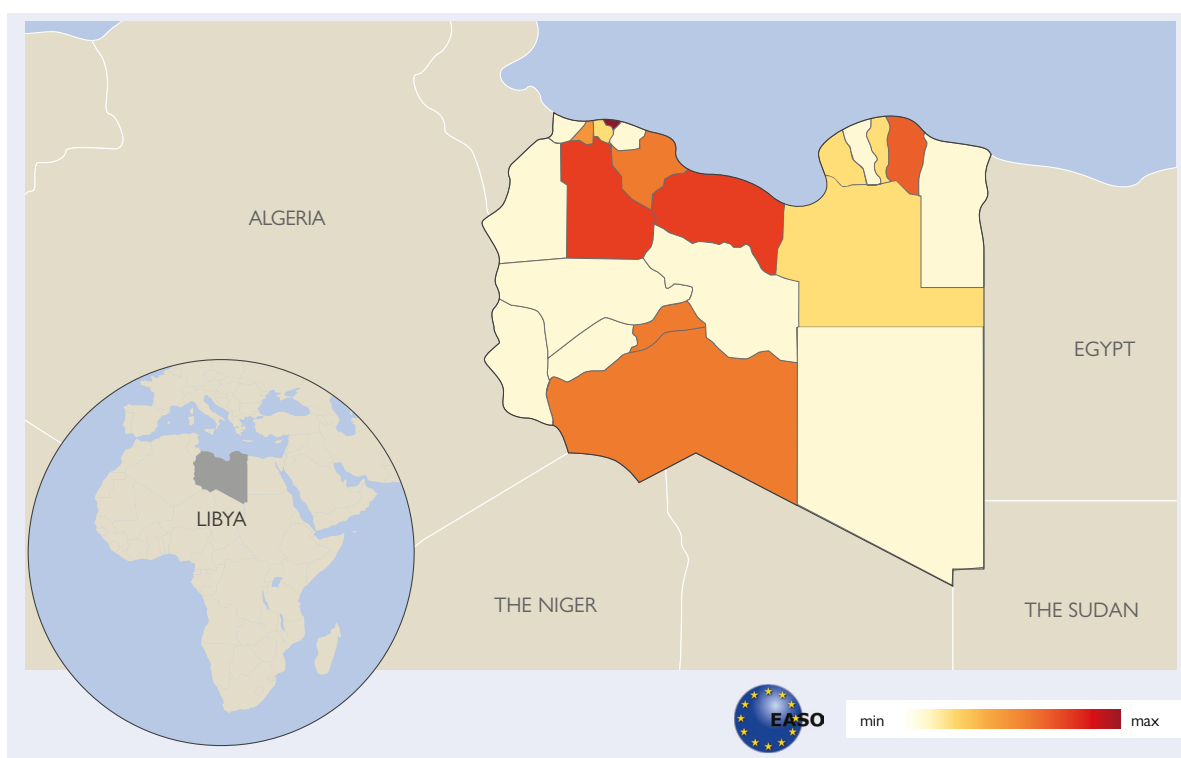


Note: PFI correlates with asylum applications in Italy during the next month, for the years 2016–2017, but the relationship atones in 2018 and 2019. Each bullet denotes one month in the respective years.<sup>23</sup>

## 8.4.2. Push Factor Index subnational map

The PFI offers the possibility to extract negative and disruptive events from big data on push factors also at the subnational level, allowing a more nuanced view of the conflict factors to emerge from the data. Figure 8.11 shows the absolute value of the PFI in Libya in 2019, separated in districts (shabiya) of Libya. PFI is highest for Tripoli, which is the capital, the most densely populated area, and the target of Libyan National Army advances in 2019 (Reuters, 2019b). Other notable districts with high PFI in 2019 include Sirte and Jabal al Gharbi, important for their strategic location because of oil fields and pipelines, where battles occurred in 2019 (DW, 2020). Several sparsely populated districts, away from points of strategic importance, exhibit low PFI, whereas the district of Murzuq in the South has seen violence from Islamic State and the Levant militants and United States strikes against them (New York Times, 2019), which contributed to its higher PFI.

<sup>23</sup> PFI is a composite index aggregating big data from media reports; hence it does not make sense to add scale.

**Figure 8.11.** Push Factor Index in Libya in 2019, with darker shades indicating a higher Index

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.

The subnational PFI map in Figure 8.11 offers a snapshot of the push factors in Libya in 2019. Because of effective Libyan Coast Guard patrolling of its territorial waters and the ongoing civil war possibly affecting migrant smuggling networks, the number of migrants departing from Libya was at its lowest levels for the past several years, also evidenced by the decrease in the number of asylum applications from Libyan nationals in Italy.

## 8.5. Conclusion

The PFI, elaborated by EASO based on big data on media-covered events in origin countries, correlates in significant and interesting ways with official statistics on irregular arrivals in EU+ countries, the number of asylum applications lodged there, and the recognition rates. The present study analyses the relation between the PFI and asylum applications by nationals of African countries, while showing the effects of the decrease in search and rescue operations in the CMR in the number of migrants travelling through this route.

While before 2018 asylum applications in Italy were correlated with push factor events occurring the previous month in Libya, this changed when the CMR became less viable. Indeed, even at the level of the African continent, the PFI was more strongly correlated with asylum applications from African nationals in the EU+ during 2016 and 2017 than in 2018 and 2019, when the CMR was effectively closed. The focus on Libya confirmed the correlation between push factor events and asylum applications while the route was more accessible. It also highlighted how the analysis of the PFI at the subnational level can illustrate hotspots of push factors or conflict, which could support operations and research in the countries of origin.

Because it can be produced for every country in the world, independently of infrastructure and/or capacity of the national statistical offices, the PFI can be a useful complement to official statistical and moderate gaps in migration data that affect other studies. Moreover, the availability of the PFI in close to real time makes it a relevant tool for monitoring the situation in countries of origin and the varying potential for migration, thus supporting better preparedness in countries of destination.

While this chapter provides some evidence in favour of the usefulness of the PFI, a number of additional analyses would be needed to further corroborate the Index and better understand how and to what extent it contributes to monitoring, understanding and anticipating migration and asylum flows. These analyses, which go beyond the scope of this chapter, would include, for example, testing the robustness of the PFI, as well as comparing it with other indices and datasets, such as the Peace Research Institute Oslo (PRIO) data on conflict, the Fragile States Index, and other similar sources of event data, such as the Armed Conflict Location and Event Data Project (ACLED).

Although further studies are necessary to better understand the relationship between push factors and asylum-related migration and the strong impact of enabling/intervening factors, the PFI is a first step in combining big data with traditional data and extracting insights that contribute to research and are practically useful in the field of asylum-related migration.



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