The Impact of Sea Rescue on Irregular Migration *

PRELIMINARY DRAFT. PLEASE DO NOT CITE OR CIRCULATE.

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Abstract

This paper investigates how sea rescue operations affect irregular migration behavior in which humans are willing to risk their lives in an attempt to reach the European Union. We study this question from two complementary perspectives. First, we identify the contemporaneous effect of sea rescue vessel presence in the Central Mediterranean on attempts by migrants to cross the Mediterranean from North Africa. To do this, we combine georeferenced data on vessel positions based on satellite tracking with information about crossing attempts. Our identification strategy exploits postponements of NGO rescue missions due to port blockades, distant port assignments, and quarantine restrictions as plausibly exogenous shocks in the number of civil sea rescue vessels present close to departure locations in North Africa. We also use event studies that leverage policy-induced displacement of NGO vessels away from North African shores to study the effects of sea rescue on irregular migration behavior. Preliminary findings show that the policy led to a sharp drop in departures from Libya. Second, acknowledging that the vast majority of those who face the decision to cross the Mediterranean have already taken the initial decision to migrate, we analyze how the provision of sea rescue affects the decision-making of potential migrants in origin countries. Using an original online survey in Nigeria, we analyze the distribution of beliefs about sea rescue in a population with a high incidence of irregular migration and examine how correcting these beliefs affects migrants' perceptions of the migration journey and their intentions to migrate to Europe.

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1 Introduction

The Mediterranean Sea has become the main route for irregular migration to the European Union (EU). According to the International Organization for Migration (IOM), since 2016, 1.2 million people have arrived in Europe by crossing the Mediterranean, and about 20 thousand people died in their attempt to reach European shores.[1] Besides the Aegean Sea, the central Mediterranean is the most important migration route and, despite its short distance, one of the deadliest in the world (McAuliffe and Ruhs 2018). In the aftermath of the Arab spring, European countries and the EU reacted to the increased drowning in the Mediterranean by setting up well-funded search and rescue (SAR) operations. Over the years, these SAR missions were terminated or superseded by smaller operations with the explicit mandate of border control rather than sea rescue. Trying to fill this gap left behind by European governments, civil rescue organizations have taken on a growing responsibility in the Mediterranean Sea (Cusumano and Villa 2021, 28).

Sea rescue, particularly civil sea rescue by non-governmental organizations, has been a central point of political and humanitarian contention in the European discourse on how to respond to increasing migration inflows. A widely discussed argument against the provision of sea rescue is that SAR activities encourage more irregular migration attempts, eventually leading to more deaths among migrants *en route*. This widely held claim arguably led to the downshift of official sea rescue missions although its empirical validity remains contested.

Analyzing the relationship between sea rescue activities and irregular migration has proven challenging due to data limitations and obvious simultaneity and omitted variables issues. Two recently published papers analyze the effects of sea rescue activities on irregular migration flows in the Central Mediterranean, yielding contradicting results. Deiana et al. (2024) devise a structural model of irregular migration behavior and estimate it using data on migrant crossings and weather conditions at the daily level. Their findings indicate that more intense SAR operations result in higher crossing attempts in worse weather conditions and increased usage of rather unseaworthy boats, eventually overcompensating the perceived ex-ante security benefits from sea rescue. In contrast, employing a Bayesian predictive modeling approach in combination with data at the monthly level, Rodríguez Sánchez et al. (2023) find that irregular migration attempts are no higher during periods with intense SAR missions than during periods without SAR missions.

Building on this literature, this paper investigates how sea rescue operations affect irregular migration behavior in which humans are willing to risk their lives in an attempt to reach the

1. Data available at: https://migration.iom.int/europe/arrivals.

European Union (EU). We study this question from two complementary perspectives. First, we analyze the contemporaneous effect of the presence of sea rescue vessels in the Central Mediterranean on attempts of irregular migrants to cross the Mediterranean from North African to European shores. We address several data limitations of existing studies that rely on time-series data of crossing attempts and SAR intensity by employing a geo-referenced data set providing high-frequency vessel position data from the Automated Identification System (AIS). We combine these data with daily information on crossing attempts of migrants from North African shores across the Central Mediterranean. To establish causality, we exploit the so-called Minniti code, a policy implemented by the Italian government in July 2017 that virtually prevented NGO vessels to enter the Libyan Search and Rescue area.

Second, acknowledging that the vast majority of those who face the decision to embark on the the crossing of the Mediterranean have already made the initial decision to migrate, we analyze how the provision of sea rescue activities may affect decision making of potential migrants in destination countries. To investigate this, we field an original online survey to respondents in Nigeria, the largest origin country of irregular migrants crossing the Central Mediterranean since 2016. In this survey, we study how beliefs about migration risks in general and sea rescue in particular are distributed in a population with high irregular migration incidence. We embed an information provision experiment in the survey that randomly informs respondents about the presence of sea rescue operations in the Mediterranean to analyze how sea rescue policy affects migrants' beliefs about the migration journey and migration aspirations to Europe.

Our preliminary findings show that there is a strong positive correlation between the number of sea rescue vessels active at a given departure location and migrant crossing attempts, even after controlling for many conceivable sources of unobserved heterogeneity. Exploiting the Minniti code in a difference-in-differences event study model, we find that the policy led to a considerable displacement of NGO vessels away from Libyan waters and resulted in a sharp drop in crossing attempts from Libya.

This paper makes several contributions to the literature. First, it provides rigorous evidence on a highly politically relevant question, for which we currently have inconclusive and partly contradictory empirical evidence: the effect of sea rescue on irregular migration. Extant research is either descriptive (Cusumano and Villa 2021; Steinhilper and Gruijters 2018), relies on indirect identification of the effect of sea rescue activities on irregular migration behavior (Battiston 2022; Deiana et al. 2024), employs aggregate time-series data (Rodríguez Sánchez et al. 2023), and overall produce inconclusive results. On the one hand, Deiana et al. (2024) find that more intensive SAR operations are causing smugglers to increasingly rely on cheaper,

unseaworthy inflatable boats in adverse weather conditions. They also show that crossing attempts from Libya drop as a result of a mandatory policy of the Italian government that restricted NGO vessels to conduct SAR missions within the Libyan SAR area. Similarly, Battiston (2022) shows that the closer vessels operate to the Libyan coast, the more migrants attempt to cross in following week. Zambiasi and Albarosa (2024) investigate the effects of the 2017 migration deal between Italy and Libya that mandated the Libyan Coast Guard (LCG) to conduct SAR activities in the Libyan rescue zone on the likelihood of migrant boat disasters. Their findings suggest that migration flows were diverted away from the Central Mediterranean to the Western Mediterranean route as a result of the decrease in SAR provision by European rescue vessels. On the other hand, employing a Bayesian predictive modeling approach, Rodríguez Sánchez et al. (2023) find that sea rescue activities do not induce irregular migration to Europe, corroborating findings from correlational analyses (Cusumano and Villa 2021; Steinhilper and Gruijters 2018). We extend these previous approaches by employing high-frequency geo-referenced data on civil sea rescue vessel positions in the Mediterranean Sea to accurately measure the daily, place-of-departure-specific variation of sea rescue operations. Second, we contribute to the burgeoning literature on irregular migration in the Mediterranean Sea. Besides the above mentioned studies, researchers have investigated the role of the falldown of the Gaddafi regime in Libya on migrant smuggling activities (Friebel et al. 2024). Fasani et al. (2019) investigate the effect of European border enforcement policies on migration flows and refugees' welfare. Third, we contribute more broadly to the literature on the drivers of irregular migration (e.g., Bah and Batista 2020; Bah et al. 2022; Czaika et al. 2021; Hager 2021). We specifically contribute to studies analyzing the role of risks along the migration journey in the decision making of potential irregular migrants to Europe (e.g., Beber and Scacco 2022; Detlefsen et al. 2022; Bemmel 2020). Third, we contribute to a literature in particularly behavioral economics that investigates how individuals' beliefs about the real world affect attitudes and behavior (see for an overview, Haaland et al. 2023). In the field of migration research, there is a large number of studies on how perceptions (especially about migration risks) and information feature in migration decisions. Most of these studies focus on the effectiveness of informational campaigns in countries of origins which aim at deterring individuals to migrating to Europe irregularly (e.g., Morgenstern 2023; Tjaden and Gninafon 2022). These informational campaigns are by definition designed to correct misperceptions about the migration journey along multiple dimensions, making claims about causal mechanisms infeasible. In contrast, this paper is, to the best of our knowledge, the first one to exogenously correct misperceptions about a specific migration policy, sea rescue in the Mediterranean.

2 Rescuing Migrants in the Mediterranean Sea

Rescuing migrants and refugees in distress at sea has been a political and public issue since at least the *International Convention on Maritime Search and Rescue* in 1979. Civil sea rescue exists longer than the current humanitarian crisis in the Mediterranean.[2] However, it became a defining issue in the European discourse on flight and migration only in the second decade of the century. As a result of the Arab Spring and the political unrest that followed, refugee and irregular migration movements increased dramatically, especially from Middle Eastern and North African countries. At the beginning of this period, state authorities were still conducting extensive sea rescue operations.[3] Frontex's operation *Hermes* had been deployed even before the outbreak of the Arab Spring. As reports of shipwrecks in the Mediterranean became more dramatic and frequent, in 2013, the Italian Coast Guard initialized *Mare Nostrum*, the most comprehensive state-run sea rescue mission to date. Until the onset of the so-called European refugee crisis (2015-2016), sea rescue was no salient issue in the European discourse. This soon began to change with increasing irregular migration flows to Europe and the accompanying rise in ship wrecks. News reports and leaks of government issues suggesting collaboration between sea rescue NGOs and smugglers further deteriorated public attitudes towards civil sea rescue (Cusumano and Villa 2021). SAR missions finally became a hotly contested topic at the center of the political debate on flight and migration.

The central substantive argument against sea rescue is the pull factor hypothesis. The criticism was initially targeted at the *Mare Nostrum* mission of the Italian Coast Guard. Critics argue that SAR operations create an incentive for potential irregular migrants. According to this view, the increased likelihood of being rescued in the event of distress at sea changes the risk calculations of migrants and smugglers, which leads to more people embarking on the dangerous crossing over the Mediterranean and, ultimately, to a higher death toll (Cusumano and Villa 2021).

The pull factor hypothesis was a key justification for the decision not to extend the comprehensive *Mare Nostrum* rescue mission (Cusumano and Villa 2021). Its successor mission *Triton* operated by Frontex was significantly smaller in terms of its financial and infrastructural capacities and its mandate was limited to a smaller area and emphasized border protection rather than sea rescue. Trying to fill this gap, NGOs increasingly took over more responsibility and were becoming the main providers of sea rescue in the subsequent years. In the course of this

2. In 1979, the German journalists Rupert Neudeck and Christel Neudeck chartered the boat *Cap Anamour* to save Vietnamese refugees trying to cross the South Chinese Sea.

3. For an overview of the state-run SAR missions in the Central Mediterranean Sea since 2009, see Deiana et al. (2024).

process, the propositions of the pull factor hypothesis which had originally been targeted at state-run SAR missions were redirected at civil sea rescue organizations.

As numbers of irregular migrants crossing the Mediterranean and operating sea rescue NGOs increased in the years following the Arab spring, sea rescue and irregular migration became more salient issues (Dennison and Geddes 2019). Based on the supposition of the pull factor hypothesis, policymakers determined to curb irregular migrant arrivals in Europe started to obstruct the activities of sea rescue NGOs. The civil organizations have faced multiple policy restrictions or legal prosecutions, heavily limiting the presence of their vessels at sea (Cusumano and Villa 2021). This struggle against sea rescue organizations in the central Mediterranean came to a head in 2018 with the formation of a new Italian government consisting of right-wing populist *Lega Nord* and the anti-establishment *Movimento 5 Stelle* (M5S). Both parties benefited from growing anti-migration sentiments among the Italian population and promised to curb irregular migration to Italy (Geddes and Pettrachin 2020).[4] Politicians of the new coalition accused NGOs of being "accomplices" of smugglers and "taxis at sea" for irregular migrants. Apart from this drastic rhetoric, the new government represented a radical shift towards migration and sea rescue deterrence policies. The new minister of the interior and *Lega* leader, Matteo Salvini, initiated several legal conflicts against civil sea rescue NGOs. He even opposed his own coast guard by ordering that the boat *U. Diciotto*, which had rescued several drowning migrants, not be allowed to dock at Italian ports (Cantarella 2019). In June 2019, the Italian government issued a decree providing the interior minister with the right to restrict access of any vessel trying to enter Italian waters for national security reasons.

Following the temporary reduction in the salience of the issue during the pandemic, irregular migration and sea rescue received increased attention once again with the renewed rise in the number of arrivals in the central Mediterranean since 2022. In autumn 2022, the radical right-wing party *Fratelli D'Italia*, which campaigned on a strong migration-limiting policy platform, became the strongest political force in Italy. Since then, the new government under Georgia Meloni has repeatedly clashed with sea rescue NGOs trying to limit NGOs' rescue operations in the Central Mediterranean in order to decrease irregular migrant arrivals in Italy. Amongst other measures, the new government restricted civil rescue vessels to carry out one rescue mission at the time only and assign vessels to remote ports in the centre and north of the country, delaying further continuation of rescue missions.

4. The increasing rejection of sea rescue by large segments of the Italian public can also be seen in the prominence of the hashtag "#portichiusi" (Cantarella 2019).

2.1 Theoretical considerations

The pull factor hypothesis is not an original invention of politicians. It is, indeed, deeply rooted in and derived from an academic tradition of thought that explains migration decisions in terms of so-called push and pull factors. The push and pull theory of international migration was coined by Lee (1966) and constitutes, together with the neoclassical microeconomic (human capital) model of migration (Todaro 1969), the dominant theoretical framework to explain individual migration decisions. According to this line of thought, people choose to migrate based on a rational calculation weighing different factors; factors in the area of origin, encouraging people to leave that area, are considered "push factors", whereas factors in the area of destination, attracting people to migrate to that particular area, are considered "pull factors". Common examples of pull factors include favorable labor market conditions, good school systems, and a generally high living standard. Push factors include rather negative aspects such as lack of economic opportunity, bad climate, or insecurity. Lee (1966) also includes "intervening obstacles" (e.g., distance, physical barriers) and "personal factors" that moderate the direction and relative magnitude of the different push and pull factors. Finally, he emphasizes the importance of information imperfection and the resulting uncertainties and risks.

The provision of sea rescue does not serve as a pull factor in the sense of the framework because it does not attract people to migrate to a specific area. Sea rescue rather enters the push-pull framework as a factor that alters the risk calculus of migrants. When migrants face the decision of crossing the Mediterranean, sea rescue missions may play a role. The provision of SAR missions can reduce the risk of dying by lowering the likelihood of drowning and, in turn, increase the chance to reach the desired area of destination. In this way, the presence of sea rescue missions could act as an incentive for migrants to attempt the crossing and lead to more crossing attempts in the Mediterranean. This proclaimed causal relationship between sea rescue and increased crossing attempts is the essence of the pull factor hypothesis. Proponents further argue that SAR missions do not only cause more crossing attempts, but also more migrant deaths. The pull factor hypothesis stresses the potential ambiguities of SAR missions: They may reduce the *ex ante* risks of each individual dying during the migration journey. However, these benefits may *ex post* be outweighed by the increase in the number of people attempting to cross the Mediterranean. In addition, SAR missions may encourage smugglers to use poor quality vessels because they anticipate being rescued at sea (Deiana et al. 2024; Robinson 2016). This shift to unseaworthy boats may additionally offset the initial safety benefits for migrants and thus increase rather than decrease the risk of dying on the passage to Europe. Therefore, sea rescue may have exactly the opposite of its intended effect, leading to an

absolutely larger number of people drowning in their attempt to reach European shores.

For the pull factor hypothesis to be valid, the following conditions must be satisfied. First, the migrants or traffickers who provide and operate the migrant boats must know whether sea rescue missions are currently in place. It is generally plausible to assume that migrants inform themselves about the current crossing conditions. Dekker et al. (2018) find that Syrian refugees have access to and consult social media to inform their decisions before and during the migration process. This is primarily social media information from existing social ties, but also information from third parties such as NGOs. A survey among refugees in Europe by Merisalo and Jauhiainen (2021) shows that almost all respondents use social media services, and about 50% used social media information to guide their decision on the passage to Europe. By now, all sea rescue NGOs use social media to inform their supporters and the general public about their missions and to raise funds.[5] Hence, it is conceivable that migrants contemplating crossing the Mediterranean consult NGOs' social media accounts before they make their decision. Even if the migrants themselves do not use this information, the smugglers could benefit from it, and migrants could, thus, indirectly use social media information from NGOs. There is no evidence on the social media use of human traffickers in the Mediterranean, but Porsia (2015) argues that smugglers use the real-live AIS data from websites such as *MarineTraffic* to track sea rescue vessels before the start of the crossing to increase the likelihood of getting embarked by civil sea rescue vessels on European shores. Migrants and smugglers could also be informed about SAR activities by NGOs letting them know about their vessels' presence. This is a common accusation of politicians opposing sea rescue, arguing that NGOs signal their presence or actively communicate their positions to facilitate the rescue at sea.[6]

The second condition is that migrants must be responsive, at least to some degree, to changes in the physical risks of crossing the Mediterranean. That is, the decision to risk the passage must be, among other things, a function of the risk of dying during the crossing. It is highly plausible to assume that migrants are at least to some degree responsive to changes in the risk they anticipate when crossing the Mediterranean, but it should be noted that these migrants are a specific set of self-selected individuals. These people are likely considerably less risk-averse than the population median. Various studies show that people who are more willing to take risks have a higher propensity to migrate or that migrants are, on average, more risk loving than people with no migration history (e.g., Jaeger et al. 2010; Williams and Baláž 2014; Dustmann et al. 2017). In addition, most of the individuals facing the decision to cross the

5. All sea rescue NGOs operating in the Central Mediterranean between 2016 and 2022 have a Twitter account.

6. According to a Financial Times article, Frontex had "clear indications before departure on the precise direction to be followed in order to reach NGOs' boats" Robinson 2016. However, Frontex and the Financial Times later corrected this statement and stated it had no evidence, but only concerns Cusumano and Villa 2021.

Mediterranean are from countries other than Libya or Tunisia and hence have already made the initial decision to move to Europe long time ago.[7] They have already experienced many risks along their migration journeys, which plausibly makes them more willing to take additional risks to eventually reach the destination Europe.

It also seems plausible that migrants do not want to stay or reside in Libya, especially given the lack of national asylum law and the reported human rights violation against asylum-seekers and migrants (Alalem and Abumais 2021). There are virtually no legal alternatives to migrate to Europe or to apply for asylum in an EU member country. As a result, many migrants are faced with the choice of either staying in Libya or Tunisia with poor economic and security prospects or risking the crossing of the Mediterranean Sea that, if successful, implies a relatively high probability of being able to stay in Europe (Knaus 2020). All these factors may contribute to particularly high levels of risk tolerance among migrants contemplating crossing the Mediterranean as irregular migrants. If the risk tolerance of these people is so high that the presence of sea rescue vessels has virtually no effect on their risk calculation, then sea rescue operations also do not affect crossing attempts, and the pull factor hypothesis would not hold. Proponents of sea rescue and NGOs regularly argue along these lines. For example, the head of operational communications for MSF, Valle (2016, 32–33) states: "With or without search and rescue capacity at sea people would continue to come in large numbers."

2.2 Existing empirical evidence

Despite its salience in the public discourse, the empirical literature on the pull factor hypothesis remains relatively scant. Hitherto, there are only a few papers explicitly dealing with the effect of sea rescue missions on irregular migration. Many methodological and data issues impede rigorous investigations. Furthermore, the existing evidence is partly contradicting and concludes with opposing statements about the validity of the pull factor hypothesis. The following section summarizes the main results of the empirical literature.

Early attempts at studying the phenomenon include rather correlational analyses. Steinhilper and Gruijters (2018) compare aggregate figures of irregular migration arrivals over three different periods with varying SAR intensity levels. They find that, in contrast to what the pull factor hypothesis would project, arrivals are not higher during periods with high SAR intensities. Their analysis is only of descriptive nature and yields only correlations at a very aggregate level. Cusumano and Villa (2021) explicitly study the effect of civil sea rescue missions of NGOs

7. Only twelve percent of all detected illegal border crossings in the Central Mediterranean between 2016 and 2022 were people from Libya and Tunisia (own computations based on data from Frontex: https://frontex.europa.eu/we-know/migratory-map/).

on crossing attempts, employing regression analysis on a dataset at the daily level. They similarly find no significant, if anything negative, relationship between the presence of civil sea rescue vessels and crossing attempts. Their analysis suffers from severe data limitations and endogeneity concerns and can thus not be regarded as causal estimates. Using a group-level Difference in Differences (DiD) strategy, Cantarella (2019) investigates the effect of specific migration deterrence policies by the Italian government. They also employ the number of NGO vessels potentially currently operating in the Mediterranean as a control variable and find no significant association between civil sea rescue and crossing attempts.

Unlike the aforementioned studies, recent studies by Deiana et al. (2024) and Battiston (2022) both find indirect evidence for the pull factor hypothesis. Battiston (2022) employs a weekly dataset covering all sea rescue activities (of state-run and civil as well as commercial vessels) before the Libyan coast where migrants were rescued and analyzes the effect of distance to the Libyan coast on future crossing attempts. In line with the pull factor hypothesis, he finds that the closer vessels operate to the Libyan coast, the more migrants attempt the crossing the following week.[8] Deiana et al. (2024) study the effect of state-run sea rescue missions in the Central Mediterranean on crossing attempts and risk. They find evidence for both propositions of the pull factor hypothesis. According to their analysis, more intense SAR missions increased the total number of crossing attempts by encouraging smugglers to increasingly rely on cheaper, unsafe inflatable boats. This price-distorting effect also increases migrants' crossing risk because the passage on inflatable rafts is much riskier than on sturdy wooden boats. On the contrary, employing monthly data on migrant crossings and a Bayesian predictive model, the findings of Rodríguez Sánchez et al. (2023) suggest that observed departures during periods with active search and rescue operations are not significantly higher than a predicted counterfactual without sea and rescue. This synthetic time-series is estimated using a Bayesian model that predicts migrant departures as a function of a series of possible exogenous determinants for migration flows to Europe.

Overall, there is so far no conclusive evidence on the empirical validity of the pull factor hypothesis. While early studies relied on correlational analyses limited by data limitations and obvious identification issues, recent attempts address these limitations by exploiting natural experiments or using causal modeling approaches. However, these recent studies arrive at partly opposing conclusions. This underlines the need for more rigorous analyses of the relationship between sea rescue activities and irregular migration flows along this important

8. He also analyzes the effect on crossing risk and finds a negative relationship between rescue distance and relative mortality. However, he does not investigate absolute mortality, thus, no evidence is found for the second impact dimension of the pull factor hypothesis.

migration route to Europe.

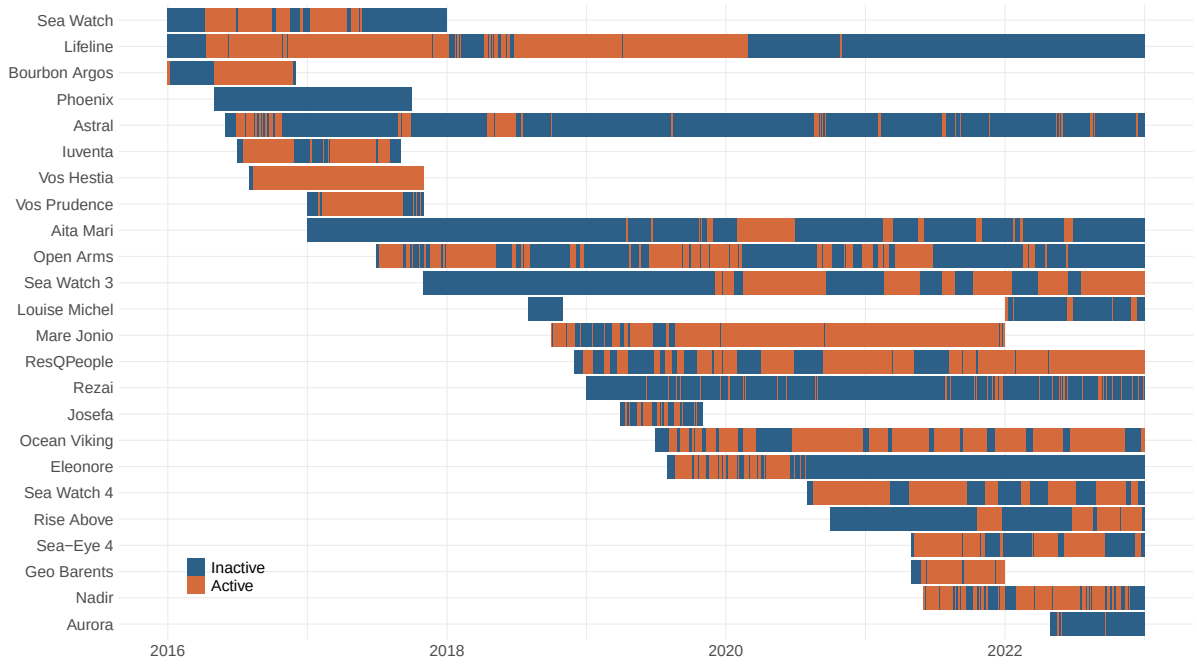
3 Data

For the empirical analysis, we compile a multi-source data set that includes data on migration, sea rescue, weather conditions, and conflict. The resulting data consists of daily observations from January 2016 to December 2022. The following section describes the sources and construction of variables.

3.1 Sea Rescue Missions

To measure the daily intensity of civil sea rescue operations in the Central Mediterranean, we employ geo-referenced high-frequency data from Automatic Identification Systems (AIS) that track vessels' geographic positions using satellite and terrestrial coordination technology. As of January 2005, International Maritime Organization (IMO) regulation requires all cargo ships above 500 tons, internationally-travelling ships above 300 tons, and all passenger ships to carry AIS technology that automatically shares positional information to other ships and everybody equipped to receive these signals. We purchase data from the commercial provider *MarineTraffic* that collects and compiles AIS data on virtually the universe of ships sending AIS information globally. We conduct an extensive manual Internet search to identify all NGO vessels active in the Mediterranean between 2016 and 2022 and their corresponding MMSI or IMO identifiers. We then retrieved a data set of all reported positions of these vessels during our period of study. These data accurately measure daily movements of almost the entirety of NGO ships active in the Central Mediterranean between 2016 and 2022. Figure 1 provides an overview of all NGO vessels in our sample with the periods each vessel was potentially operational and in which periods it was actually on a mission.

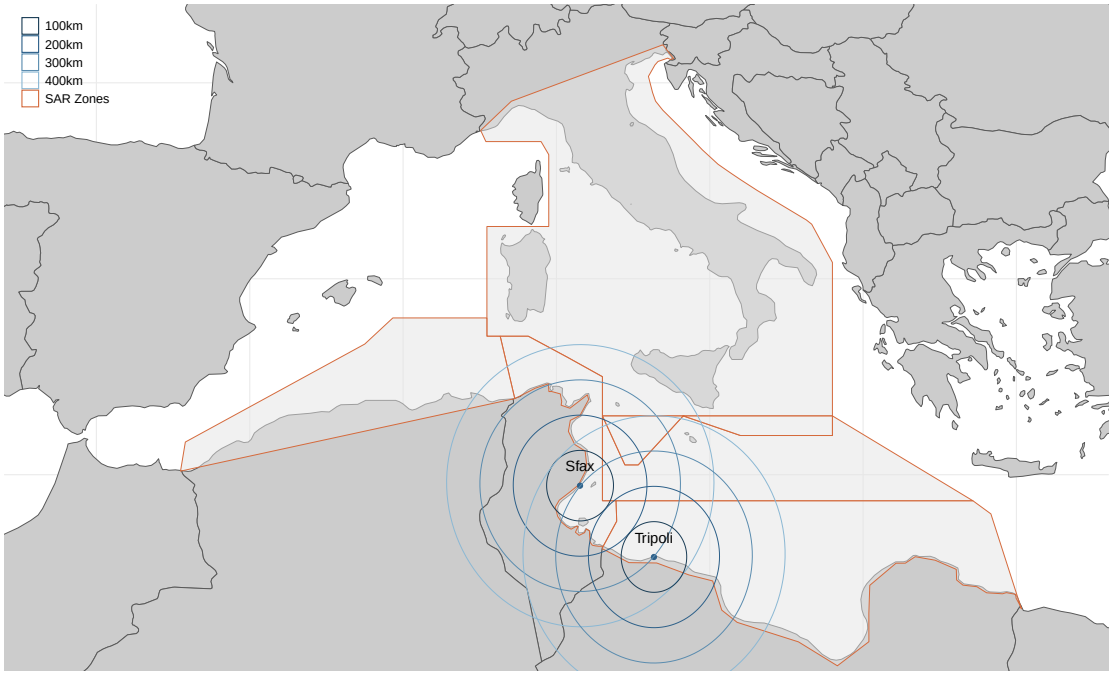
Figure 1: NGO Vessel Presence in the Central Mediterranean



Notes: This graph shows NGO vessels presence in the Central Mediterranean. The span of the bars indicate the periods in which a given NGO vessels was potentially operational. A vessel is coded as active on a given day if its AIS position was within the SAR zones of Algeria, Italy, Libya, Malta, or Tunisia.

Based on these data, we construct a panel data set at the daily level consisting of the two main departure locations in Libya and Tunisia, Tripoli and Sfax respectively, and use several alternative measurements for NGO intensity at these two departure locations. We compute the average daily distance to the two departure points and code a given location as treated by a given NGO vessels if the daily average distance is below a certain threshold (100km, 200, 300km, 400km) (see Figure 2). We then calculate the sum of vessels active within each treatment ring that we use as our main treatment variable and interpret as the number of NGO vessels active at a given departure location.

Figure 2: Illustration of Treatment Measurement



3.2 Migrant Crossing Attempts

We compute the sum of arrivals and migrants dead or went missing along the passage to obtain a daily estimate for crossing attempts from Tripoli and Sfax. To do this, we combine two data sources.

We compute the sum of arrivals and migrants dead or went missing along the passage to obtain a daily estimate for crossing attempts from Tripoli and Sfax. To do this, we combine two data sources. First, we employ data on irregular migrant arrivals in Europe in the Central Mediterranean obtained through a Freedom of Information Act with Frontex.[9] These data include all incidents involving irregular border crossing in the Mediterranean Sea between 2016 and 2022 that have been recorded in European waters or at European shores. The data contains, inter alia, information on the number of irregular migrants, country of departure, and the type of the transport vehicle. For those incidents that were recorded outside the operational area of Frontex missions which includes almost all incidents where NGOs are the rescuers, the exact coordinates of the detection and interceptions is also available. The data further includes a variable that indicates the operational area where the irregular crossing occurred for those incidents before 2018. We calculate the daily number of irregular migrants that depart from Libya and Tunisia by summing all daily incidents at the country of departure-day level. We assume

9. We used the portal AsktheEU: `https://www.asktheeu.org/en/request/jora_variables_for_boat_intercep_2#c`

that all migrants coming from Libya or Tunisia embarked on their boat at the respective main hub of departure of their respective country of departure (Tripoli for Libya, Sfax for Tunisia). For incidents with an unknown country of departure (less than 2 percent of all cases), we determine the distance from the point of detection in the Mediterranean to the two main departure points if geographical information is available. The incident is then assigned to the departure point that is closer. There are only five incidents that could not clearly assigned to either Tripoli or Sfax through this procedure, two of which being recorded in the operational area of Puglia suggesting that individuals on these boats were crossing from the Western Balkan countries rather than North Africa. We omit the remaining three observations where the place of departure could not be estimated from the data. These incidents only include arrivals with five or fewer irregular migrants on board.

Second, we use geo-referenced data from the IOM Missing Migrants Project which records instances where people die or go missing in the migration journey.[10] We calculate the distance of each missing migrants incident along the Central Mediterranean migration route to Tripoli and Sfax, and assign the missing migrants to the departure point closer to the location where the incident occurred. We then obtain an estimate for the daily number of migrants, who died during their attempt to cross from a given departure point, by summing up the number of dead and missing migrants.

3.3 Other Data Sources

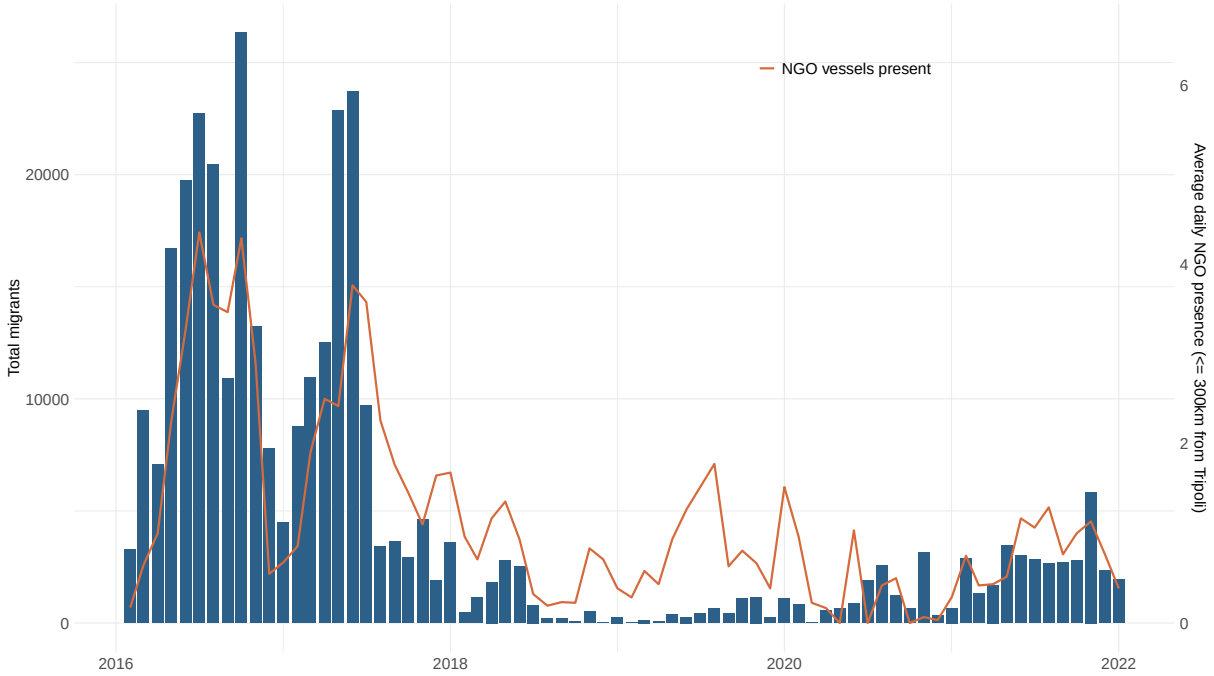
In most specifications, we control for weather conditions at the two departure points Sfax and Tripoli. We employ data on wind speed and temperature from the free online database *Open-Meteo* based on data from the European Centre for Medium-Range Weather Forecasts (ECMWF). We also control for the number of conflict fatalities in Libya and Tunisia using data from ACLED (Raleigh et al. 2010).

4 Empirical Analysis

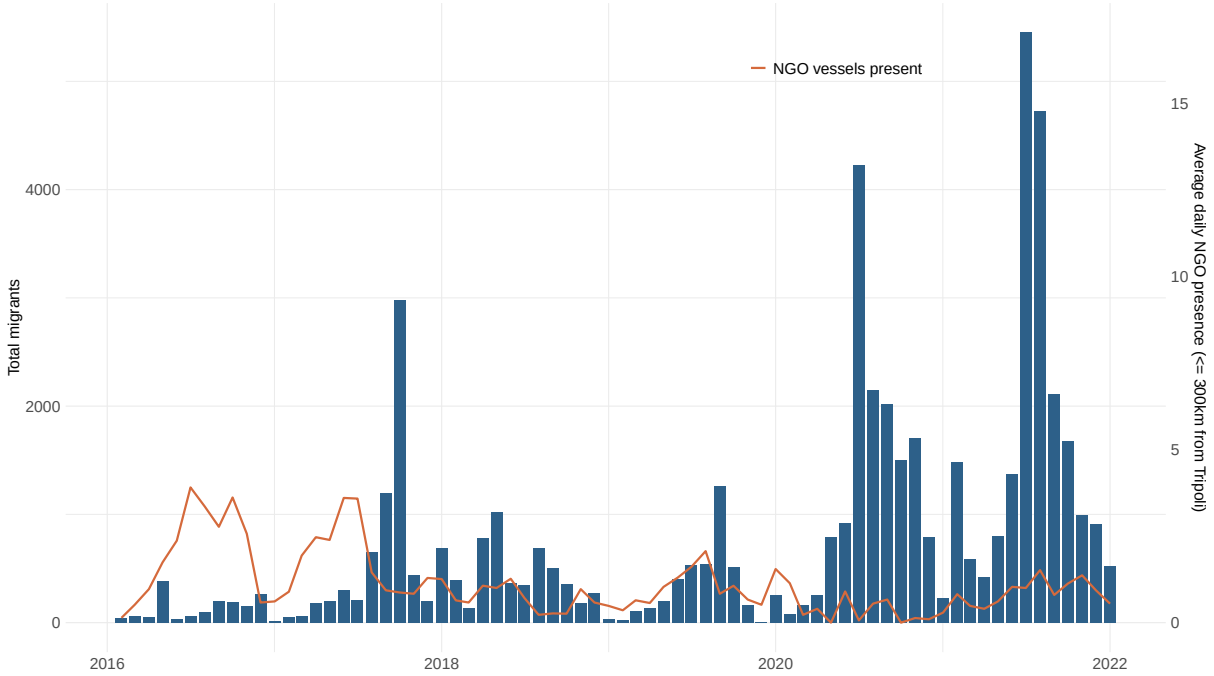
Figure 3 depicts total monthly crossing attempts and the average daily NGO presence in the Central Mediterranean over the period 2016 to 2022. The graph suggests a positive correlation between sea rescue operations and crossing attempts. As the average daily presence of NGO sea rescue vessels increases, more migrants attempt to cross the Central Mediterranean. We quantify this correlation at the daily level using the following Poisson regression:

10. The data can be accessed at: https://missingmigrants.iom.int/downloads.

Figure 3: Crossing Attempts and Civil Sea Rescue Presence in the Central Mediterranean



(a) Libya



(b) Tunisia

Notes:The bars depict the monthly number of departure attempts from Libya (a) and Tunisia (b). The red line graph shows the average daily presence of NGO sea rescue vessels for each month in the Central Mediterranean.

$$crossings_{i,t} = exp(\ vessels_{i,t}\ \beta_1 + temp_t\ \beta_2 + wind_t\ \beta_3 + conflict_{i,t}\ \beta_4 + \lambda_i + \delta_w + \gamma_{m,y} + \epsilon_t\ ), \tag{1}$$

where the outcome variable is $crossings$, a measure for the number of crossing attempts from departure location i on day t. The variable of interest is $vessels$, indicating the number of NGO sea rescue vessels that are present close to a given departure location (see Figure 2). The model also includes control variables at the day-location of departure level. $temp$ is the mean daily temperature in degree Celsius (°C), $wind$ is the average wind speed on a given day at a given departure location. $conflict$ measures the daily number of conflict fatalities as reported by ACLED in Libya, Tunisia respectively. λ is a departure location fixed effect, δ_w is a week-in-the-year fixed effect and $\gamma_{m,y}$ is a month $\times$ year fixed effect. ϵ_t is the idiosyncratic error term.

Daily sea rescue presence is arguably correlated to several other push and pull factors affecting migrants' and smugglers' decisions to attempt the crossing from North Africa to Europe. If these variables are not accounted for, the estimated coefficients suffer from omitted variable bias. Regression equation 1 account for some of these challenges. First, to account for a potential confounding effect of the security situation at the points of departure, we include a measure for conflict fatalities recorded in Libya and Tunisia in the model. Poor security conditions in places, from which migrants depart, could act as additional push factors (Brück et al. 2018). If migrants feel physically threatened by acts of war, violent protests, or terrorist attacks near their staging points in Libya and Tunisia, their risk calculation regarding their decision to stay or to attempt the crossing arguably changes. On the supply side, sea rescue NGOs may observe the security situation in Libya and Tunisia, use this information as an indicator for the current and future demand for sea rescue, and adapt their sea rescue supply accordingly. In this case, the omission of a variable capturing the security situation would yield biased estimates of the coefficient of interest.

Second, maritime transport is obviously dependent on weather conditions. Especially for small vessels, the physical conditions at sea determine whether and how the voyage can be conducted. This issue is relevant to both treatment and outcome in this context. Therefore, we include a measure for the wind speed and temperature in Sfax and Tripoli, the two main departure location for boat migrants.

Third, Figure 3 suggests a seasonal pattern for crossing attempts. This could indeed be a direct consequence of a seeming seasonal pattern of NGO presence, which would be unproblematic. However, this likely results from a seasonality in other push, pull, and risk factors

influencing decisions of migrants and smugglers. Temporal changes in these factors may well be correlated to changes in the presence of civil sea rescue vessels. For instance, labor demand for seasonal workers in agriculture and, thus, employment opportunities for potential migrants at their destination is higher during the summer. Also, overall climatic conditions change, affecting the ability to cross the Mediterranean on boats for migrants, and sending out rescue ships for NGOs. Overall, there seem to be several seasonal factors positively correlated to both crossing attempts and the presence of civil sea rescue missions. To account for this, we include week-in-the-year fixed effects capturing seasonal variation at a highly granular temporal level.

Fourth, changes in the overall political and institutional environment arguably play a crucial role in both the demand for and supply of civil sea rescue missions. In terms of push factors, living conditions in countries of origin may change considerably over time. Armed conflicts can start, end, or completely change in intensity and scope. Also, economic or political shocks may occur, triggering people to leave their countries and changing the aggregate number and composition of migrants that contemplate crossing the Mediterranean to reach Europe.[11] These variations may also have implications for the development of the outcome variable. At the aggregate level, with a higher stock of migrants in Libya and Tunisia waiting for a continuation of their migration journey to Europe, the number of crossing attempts most likely increases too. Furthermore, changes in the composition in terms of countries of origin imply changes in the cultural composition of the migrants. It is plausible that people with different cultural backgrounds have different behavioral responses and risk attitudes (**Falk**). Another factor influencing migrants' decisions is that origin and transit countries may adapt the institutional and practical frameworks that shape migrants' and smugglers' possibilities and agency. The political climate and perceptions towards refugees and migration in European countries changed considerably over the years (Czymara 2020). This probably contributed to governments of both European and transit and origin countries increasingly turning to a strategy of deterring migration flows to Europe (Cantarella 2019). Capacities of border protection agencies such as Frontex or the Libyan Coast Guard were expanded and public information campaigns in transit or origin countries were conducted to raise (potential) migrants' awareness of the risks along the journey to Europe (Bishop 2020; Tjaden and Gninafon 2022). Furthermore, two different state-run sea rescue missions with different SAR intensities have been in place during the study period, *Triton II* and *Themis* that impact migration decisions as well as civil sea rescue missions differentially (Deiana et al. 2024). In addition, the Covid-19 pandemic since 2020 has arguably largely impacted both supply of and demand for sea rescue missions. Strict isola-

11. The empirical data indeed show considerable variation in both the absolute number of migrants crossing the Mediterranean (see Figure 3) and the distribution of migrants' countries of origin (see Figure A1).

tion and health rules prevented sea rescue organizations from deploying their vessels as usual (Reidy 2020). The pandemic's effect on irregular migration is ambiguous, but it affected the number of people attempting to cross the Mediterranean.[12] In sum, there several political and institutional factors that arguably determine migrants' abilities to cross the Mediterranean, but also correlate with NGOs' abilities to provide SAR missions. Therefore, we include month $\times$ year fixed effects to capture all these confounding factors. Because such policy frameworks do not usually change from day to day but rather adjust slowly, month $\times$ year fixed effects should capture most of the variation in this regard.

Finally, we control for time-invariant factor at the location of departure by including country-of-departure fixed effects.

Table 1: Correlates of Migrant Crossing Attempts

	(1)	(2)	(3)
NGO vessels ($<$ 100km)	0.239^{***}		
	(0.056)		
NGO vessels ($<$ 200km)		0.253^{***}	
		(0.038)	
NGO vessels ($<$ 300km)			0.157^{***}
			(0.041)
Temperature	0.157^{***}	0.156^{***}	0.148^{***}
	(0.031)	(0.032)	(0.031)
Wind speed	-0.115^{***}	-0.114^{***}	-0.113^{***}
	(0.009)	(0.009)	(0.009)
Conflict fatalities	0.005	0.003	0.004
	(0.003)	(0.002)	(0.002)
Observations	4384	4384	4384
Pseudo ^{2}	0.561	0.568	0.555
Week-of-the-year FE	Yes	Yes	Yes
Month $\times$ year FE	Yes	Yes	Yes
Departure FE	Yes	Yes	Yes

Notes: Regression results are obtained by Poisson Pseudo Maximum Likelihood estimations based on a panel covering departures from Sfax (Tunisia) and Tripoli (Libya) from 1 February 2016 to 31 January 2022. Standard errors clustered at the week-of-the-year level are in parentheses. Significance levels: * 0.10 ** 0.05 *** 0.01.

Table 1 presents the estimation results from 1 based on the daily panel of Tunisia and Libya covering the period 1 February 2016 to 31 January 2022. We use different definitions of our main treatment variable, the number of civil sea rescue vessels present at a given location of departure (see Figure 2). The results show a statistically significant positive association between the daily number of NGO vessels present at a departure location and the number of irregular mi-

12. For a discussion on the complex relationship between the pandemic and irregular migration in the Mediterranean, see Villa (2020).

gration attempts on a day, conditional on weather conditions at embarkation points, conflict fatalities, as well as seasonality, month $\times$ year, and location of departure fixed effects. According to the estimate in column (1) where we consider a vessel present at a departure location if its daily average distance to that location is below 100 km, each additional NGO vessel present at a given departure location on a given day is associated with an approximate increase in migrant departures of 34 percent ($1 - exp(0.29) \approx 0.34$). This positive association is slightly lower though still highly significant if we consider vessels as present at embarkation that operate within 300km distance. This positive association also holds when incorporating even stricter sets of fixed effects such as week $\times$ year and week $\times$ year $\times$ location-of-departure fixed effects (see Table A1).

These correlational evidence should not be considered as causal, as the analysis could so far not account for the arguably most severe endogeneity issue in this study context, reverse causality. This paper aims to identify the effect of sea rescue on crossing attempts, but causality could as plausibly go in the opposite direction. Humanitarian sea rescue NGOs arguably respond to changes in migration flows across the Mediterranean by adjusting their sea rescue supply and sending out or withdrawing vessels. Indeed, it is these NGOs' explicit goal to rescue migrants on boats in distress, and for doing that they need to operate closer to the embarkation locations when migrant depart from North Africa. To address this reverse causality issue, we devise a number of identification strategies that exploit plausible exogenous variation in the supply of sea rescue vessels in the Central Mediterranean. We detail these empirical strategies below.

4.1 Exogenous Postponements of SAR Missions

Our first identification strategy exploits variation in the supply of civil sea rescue vessels near departure points in Libya and Tunisia that results from postponements of NGO rescue missions upon mission completion. The responsible Rescue Coordination Center (RCC) assigns each vessel that takes migrants in distress aboard to a European port for disembarkation. The process of traveling from the point of detection at sea to the disembarkation port, potentially waiting for the assignment to a disembarkation point, preparing for the next search and rescue mission (e.g., refueling, restocking supplies), and (potentially) returning to a rescue area close to Libya and Tunisia effectively delays the continuation of operational rescue missions by several days, during which the same vessel could otherwise have continued searching for migrants in distress. This temporal postponement of missions thus leads to a decrease in the current supply of sea rescue missions in the Central Mediterranean, which is unrelated to changes

in departure attempts. Vessels in this *transit* mode cannot react to irregular migration flows.

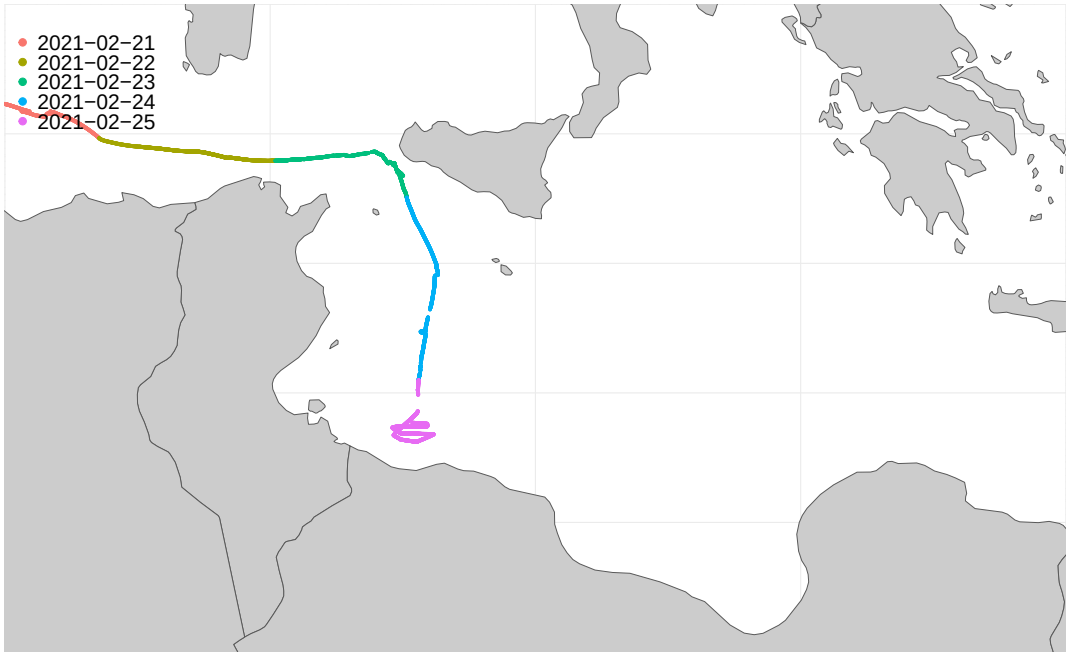
We use three exogenous factors that prolong the absence of any given vessel after mission completion which would otherwise be fit to conduct SAR missions: First, we use the travel duration from the date of heading back to European shores and the arrival at port. This duration depends on the travel distance at sea and the period of time which NGOs wait for being assigned to a port for disembarkation. The latter is relevant for our period of study because Italian and Maltese maritime authorities reportedly deferred the communication with the NGOs and the assignment to ports in Europe. Our data indeed shows indications for such dynamics. Second, we leverage the fact that the Covid-19 pandemic falls in our period of study. In this period, irregular migrants rescued in the Mediterranean were not allowed to disembark the vessel that performed the rescue for an extended period of time. Using publicly available information on Twitter/X published by the NGOs, we can determine when migrants were disembarked (and thus from which point in time the vessel was in principle ready to depart for the next mission in the Central Mediterranean. Third, we make use of a recent policy change enacted by the Meloni government in Italy which entailed that NGO vessels can make only one rescue upon one mission and that the responsible Italian RCC assigns a vessel to any Italian port, including those farther away in the north of the country. The decision to which port a vessel is assigned is exogenous from the NGOs' perspectives and thus prolong the diversion of NGO ships which are else ready to go on SAR missions.

We compute the number of vessels in *transit* through the following procedure. We first match all irregular migration incidents in the Central Mediterranean as reported by Frontex to the vessel movements based on our AIS data. This approach allows us to identify the NGO vessel that conducted the rescue and boarding of migrants of most incidents involving NGO vessels. Second, we inspect the movement patterns of these vessels in the aftermath of the interception and examine whether the given vessel was still performing SAR operations or immediately headed back to European shores to disembark the migrant passengers. This manual inspection of the vessel movements is inconclusive for some incidents, as, for instance, it is unclear whether the vessel was assisting other NGO vessels in rescue operations after the initial rescue or it is ambiguous which vessel took the migrants on board for cases where multiple boats are at the identical detection location. In these cases, we consult self-reported information of the civil rescue organizations on Twitter/X. The combination of all this information allows us to manually code the date of the inception of the return to European shores of a rescue vessel upon mission completion. Finally, we compute the fastest travel time for the port of disembarkation to all locations of departure for migrants in Libya and Tunisia using an algorithm

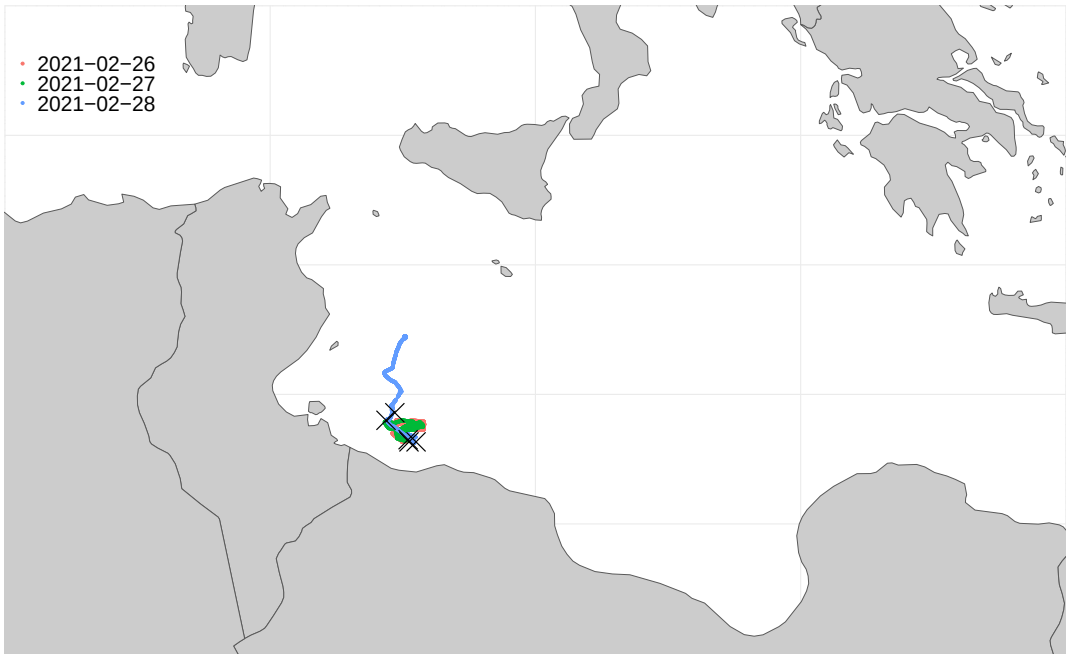
based on graph theory.

Figure 4: Sequence of a Typical Rescue Mission (Part 1)

(a) Arrival at Rescue Zone



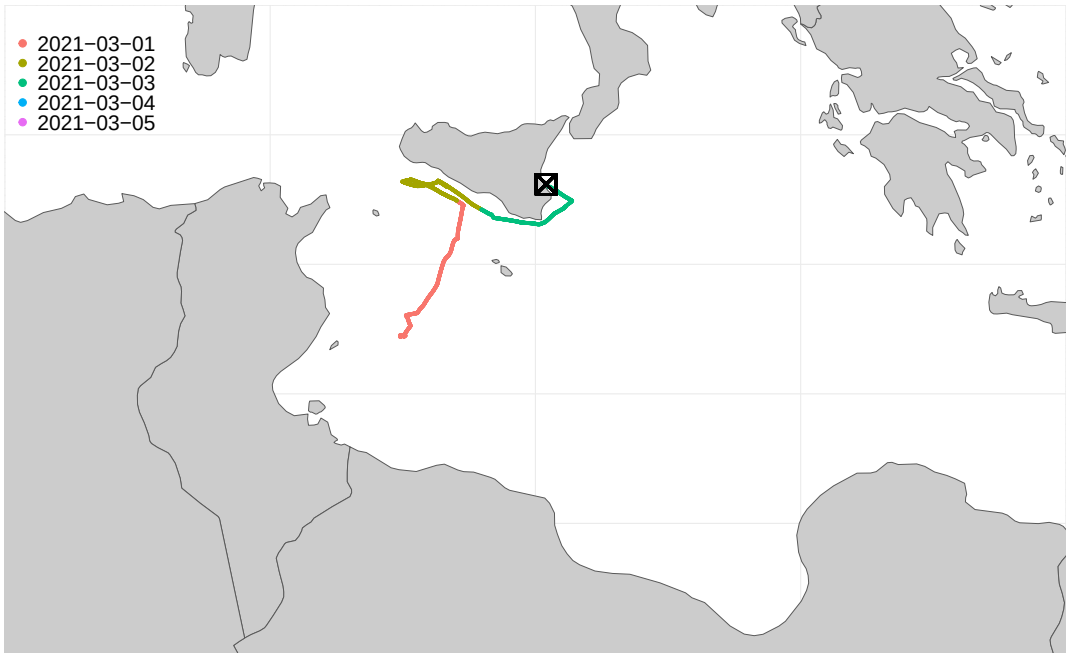
(b) Rescues



For each vessel and departure-location combination, we can determine whether the vessel was unable to operate at a specific location on a given day due to the reasons outlined above. The period for which a given vessel after a rescue is coded on transit is given through the

Figure 5: Sequence of a Typical Rescue Mission (Part 2)

(a) Head to Port



(b) Arrive at Port

following formula:

$$transit_{v,i,t} = \#days(to\ port)_{v,i,t} + \#days(at\ port)_{v,i,t} + \#days(to\ SAR\ zone) \tag{2}$$

We employ this temporal delay due to port assignments as an instrumental variable to address the bi-directional nature of sea rescue and irregular migration attempts. We estimate the following two-stage instrumental variable model:

$$y_{i,t} = \hat{vessels}_{i,t}\beta_1 + libya_i\beta_2 + X'_{i,t}\beta_3 + \delta_w + \gamma_{m,y} + \epsilon_{i,t} \tag{3}$$

$$vessels_{i,t} = transit_{i,t}\psi_1 + libya_i\psi_2 + X'_{i,t}\psi_3 + \tau_w + \varrho_{m,y} + \varepsilon_{i,t} \tag{4}$$

where y is the outcome variable, $libya$ the Libya fixed effect, and the instrument $transit$ denotes the sum of vessels coded as on transit on a given day for a given departure location. The coefficient of interest is β_1 that estimates the LATE (Local Average Treatment Effect). We control for the same vector of covariates and fixed effects as defined in 1.

4.2 Minniti Code Analysis

Beginning in early 2017, the Libyan Coast Guard funded by the European Union and the Italian government started operating in the Libyan SAR zone, rescuing and intercepting migrant boats and returning them back to the Libyan shores.[13] To reduce interference with this new actor, then Italian minister of the Interior Marco Minniti (Social Democratic *Partito Democratico*) asked all sea rescue NGOs active in the Central Mediterranean to sign a code of conduct that practically impeded their vessels to conduct rescue missions within the Libyan SAR zone (thereafter *Minniti code*). Although the majority of the NGOs refused to sign this code, it arguably forced NGO vessels out of Libyan water and to patrol farther away from the Libyan shores, decreasing the supply of civil sea rescue vessels active in Libyan waters looking for migrants in distress. Deiana et al. (2024) use this policy shift as an unanticipated shock to the provision of sea rescue activities. They compare crossing attempts from Libya and Tunisia before and after the code of conduct and find that crossing attempts from Libya dropped significantly post-Minniti. However, their data merely allow them to run the reduced form model comparing crossing from Libya and Tunisia before and after the code of conduct because they do not observe the actual presence of NGO vessels. Our data in contrast explicitly enables us to examine this first stage,

13. This practice has been subject to heated discussion and is often referred to as 'pull backs'. The LCG has repeatedly been accused by human rights organizations to be engaged in human trafficking and other human rights violations at sea as well as in Libya. Zambiasi and Albarosa (2024) investigate the effects of this policy deal and find that mortality among boat migrants increased.

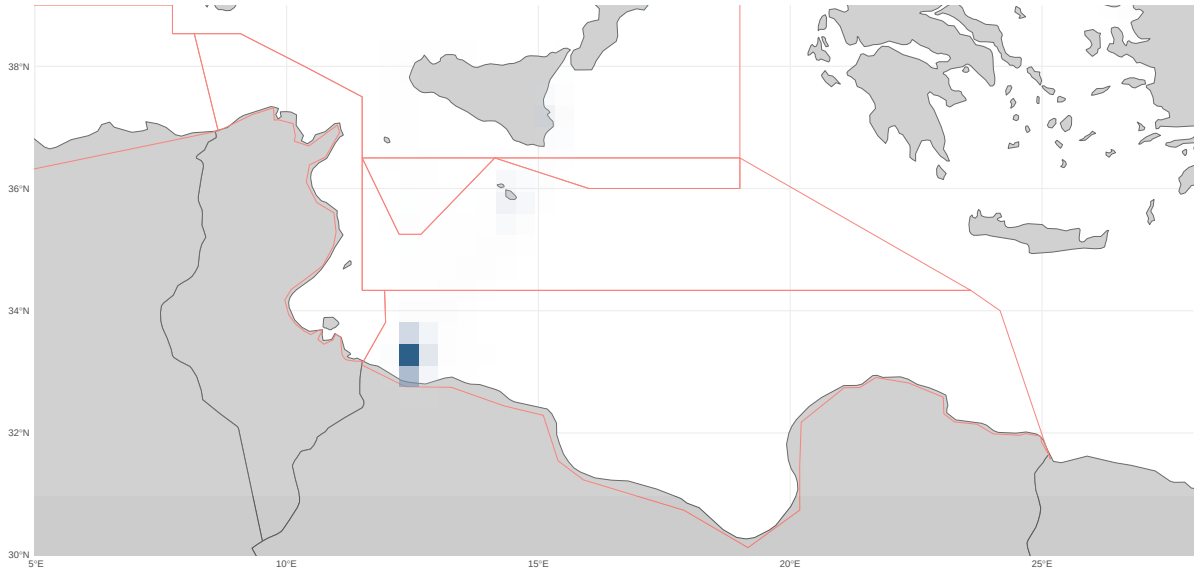
the effect of the Minniti code on how many vessels patrol and how far away from the Libyan coast they operate.

Figure 6 shows the spatial distribution of NGO vessel operations between 1 June 2017 and 30 September 2017. Panel (a) indicates that during the period just before the Italian government announced the Minniti code on 7 August 2017, NGO vessels were extensively operating very close to Tripoli, the main departure point for boat migrants in Libya. In the week following the announcement, civil sea rescue vessels were almost exclusively present close to the Italian island Lampedusa, suggesting that the code of conduct led to a considerable shift of NGO vessels' operations away from Libyan waters. Figure A2 confirms this impression: Just a few days after the announcement of the Minniti code, no NGO vessels were active within the Libyan SAR zone. NGO operations within Libyan water only resumed after a few weeks. Overall, these descriptive statistics suggest that the Minniti code indeed shifted NGOs' activities away from Libyan waters, essentially decreasing the supply of SAR activities for migrants trying to cross the Mediterranean from Libya. Although the Libyan coast guard had started its operations in the Libyan waters by then conducting rescues in the Libyan SAR zone, it is likely that the decreased supply of civil SAR missions close to the Libyan shore increased the (perceived) crossing risk and, in turn, the probability of arriving in Europe. Especially in the immediate aftermath of its foundation, LCG operations were highly inefficient, heavily understaffed, and equipment was not appropriate. Therefore, if civil sea rescue causally affects irregular migration through the Mediterranean, we would expect that the Minniti code led to a decrease in crossing attempts from Libya.

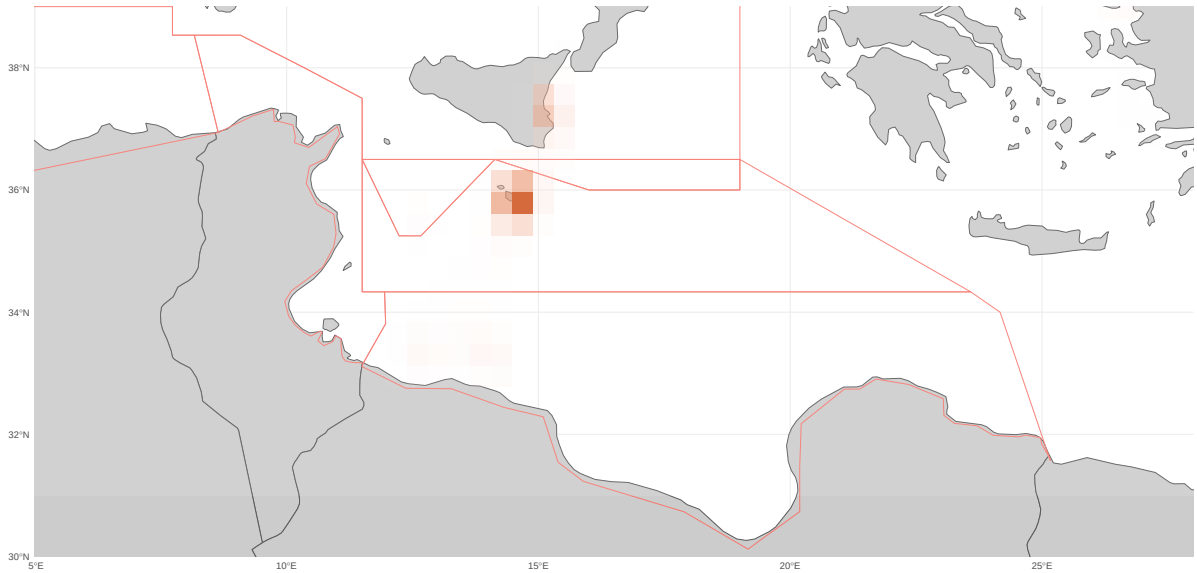
The announcement of the Minniti code obviously was a direct response to increased irregular arrivals in Italy by the Italian government and is thus no exogenous shock to the supply of sea rescue as such. However, the policy only affected civil sea rescue missions in the Libyan SAR zone, leaving NGOs operations in Tunisia unaffected. In 2017, Libya was by far the more relevant point of departure for irregular migration through the Central Mediterranean compared to Tunisia. This began only to change more recently (see Figure 3). But even at this early stage, there was indeed a considerable number of crossing attempts from Tunisia. Against this backdrop, the change in SAR activities in the Central Mediterranean brought about by the Minniti code provides an excellent opportunity to study the effects of civil sea rescue presence on irregular migration attempts. Drawing from Deiana et al. (2024), the following analysis builds on a Difference-in-Differences (DiD) intuition, comparing crossing from Sfax (Tunisia) and Tripoli (Libya) immediately before and after the announcement of the Minniti code.

Figure 6: Spatial Distribution of civil SAR operations

(a) Pre-Minniti



(b) Post Minniti



Notes: This graph depicts the spatial distribution of NGO vessels' operations in the Central Mediterranean during the period June to September 2017 before and after the enactment of the Minniti code. Panel (a) shows the period 1 June 2017 to 6 August 2017 and Panel (b) shows the period 7 August 2017 to 30 September 2017. Darker shades indicate a higher density. The red lines indicate SAR zone boundaries

$$y_{i,t} \;=\; libya_i\;\beta_1 \;+\; post_{i,t}\;\beta_2 \;+ \\ posti,t \times libya_i\;\beta_3 \;+\; X'_{i,t}\phi \;+\delta_w \;+\; \gamma_{m,y} \;+\; \epsilon_{i,t}, \tag{5}$$

where y is the outcome variable, $libya$ the Libya fixed effect, and $post$ a dummy indicating the post-Minniti period from 7 August 2017. The coefficient of interest is β_3 that estimates the effect of the policy change on the respective outcome in Libya. It can be interpreted as the difference in the averages of Libyan and Tunisian outcomes before and after the policy intervention, conditional on seasonality fixed effects $delta$, $month \times year$ fixed effects, and the vector of control variables X as defined in equation 1.

Table 2: Effects of the Minniti code on NGO Vessels Present and Migrant Crossing Attempts

	NGO vessels present			Crossing attempts
	100 km	200 km	300 km	
	(1)	(2)	(3)	(4)
Libya × post-Minniti	-1.260^{***}	0.693	0.531^{***}	-2.783^{***}
	(0.087)	(0.825)	(0.098)	(0.593)
Libya	21.062^{***}	2.027^{***}	-0.006	3.907^{***}
	(0.109)	(0.367)	(0.086)	(0.472)
post-Minniti	0.724^{***}	-1.310^{*}	-0.983^{***}	2.249^{***}
	(0.132)	(0.775)	(0.088)	(0.601)
Temperature	-0.134	-0.118	0.001	-0.030
	(0.115)	(0.103)	(0.056)	(0.194)
Wind speed	-0.011	-0.005	-0.019^{***}	-0.075^{***}
	(0.011)	(0.010)	(0.007)	(0.022)
Conflict fatalities	0.018	0.017	0.015^{**}	0.013
	(0.015)	(0.012)	(0.007)	(0.017)
Observations	242	242	242	242
Pseudo^2	0.458	0.310	0.130	0.668
Week-of-the-year FE	Yes	Yes	Yes	Yes
Month × year FE	Yes	Yes	Yes	Yes

Notes: Regression results are obtained by Poisson Pseudo Maximum Likelihood estimations based on a panel covering departures from Sfax (Tunisia) and Tripoli (Libya) from 1 June 2017 to 30 September 2017. Standard errors clustered at the week-of-the-year level are in parentheses. Significance levels: * 0.10 ** 0.05 *** 0.01.

Table 2 shows the estimation results from equation 5. The coefficient on the interaction term reported in the first row of columns (1) to (3) shows the effects of the Minniti code on NGO vessels present using the different definitions of vessel presence as defined in Figure 2. The analysis confirms that the policy shifted NGO vessels away from Libyan waters, either toward the Tunisian SAR zone, farther from Libyan shores, or, in some cases, rendered them unable to continue their missions. Column (1) suggests that the code of conduct led to a more than twofold reduction in the number of NGO vessels active within 100 km distance from Tripoli. In

contrast, column (3) indicates that the number of NGO vessels operating farther away within a distance of up to 300 km increased significantly by 70 percent ($1 - exp(0.531) \approx 0.70$). Column (4) reports the estimated effects on the number of irregular migrant crossings. The analysis shows that the policy shift brought about by the Minniti-code resulted in a sharp decline in crossing attempts from Libya (Tripoli). The estimate indicates a decline of migrant departures from Libya by about 94 percent ($1 - exp(-2.783) \approx 0.94$). This implies a virtually drop to zero migrant departures as a result from the Minniti code.

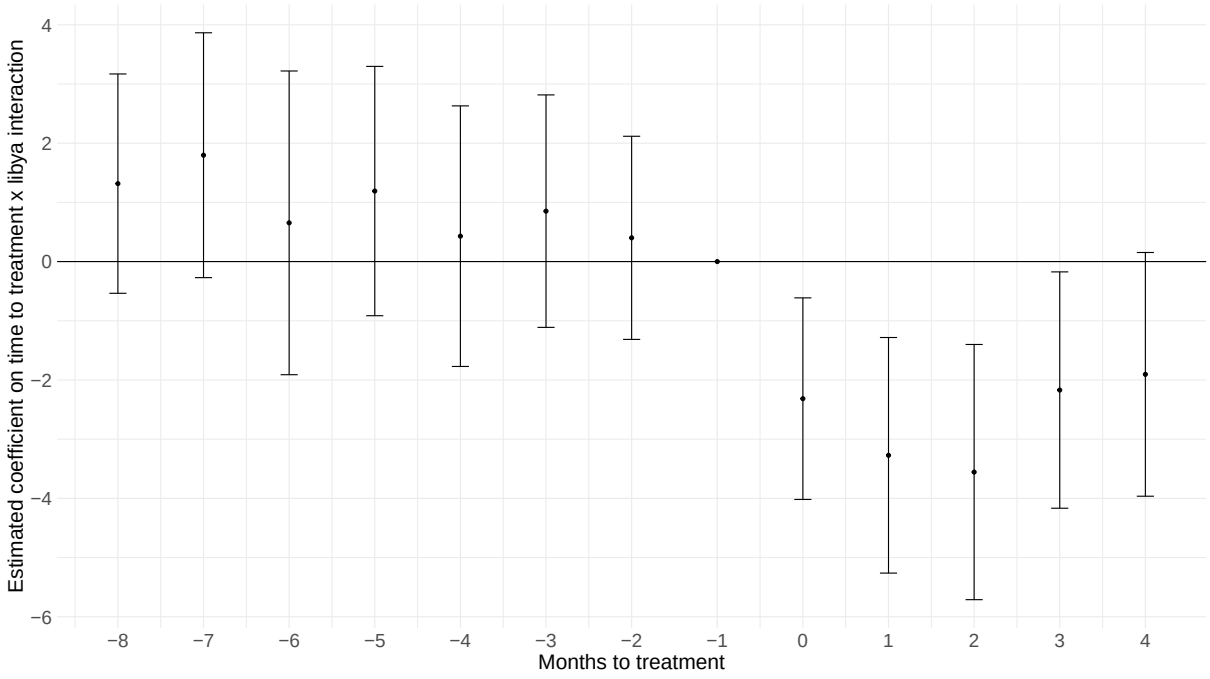
The identifying assumption of this difference-in-differences analysis is that migrant departures from Libya post-Minniti would have evolved in parallel to those from Tunisia in the hypothetical counterfactual without the policy intervention. Obviously, this assumption is not conclusively testable. However, Figure A3 shows that irregular migrant departures from Libya and Tunisia moved broadly in parallel in the period before the Minniti code. We only see the convergence of both graphs in the post-treatment period, borrowing preliminary evidence supporting the validity of the parallel trends assumption. We further evaluate if this assumption holds in the pre-treatment period by estimating an event study specification of Equation 5. The regression model reads:

$$y_{i,t} = libya_i\beta_1 + \sum_{j=-8}^{4} D_{\tau,i} \times libya_i\beta_\tau + \sum_{j=-8}^{4} \gamma_\tau + X'i, t\phi + \delta_w + \epsilon_{i,t}, \tag{6}$$

where we incorporate a set of interaction terms of the Libya dummy and a vector of binary variables that indicate the number of months (defined as 30 day periods) until the treatment on 7 August 2017 occurs. We include the usual fixed effects and covariates to control for unobserved heterogeneity, apart from the month $\times$ year fixed effect that is already captured by the months-to-treatment fixed effects γ. We estimate this model on the panel covering the entire year of 2017 to also assess possible dynamics in the effect of the Minniti code on migrant departures.

Figure 6 depicts the results from the event study specification as defined in Equation 6. The estimates provide additional support for the validity of the parallel trends assumption as all estimated pre-treatment coefficients are insignficant at the 95 percent level. That is, we cannot falsify the null hypothesis of parallel trends in the pre-treatment period. The effect estimates for the post-treatment period indicate that the Minniti code results in a significant drop in the number of migrant departures from Libya in the 30-day period that immediately follow the Minniti code. This effects remains overall roughly constant for the three months following the policy intervention. In the fourth month after the implementation of the Minniti code, the policy seem to have a somewhat attenuated effects on migrant departure before it turns

Figure 7: Event Study Estimation Results



Notes: This graph depicts estimation results from Equation 6. The months to treatment variable indicates how many 30-day periods, a given observation is temporally distant from the treatment time, 7 August 2017. Whiskers indicate 95 percent confidence intervals. Full estimates results can be found in Table A2

insignificant in the following period.

Overall, our analysis shows, first, that there is a strong and robust positive correlation between the daily number of sea rescue vessels active close to a departure location in North Africa and the number of irregular migrant attempts departing from that location. Addressing obvious simultaneity concerns using a Difference-in-Differences event study specification, we, second, show that the implementation of a policy that resulted in a substantial decline of civil sea rescue supply for migrants departing from Libya led to a sharp drop in migrant departures from Libya. These findings are also in line with those from Deiana et al. (2024).

The policy implications are however far from clear. Although we may establish a causal effect of the Minniti policy on departure attempts, it remains unclear whether this effect generalizes to other periods where there is no such large policy-induced variation in the supply of civil sea rescue vessels. To investigate this general relationship between sea rescue and irregular migration through the Central Mediterranean, we plan to expand our analysis by using an instrumental variable design that exploits the temporal delay caused by assignments of NGO vessels to ports farther away from the Central Mediterranean, for example in Northern Italy. Furthermore, we acknowledge that most of the (potential) migrants at the points of departure are people people from countries other than Libya or Tunisia, but have migrated to these transit

countries in their attempt to reach Europe from countries of origin such as Bangladesh, Syria, or Nigeria. Therefore, even if the presence of civil sea rescue vessels causally affects migrant behavior contemporaneously, it remains unclear whether this in fact implies that sea rescue constitutes a pull factor in the sense of the theory, i.e., that it encourages more migration to Europe. To evaluate this, one needs to investigate if and to what extend sea rescue features in the *initial* migration decision.

5 Survey Design

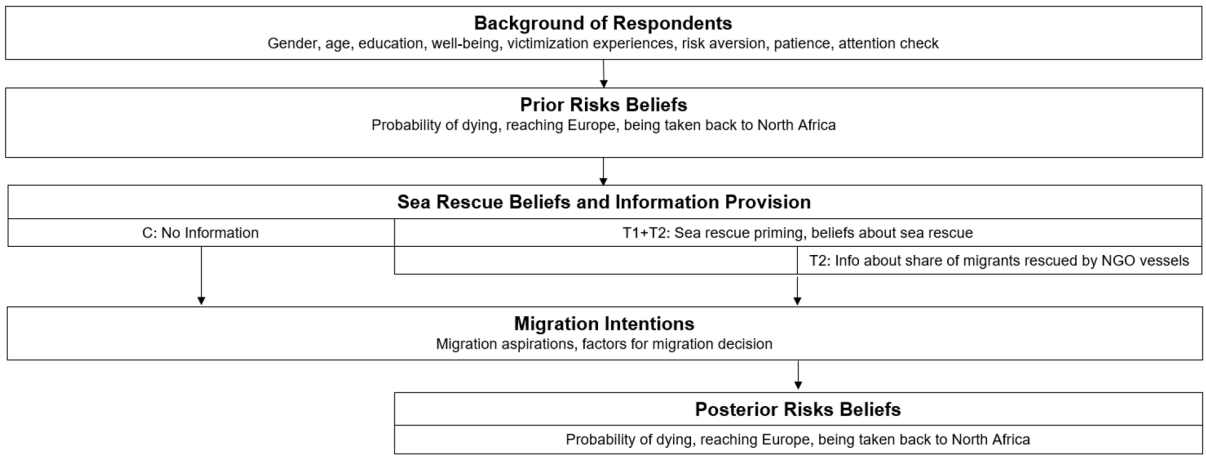
We plan to field an original online survey to investigate how sea rescue affects initial migration intentions in the largest country of origin of irregular migrants via the Central Mediterranean route to Europe since 2016. The survey has a twofold purpose: First, we are descriptively interested in how well potential migrants are informed about the risks associated with migrating to Europe in general, and about the presence of sea rescue activities in particular. Second, we embed an information provision experiment in which respondents are randomly informed about the presence of sea rescue operations in the Mediterranean to examine how sea rescue policy affects migrants' beliefs about the migration journey and migration aspirations to Europe. Our target population is the adult population. We apply quota sampling based on gender and age and aim for a sample size of about 2,500 respondents. The survey design is structured as illustrated in Figure 8 and the entire questionnaire can be found in the Appendix.[14]

First, we start by asking all respondents questions on their basic demographic characteristics, including gender, age, education, region of residence, marital status, children, as well as some questions on their well-being and victimization experiences. Second, we elicit prior beliefs about the risks of migration to Europe in T1 and T2. Next, we randomly assign each respondent to one of three experimental groups, with each group receiving a different information treatment. The passive control group (C) receives no information and no prior beliefs will be elicited. The active control group (T1) is asked about the prior beliefs regarding the number of people who get rescued by civil sea rescue vessels in the Mediterranean and is provided with a qualitative statement about the presence of such missions. These prior beliefs are also elicited in the treatment group T2, but respondents in this condition additionally get quantitative information about the objectively true number of the share of migrants rescued by NGO missions. After the information provision, we elicit all respondents' individual migration aspirations. Finally, we elicit posterior risks beliefs in T1 and T2.

Previous empirical evidence suggests that potential irregular migrants to Europe tend to be

14. A discussion on ethical considerations in our survey experiment can be found in the Appendix.

Figure 8: Survey Design Flowchart



poorly informed about the risks they will face on their journey, with people on average overestimating the risk of dying along the route (Beber and Scacco 2022; Detlefsen et al. 2022).[15] We expect that informing respondents about the presence of sea rescue activities alters their perceptions about how likely it is that migrants trying to cross the Mediterranean arrive in Europe, are intercepted and taken back to North Africa by coast guards, and die at sea. Informing respondents qualitatively about the presence of sea rescue vessels is expected to decrease their perceived likelihood of dying and being taken back to North Africa and to increase their perceived chance of arriving in Europe. This effect cannot be interpreted as due to belief updating as the elicitation of prior beliefs about sea rescue activities in combination with the information treatment (T1) likely causes a priming effect too. We therefore use T1 as an active control group in the comparison with respondents in T2. We expect that informing respondents about the true share of migrants rescued by civil sea rescue operations changes their probability perceptions of dying, reaching Europe, and being taken back to North Africa conditional on their prior beliefs. Individuals who previously underestimated the chance of being rescued by NGO vessels are expected to increase their perceived likelihood of reaching Europe and to report reduced perceived risks of dying at sea and being taken back to North Africa; individuals who previously overestimated the likelihood of NGO rescue *vice versa*. However, whether these altered risks perceptions translate into changes in individuals' migration aspiration remain unspeci-

15. Beber and Scacco (2022), however, show that potential migrants in Nigeria are relatively well informed about the economic conditions of migrants and the probability of receiving a legal status in Europe.

fied. On the one hand, research employing hypothetical vignettes and conjoint designs finds that migration journey risk is a significant determinant for migration decision making (Bah and Batista 2020; Detlefsen et al. 2022; Hager 2021). On the other hand, studies in the context of irregular migration from Africa to Europe rather suggests that risk perceptions of potential migrants are no salient factor for migration decisions (Mbaye 2014; Bemmel 2020). We therefore refrain from formulating clear theoretical expectations in advance regarding these second stage effects.

We will field the first survey wave in October 2017. Respondents are recruited through the online survey marketplace Cint. We invite all respondents to a second, follow-up wave two weeks after the first wave. We plan to recontact respondents for three main reasons, with the first two addressing common limitations found in information provision experiments (Haaland et al. 2023). First, in some contexts it is questionable whether the estimated treatment effect of the information provision is due to genuine belief updating or because respondents are primed on a specific issue, affecting their response behavior. Second, respondents in treatment and control groups may infer experimenter demand differentially due to the information provision leading to a biased interpretation of the estimated effects. These two caveats are arguably much less of a concern in a follow-up survey where individuals do not again receive the information treatment but only reply to similar items measuring the outcomes of interest (in this case, migration aspirations and beliefs about the risk of migrating to Europe). Short-lived priming effects have most likely faded a few weeks after the information provision, and thus the estimated treatment effect on the outcome of interest measured a few weeks after the initial intervention can be more credibly interpreted as due to belief updating. To further address experimenter demand concerns, we will obfuscate the follow-up survey wave in a way that it is considerably less likely that respondents infer the purpose of the survey and create a cognitive connection to the original survey that they completed a few weeks before (Haaland and Roth 2020). Third, we cannot observe actual migration behavior but only migration aspirations. Although migration aspirations are conceptualized as a pre-condition for voluntary mobility (Haas 2021), being able to show potentially persistent treatment effects of the information intervention on migration aspirations would imply a higher credibility from a public policy viewpoint.

6 Conclusion

This paper provides a comprehensive analysis of the effects of sea rescue on irregular migration flows via the Mediterranean Sea. For the observational analysis, we compile a geo-referenced,

high-frequency data set of civil sea rescue presence and irregular migration in the Central Mediterranean between 2016 and 2022. We find a robust positive correlation between civil sea rescue and crossing attempts. We address the evident reverse causality issue by exploiting a policy shock that displaced NGO vessels farther from Libyan waters, arguably exogenously reducing the availability of civil sea rescue for migrants departing from Libya. Employing a difference-in-differences specification, we find that this policy shift led to a sharp drop in migrant crossing attempts from Libya in the months following the code of conduct. Our preliminary results thus seemingly corroborate the pull factor hypothesis and is in line with the findings from Deiana et al. (2024) and Battiston (2022).

Nonetheless, these findings should be interpreted with caution for several reasons. First, we acknowledge that these local findings, based on a unique historical policy intervention, may not be generalizable to other time periods. Second, while we perform several falsification tests to support the credibility of the parallel trends assumption in our event study, there may still be confounding factors that complicate interpreting our findings as causal. Third, even if these findings reflect a contemporaneous causal relationship between sea rescue provision and irregular migration attempts in the Central Mediterranean, this does not necessarily imply that sea rescue indeed leads to increased irregular migration to Europe. Instead, sea rescue may merely cause a temporal shift from periods with less sea rescue supply to periods when more NGO vessels are present. Most migrants crossing the Mediterranean are actually from countries other than Libya and Tunisia. Their decision to move to Europe was taken well before reaching these transit countries. Therefore, we argue that to comprehensively evaluate the validity of the pull factor hypothesis, it is necessary to investigate the extent to which sea rescue influences potential migrants' decision-making in their countries of origin. We will field an original online survey experiment where we study exactly this dimension. Finally, whether the provision of sea rescue leads to higher mortality among irregular migrants remains unclear and has yet to be studied.

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Appendix

Additional Figures

Figure A1: Illegal Border Detections by Country of Origin

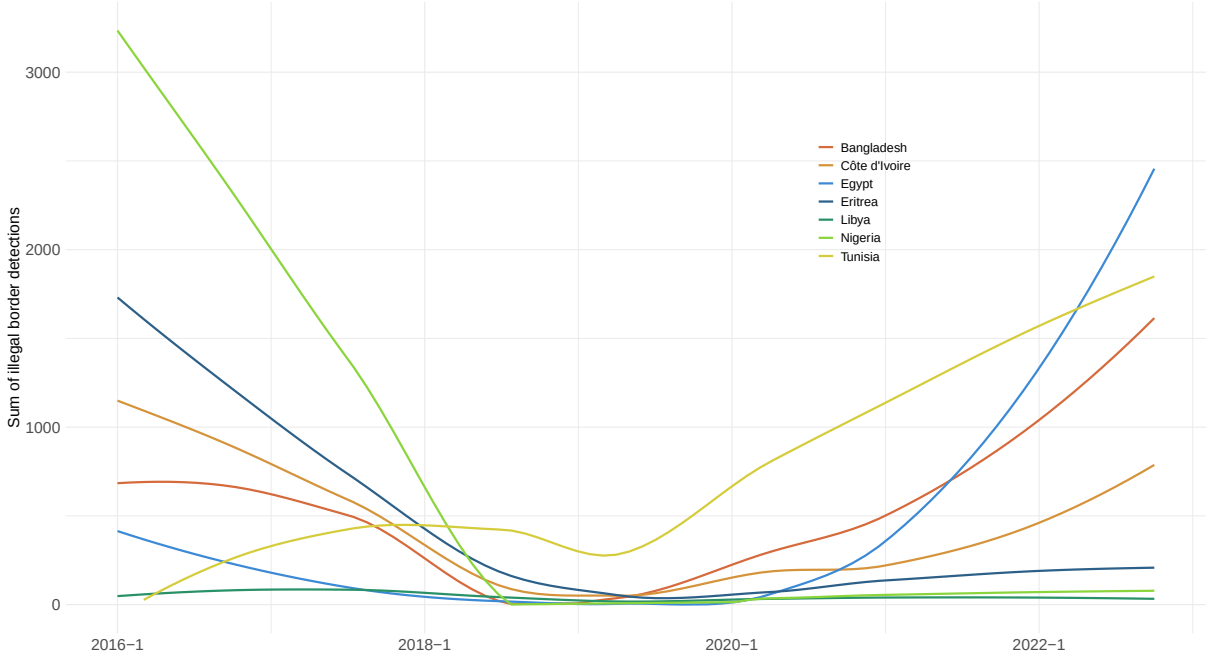
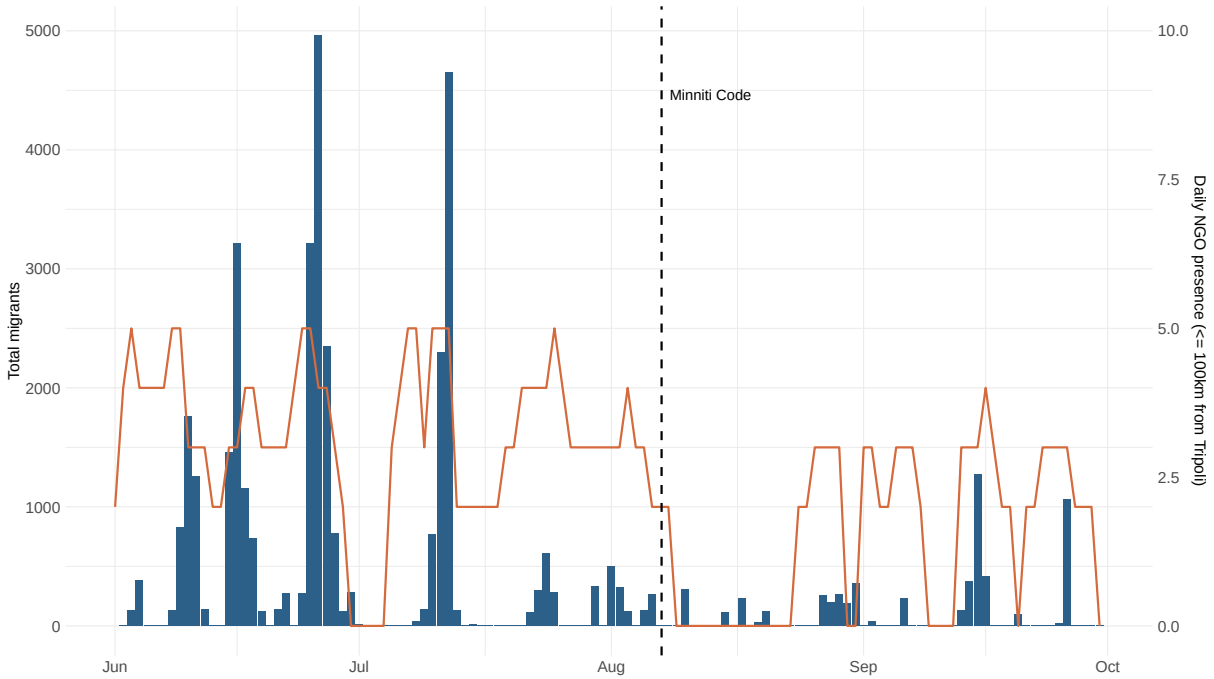
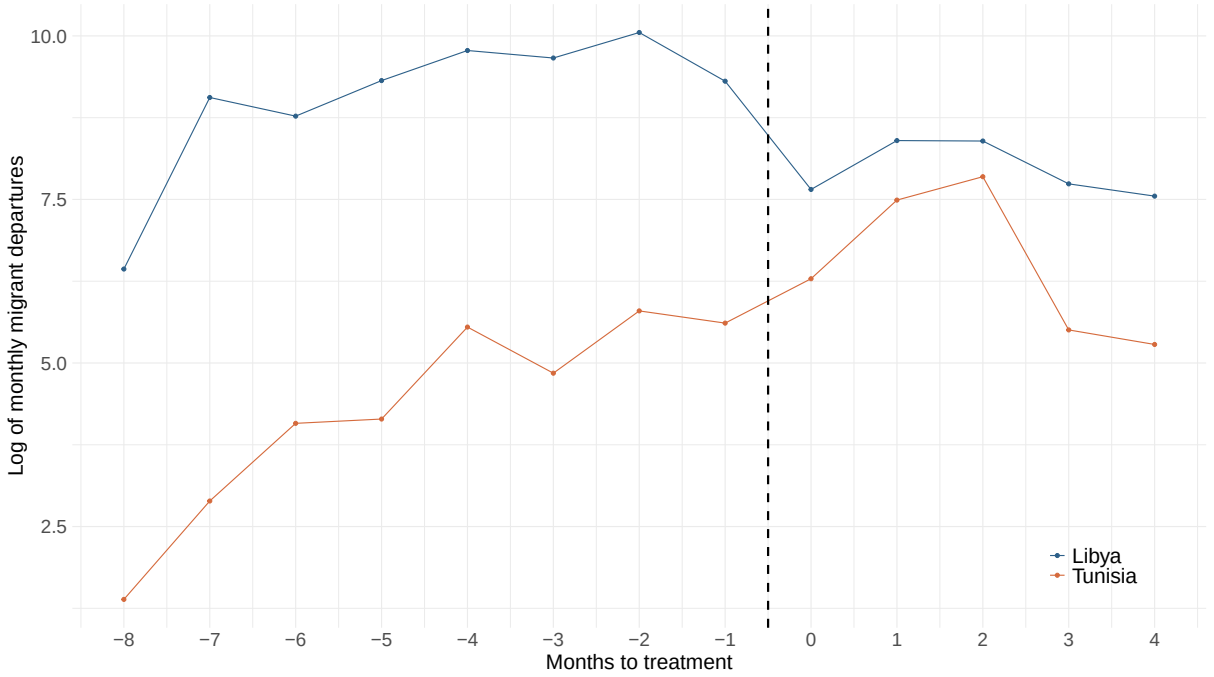


Figure A2: Crossing Attempts and Civil Sea Rescue Presence in the Central Mediterranean Before and After Minniti Code



Notes:The bars depict the daily number of departure attempts from Libya. The red line graph shows the daily presence of NGO sea rescue vessels in the Libyan SAR zone. The vertical dashed line indicates the data where the Minniti code was announced, 7 August 2017.

Figure A3: Trends of Irregular Migrant Departures from Libya and Tunisia in 2017



Notes: This graph depicts the evolution of the logarithmized monthly sum of irregular migrant departures from Libya and Tunisia in 2017. The vertical dashed line indicates the time of treatment. For example, observations with the value zero in the month to treatment variable are observations within the 30 days after 6 August 2017.

Additional Tables

Table A1: Correlates of Migrant Crossing Attempts, stricter fixed effects

	(1)	(2)	(3)
NGO vessels	0.239^{***}	0.331^{***}	0.185^{**}
	(0.056)	(0.077)	(0.090)
Temperature	0.157^{***}	0.211^{***}	0.181^{***}
	(0.031)	(0.036)	(0.047)
Wind speed	-0.115^{***}	-0.104^{***}	-0.105^{***}
	(0.009)	(0.010)	(0.012)
Conflict fatalities	0.005	0.003	0.001
	(0.003)	(0.003)	(0.004)
Observations	4384	4184	3785
Pseudo ^{2}	0.561	0.638	0.687
Week-of-the-year FE	Yes	Yes	Yes
Month $\times$ year FE	Yes	No	No
Week $\times$ year FE	No	Yes	Yes
Departure FE	Yes	Yes	Yes
Week $\times$ year $\times$ departure location	No	No	Yes

Regression results are obtained by Poisson Pseudo Maximum Likelihood estimations based on a panel covering departures from Sfax (Tunisia) and Tripoli (Libya) from 1 February 2016 to 31 January 2022. NGO vessels is a count variable indicating how many NGO vessels operate within 100km distance to a given location of departure. Standard errors clustered at the week-of-the-year level are in parentheses. Significance levels: * 0.10 ** 0.05 *** 0.01.

Table A2: Effects of the Minniti Code on Migrant Crossing Attempts, Event Study Specification

	(1)
Libya × D(months to treatment = -8)	1.317
	(0.945)
Libya × D(months to treatment = -7)	1.797*
	(1.055)
Libya × D(months to treatment = -6)	0.654
	(1.309)
Libya × D(months to treatment = -5)	1.192
	(1.075)
Libya × D(months to treatment = -4)	0.429
	(1.123)
Libya × D(months to treatment = -3)	0.852
	(1.002)
Libya × D(months to treatment = -2)	0.401
	(0.875)
Libya × D(months to treatment = 0)	−2.316***
	(0.869)
Libya × D(months to treatment = 1)	−3.273***
	(1.015)
Libya × D(months to treatment = 2)	−3.556***
	(1.100)
Libya × D(months to treatment = 3)	−2.171**
	(1.019)
Libya × D(months to treatment = 4)	−1.905*
	(1.050)
Observations	730
Pseudo^2	0.645
Week-of-the-year FE	Yes
Months-to-treatment FE	Yes
Libya FE	Yes
Individual Controls	Yes

Regression results are obtained by Poisson Pseudo Maximum Likelihood estimations based on a panel covering departures from Sfax (Tunisia) and Tripoli (Libya) from 1 January 2017 to 31 December 2017. Standard errors clustered at the week-of-the-year level are in parentheses. Significance levels: * 0.10 ** 0.05 *** 0.01.

Survey Instrument

Sea rescue and irregular migration V2

Start of Block: Introduction

Introduction Dear respondent, We are a group of academic researchers from Germany who are not associated to any international organization or government. We would like to invite you to participate in an online survey on current social issues. Please feel free to contact nigeria-survey@uni-koeln.de for questions about the survey or contact details of the data collectors. **You must be at least 18 years old to participate in this study. Your participation in this study is purely voluntary.** You have the right to refuse consent or withdraw from the study at any time without giving reasons and without negative consequences for you by closing your browser. The processing done up to that point remains legal, but the cancellation applies to the future. The data given by you will be erased if the data is still connectable to you. No matter what your personal views are, this is an important matter, and by completing this survey, you are contributing to our knowledge as a society. If you do not feel comfortable with a question you can skip it. Please note that it is very important for the success of our research that you answer honestly and read the questions very carefully before answering. Any time you do not know an answer, just give your best guess. To make sure the survey data is good, we will use methods that can find answers that do not make sense or were entered too quickly. It is also very important for the success of our research project that you complete the entire survey, once you have started. This survey should take about 12 minutes to complete. Your name will never be recorded by researchers and you will never be identified. The collection of the data is conducted via a panel supplier which means that your data will be anonymous to us even before the study starts. Your data can at no point in time connected with your person. Though your data is anonymous to us, we give you the following information pursuant to Art. 13 of the General Data Protection Regulation (GDPR, Regulation (EU) 2016/679). Responsible for the collection of the data are the University of Cologne and the University of Göttingen. The collection and processing of the data is necessary to conduct the study, and is based on your informed consent pursuant to Art. 6 para. 1 subpara. 1 lit. a), Art. 9 para. 2 lit. a) GDPR (legal basis). The data will be stored on a protected cloud application at the University of Cologne and will be kept confidential. The data will be processed by the principal researcher and their team and can later be published as part of research articles. **Right to appeal**: Any data subject has got the right to appeal to the State Commissioner of Data Protection of Lower Saxony or any other data protection supervisory authority within the European Economic Area pursuant to Art. 77 GDPR. Please feel free to contact nigeria-survey@ uni-koeln.de for questions regarding electronic privacy and for contact details of the data protection officer or State Commissioner of Data Protection. By clicking below, you are indicating that you consent to participate in this study. If you wish, you can print a copy or make a screen-shot of this consent form for your records.

Consent Do you understand and consent to these terms?

- ○ Yes, I agree and would like to take part in this study. (1)
- ○ No, I do not agree and would not like to participate. (2)

End of Block: Introduction

Start of Block: Block A: Demographics for Quotas and Attention check

A1 Which of these describes you more accurately?

- ○ Male (1)
- ○ Female (2)

A2 How old are you?

- ○ 18-24 (4)
- ○ 25-34 (5)
- ○ 35-44 (6)
- ○ 45-54 (7)
- ○ 55 or older (8)

Q163 In which state and and which local government area (LGA) do you live?
State (1)
LGA (2)

▼ Abia (1) ... Zamfara ~ Zurmi (811)

B7.2 The next question is about the following problem: In surveys like ours, some participants do not carefully read the questions and just quickly click through the survey. This undermines the results of research studies. To show that you read our questions, please choose “Six or seven times” on the question below. Given the text above, how many times a week do you exercise?

- ○ Never (1)
- ○ One or two times (2)
- ○ Three or four times (3)
- ○ Five times (4)
- ○ Six or seven times (5)

End of Block: Block A: Demographics for Quotas and Attention check

Start of Block: Block B: Wellbeing and Personal Characteristics

B0 *First we are interested in your general wellbeing.*

B1 Does your household have ...? *You can select multiple answers.*

- ☐ Generator (1)
- ☐ Radio (2)
- ☐ AC (4)
- ☐ Computer (5)
- ☐ Refrigerator (6)

B2 What is your current employment status?

- ○ Full-time employee (1)
- ○ Part-time employee (2)
- ○ Self-employed or small business owner (3)
- ○ Unemployed and looking for work (4)
- ○ Student (5)
- ○ Not currently working and not looking for work (6)
- ○ Retiree (7)

Page Break

B3 **How much do you agree or disagree with the following statements?** *Please indicate your answer on a scale of 1 ("strongly agree") to 5 ("strongly disagree").*

B3.1 I like what I do every day.

- 1 - strongly agree (1)
- 2 - somewhat agree (2)
- 3 - neither agree nor disagree (3)
- 4 - somewhat disagree (4)
- 5 - strongly disagree (5)

B3.2 I can't imagine living in a better community than the one I live in today.

- 1 - strongly agree (1)
- 2 - somewhat agree (2)
- 3 - neither agree nor disagree (3)
- 4 - somewhat disagree (4)
- 5 - strongly disagree (5)

B3.3 I can save money at the end of the month.

- 1 - strongly agree (1)
- 2 - somewhat agree (2)
- 3 - neither agree nor disagree (3)
- 4 - somewhat disagree (4)
- 5 - strongly disagree (5)

B3.4 I have enough money to cover monthly expenses.

- 1 - strongly agree (1)
- 2 - somewhat agree (2)
- 3 - neither agree nor disagree (3)
- 4 - somewhat disagree (4)
- 5 - strongly disagree (5)

Page Break

B4 **Now, we want to ask you some questions about the past year. Please tell us how often certain situations occurred during this time.** *Please indicate your answer on a scale of 1 ("never") to 5 ("always").*

B4.1 How often over the past year have you or anyone in your household gone without enough food to eat?

- ○ 1 - Never (1)
- ○ 2 - Just once or twice (2)
- ○ 3 - Several times (3)
- ○ 4 - Many times (4)
- ○ 5 - Always (5)

B4.6 How often over the past year has your community experienced droughts or floods?

- ○ 1 - Never (1)
- ○ 2 - Just once or twice (2)
- ○ 3 - Several times (3)
- ○ 4 - Many times (4)
- ○ 5 - Always (5)

B4.7 How often over the past year have you experienced any form of violence?

- 1 - Never (1)
- 2 - Just once or twice (2)
- 3 - Several times (3)
- 4 - Many times (4)
- 5 - Always (5)

Page Break

B5 **In the following, we will ask you for your willingness to act in a certain way.**

B5 In general, how willing or unwilling are you to take risks? *Please indicate your answer on a scale from 0 to 10, where 0 means you are "completely unwilling to take risks" and 10 means you are "very willing to take risks."*

- ○ 0 - completely unwilling to take risks (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 (7)
- ○ 7 (8)
- ○ 8 (9)
- ○ 9 (10)
- ○ 10 - very willing to take risks (11)

B6 In general, how willing are you to give up something that is beneficial for you today in order to benefit more from that in the future? *Please indicate your answer on a scale from 0 to 10. A 0 means "completely unwilling to do so," and a 10 means "very willing to do so."*

- ○ 0 - completely unwilling to do so (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 (7)
- ○ 7 (8)
- ○ 8 (9)
- ○ 9 (10)
- ○ 10 - very willing to do so (11)

Page Break

End of Block: Block B: Wellbeing and Personal Characteristics

Start of Block: Block C: Prior Risk Beliefs

C1 *We will now turn to migration to Europe. Nigerians who migrate through the desert ("follow land") will have to cross the Central Mediterranean by boat to reach Europe. Migrants who try to cross the Mediterranean either arrive in Europe, are brought back to the North African coast* by coast guards*, or drown at sea. In the following, we will ask you to think about how likely it is for these situations to happen.*

C2 **Suppose there are 100 migrants who want to cross the Mediterranean from North Africa to Europe. How many out of these 100 people...**

_____ reach Europe? (1)
_____ die at sea? (2)
_____ are brought back to the North African coast? (3)

Q149 *Note: You can choose a number between 0 and 100 by moving the slider. Your responses must total 100. If you do not know the answer or are unsure, please give your best guess.*

C3 How sure are you about your answers to the previous question?

- Very sure (1)
- Sure (2)
- Somewhat unsure (3)
- Unsure (4)
- Very unsure (5)

End of Block: Block C: Prior Risk Beliefs

Start of Block: Block D: Sea Rescue Beliefs and Information Provision (T1)

T1.1 Do you think there are civil groups that help migrants in distress at sea and bring them to Europe?

- ○ Yes (4)
- ○ No (5)
- ○ Don't know (6)

Page Break

T1.2 *In fact, there are civil sea rescue vessels that rescue a number of migrants on boats in distress and take them to European shores.*

T1.3 What do you think: how many out of 100 migrants who attempt to cross the Mediterranean Sea are rescued by civil sea rescue vessels? *You can choose a number between 0 and 100 by moving the slider. If you do not know the answer or are unsure, please give your best guess.*

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Q152 How sure are you about your answer to the previous question?

- Very sure (1)
- Sure (2)
- Somewhat unsure (3)
- Unsure (4)
- Very unsure (5)

End of Block: Block D: Sea Rescue Beliefs and Information Provision (T1)

Start of Block: Block D: Sea Rescue Beliefs (T2)

T2.1 Do you think there are civil groups that help migrants in distress at sea and bring them to Europe?

- Yes (4)
- No (5)
- Don't know (6)

Page Break

T2.2 *In fact, there are civil sea rescue vessels that rescue a number of migrants on boats in distress and take them to European shores.*

T2.3 What do you think: how many out of 100 migrants who attempt to cross the Mediterranean Sea are rescued by civil sea rescue vessels? *You can choose a number between 0 and 100 by moving the slider. If you do not know the answer or are unsure, please give your best guess.*

Number from 0 to 100 ()	

Q154 How sure are you about your answer to the previous question?

- ○ Very sure (1)
- ○ Sure (2)
- ○ Somewhat unsure (3)
- ○ Unsure (4)
- ○ Very unsure (5)

Page Break

T2.4 *On the next screen, you will receive information about the actual number of migrants rescued by civil sea rescue missions. Please read the information carefully. This information is only displayed once, you cannot return to it.*

Page Break

End of Block: Block D: Sea Rescue Beliefs (T2)

Start of Block: Block D: Sea Rescue Information Provision (T2)

JS

Q156

You said that [Belief] out of 100 migrants who attempt to cross the Mediterranean Sea are rescued by civil sea rescue vessels. Latest UN and EU statistics indicate that 8 out of 100 migrants are rescued by civil sea rescue vessels.

Your guess:

[Belief] out of 100 migrants are rescued by civil sea rescue vessels.

Official Statistics:

8 out of 100 migrants are rescued by civil sea rescue vessels.

End of Block: Block D: Sea Rescue Information Provision (T2)

Start of Block: Block D: Sea Rescue Beliefs and Information Provision (C)

Start of Block: Block E: Migration Intentions

E1 Would you like to continue living in Nigeria?

- Yes (2)
- No (1)
- Don't know/Prefer not to say (3)

E2 Would you like to move to another country?

- Yes (1)
- No (2)
- Don't know/Prefer not to say (3)

Display This Question:

If Would you like to move to another country? = Yes

E2.1 To which region would you move to?

- ○ Europe (7)
- ○ Gulf states (5)
- ○ USA - United States of America (6)
- ○ Other (4) _____

Page Break

Q147 In the following, we will ask you about your intentions to move to Europe.

E4 How likely is it that you will move to Europe within the next two years? *Please choose on a scale of 1 to 5 (where 1 means very unlikely and 5 very likely)*

- 1 - very unlikely (1)
- 2 - somewhat unlikely (2)
- 3 - neither unlikely nor likely (3)
- 4 - somewhat likely (4)
- 5 - very likely (5)
- Don't know/Prefer not to say (8)

Q167 How likely is it that you will follow land to Europe within the next two years?

- 1 - very unlikely (1)
- 2 - somewhat unlikely (2)
- 3 - neither unlikely nor likely (3)
- 4 - somewhat likely (4)
- 5 - very likely (5)
- Don't know/Prefer not to say (6)

E5 Have you done any preparation for moving to Europe?

- ○ Yes (2)
- ○ No (1)
- ○ Don't know/Prefer not to say (4)

Q166 How likely you think it is that you would be able to go all the way to Europe, if you wanted to. If you had 100 attempts, how many of these attempts would succeed?

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Page Break

E6 People have different reasons to migrate to Europe. What do you think influences the decision to migrate from Nigeria to Europe? *Rank the individual items from very important (1) at the top to less important (10) at the bottom. Please drag each factor from the list on the left into the box on the right.*

1-10
_____ Jobs (1)
_____ Migration costs (2)
_____ Safety (3)
_____ Social benefits (4)
_____ Education (5)
_____ Health care (6)
_____ Sea rescue (7)
_____ Corruption (8)
_____ Join family/friends (9)
_____ Legal status (10)

Page Break

E7_2 How much do you agree or disagree with the following statements? *Please indicate your answer on a scale of 1 ("strongly agree") to 5 ("strongly disagree").*

E7.1_2 It costs lots of money to move to Europe.

- 1 - strongly agree (1)
- 2 - somewhat agree (2)
- 3 - neither agree nor disagree (3)
- 4 - somewhat disagree (4)
- 5 - strongly disagree (5)

E7.2_2 African migrants are welcome in Europe.

- 1 - strongly agree (1)
- 2 - somewhat agree (2)
- 3 - neither agree nor disagree (3)
- 4 - somewhat disagree (4)
- 5 - strongly disagree (5)

End of Block: Block E: Migration Intentions

Start of Block: Block F: Information gathering

F1 How many, if any, of your family members or friends currently live in Europe?

- None (1)
- 1-2 (2)
- 3-5 (4)
- More than 5 (5)

F2 Do you know anyone who has attempted to migrate to Europe by crossing the Mediterranean Sea?

- Yes (2)
- No (1)

Display This Question:

If Do you know anyone who has attempted to migrate to Europe by crossing the Mediterranean Sea? = Yes

F2.a Were they rescued during their crossing of the Mediterranean?

- Yes (2)
- No (1)
- Don't know (3)

Page Break

F4 Which media source do people use to get information about the journey and the conditions in the destination country? *You can select multiple answers.*

- ☐ Social media (e.g., Facebook, Instragram, Tiktok, Twitter, Reddit) (1)
- ☐ Traditional media (e.g., TV, radio, newspaper) (2)
- ☐ Messenger tools (e.g., WhatsApp, Telegram, Signal) (3)
- ☐ Online sources (e.g., Google, Bing) (4)
- ☐ Information campaigns by NGOs (e.g. UNHCR, IOM) (5)

End of Block: Block F: Information gathering

Start of Block: Block G: Posterior Risk Beliefs

G1 *Next, please tell us again: How likely you think is it that migrants who attempt to cross the Mediterranean from North Africa arrive in Europe, die at sea, or are taken back to North Africa.*

Q148 **How many out of 100 migrants who try to cross the Mediterranean...**

_____ reach Europe? (1)
_____ die at sea? (2)
_____ are brought back to the North African coast? (3)

Q146 *Note: You can choose a number between 0 and 100 by moving the slider. Your responses must total 100. If you do not know the answer or are unsure, please give your best guess.*

G4 How likely is it that migrants reach European shores?

- ○ Very unlikely (1)
- ○ Unlikely (2)
- ○ Somewhat unlikely (3)
- ○ Likely (4)
- ○ Very likely (5)

Page Break

Display This Question:

If T2Displayed = True

Q169 Based on the information we gave about the number of migrants rescued by civil organizations in the Mediterranean, do you think your guess was too low, about right, or too high?

- ○ Too low (1)
- ○ About right (2)
- ○ Too high (3)

Q170 Please estimate again: how many out of 100 migrants who attempt to cross the Mediterranean Sea are rescued by civil sea rescue vessels? *You can choose a number between 0 and 100 by moving the slider. If you do not know the answer or are unsure, please give your best guess.*

0 10 20 30 40 50 60 70 80 90 100

1 ()

End of Block: Block G: Posterior Risk Beliefs

Start of Block: Block H: Further Demographics

A3 What is the highest level of school you attended?

- ○ No formal schooling (1)
- ○ Informal schooling only (including Koranic schooling) (2)
- ○ Primary school (3)
- ○ Secondary school (i.e., high school) (4)
- ○ Higher (5)
- ○ Prefer not to say (6)

H2 What is your current marital status?

- ○ Married or living together (1)
- ○ Divorced or separated (2)
- ○ Widowed (3)
- ○ Single (4)

H3 Are there any children below 15 living in your household?

- ○ Yes (4)
- ○ No (3)

Q165 In what year were you born?

▼ 1930 (1) ... 2006 (90)

Page Break

Q150 *Lastly, we would like to know your views about this questionnaire.*

Display This Question:

If T1Displayed = True

Or T2Displayed = True

F3 How credible do you consider the information provided in the survey?

- ○ Not credible at all (1)
- ○ Slightly credible (2)
- ○ Moderately credible (3)
- ○ Very credible (4)
- ○ Extremely credible (5)

H4 In your opinion, what is the purpose of this study?

_____

Page Break

Q160 Thank you for completing the survey! If you have any thoughts or feedback you would like to share with us, please feel free to write them here.

_____

End of Block: Block H: Further Demographics

Discussion of Ethical Considerations in the Survey Experiment

Ethical considerations in the choice of the research method

In the choice of research method, we distinguished between the costs of ignorance and the costs of knowledge in line with the usual assessment of the ethical aspects of human research. With regard to the costs of knowledge, we considered which research designs would in principle be available to answer our research questions. This particularly concerns the invasiveness and risk involved in participating in a study. One conceivable valid approach, which is considered the gold standard of causal inference, would be a field experiment in which randomly selected individuals from the population (in this case, adults in Nigeria) receive randomized information about sea rescue missions in the Mediterranean. Subsequently, risk perceptions, migration intentions and decisions to migrate irregularly would be recorded at different points in time. Another approach would be to offer study participants direct or indirect incentives to take actions.

In comparison, our research design is based on an approach that is minimally invasive and relies exclusively on the provision of valid information. We deliberately opted for a purely survey-based measurement of the dependent variables and an intervention that only provides correct and neutrally formulated information, which is also available to the participants outside of the anonymous survey. This also means that individuals are not deceived and are not directly or indirectly incentivized to act in a particular way. The provision of information merely improves the information basis for a randomly selected part of the sample. This also means that no study participant is excluded from the information in a discriminatory manner on the basis of certain characteristics. Instead, in line with the principle of experimental-based human research that the benefits of study participation should be distributed in a non-discriminatory manner, correct information is made available to many study participants. Participants can also terminate the survey at any time and thus end their participation without any hurdles.

Despite its high political relevance, there is no systematic evidence to date on the effect of beliefs about sea rescue presence on migration aspirations and decisions. This fact increases the expected costs of not knowing as absent of such evidence it is not clear how information about sea rescue activities are distributed in a population with a high incidence of migration and thus how these beliefs impact migration decisions. Empirical research only documents that potential migrants are poorly informed about the migration route and the associated risks. Therefore, we assume that there are both overestimations and underestimations of rescue probabilities. Providing valid information would adjust the expected rescue probability upwards for some study participants and downwards for others. If these corrected assessments influ-

ence behavior, migration decisions would otherwise be based on significant misperceptions of rescue probability without our informational intervention. Given the potential impact of this decision, we believe it is ethically desirable to improve the information base on which individuals can make optimal decisions by clarifying objective facts about the migration route to Europe. Additionally, we present information about sea rescue within a series of questions about the risks of the Mediterranean migration route, making other factors that could deter migration decisions similarly salient. Our intervention consists solely of neutral and valid information without any connection to individual human stories. Furthermore, the migration decision itself is binary. Considering the multifactorial nature of this decision, it seems unlikely that the information provided by the study, even if it positively influences the inclination to migrate, will have a pivotal effect.

Data security

The participants will be made up of panelists from Nigerian partner companies of the international survey company Cint. According to Cint they "take data privacy seriously, are fully compliant with the most stringent regulations, such as GDPR. We facilitate consumer permissions and control via Cint's Permissions Engine. When it comes to transparency, our clients have full, direct access to supply source information so they can monitor and evaluate recruitment quality." We also inform participants about the data security from our side as follows: "Your name will never be recorded by researchers and you will never be identified. The data will be stored on a protected cloud application at the University of Cologne and will be kept confidential. The collected anonymous data may be made available to other researchers for replication purposes." Participants explicitly consent to data processing. The university's data protection office has confirmed the study's compliance (confirmation attached).

Risk of psychological distress or discomfort

In combination with specific individual experiences, individual questions on perceptions of the risks of the migration route to Europe could cause psychological stress or a feeling of threat. The items of the survey are neutral and aim to minimize emotional reactions of the participants. In addition, emigration (to Europe by irregular means) is a highly virulent topic in the Nigerian context, which is why dealing with migration risks is a widespread and frequent phenomenon. In our opinion, the information and questions presented are less anxiety-provoking or psychologically stressful than comparable information in the media or from the experiences of family members, friends and acquaintances. Respondents can also end their participation in the survey at any time.

Misuse by governments, companies or other institutions

Last year alone, IOM estimates that over 200,000 migrants attempted to cross the central Mediterranean from Tunisia and Libya, with around 2,500 deaths. This study investigates whether civilian sea rescue, which saves people in distress at sea, acts as a "pull factor" as critics claim. They argue that NGO ships encourage more migrants to cross, potentially increasing mortality rates. Our research aims to provide evidence on this debated issue, where rigorous analyses are scarce.

Given the polarization of sea rescue, political actors or NGOs might selectively use our findings. However, we believe the potential benefits of rigorously investigating this hypothesis outweigh the risks. Current approaches mainly examine the immediate impact of sea rescue on Mediterranean crossing attempts for a group of people that have already decided to migrate. Our comprehensive analysis includes the potential effects in migrants' countries of origin to determine if sea rescue influences initial migration decisions. Since many migrants decide long before reaching the Mediterranean, it remains unclear if sea rescue is truly a pull factor. We aim to inform potential reforms of European border policies to alleviate the humanitarian crisis in the Mediterranean.