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IZA DP No. 11978

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ABSTRACT

International Migration Intentions and Illegal Costs: Evidence from Africa-to-Europe Smuggling Routes*

Irregular migrants from Africa and the Middle East flow into Europe along land and sea routes under the control of human smugglers. The demise of the Gaddafi regime in 2011 marked the opening of the Central Mediterranean Route for irregular border - crossing between Libya and Italy. This resulted in the immediate expansion of the global smuggling network, which produced an asymmetric reduction in bilateral distance between country pairs across the Mediterranean sea. We exploit this source of spatial and time variation in irregular migration routes to estimate the elasticity of migration intentions to illegal moving costs proxied by distance. We build a novel dataset of geolocalized time-varying migration routes, combined with cross-country survey data on individual intentions to move from Africa (and the Middle East) into Europe. Netting out any country-by-time and pair-level confounders we find a large negative effect of distance along smuggling routes on individual migration intentions. Shorter distances increase the willingness to migrate especially for youth, (medium) skilled individuals and those with a network abroad. The effect is stronger in countries closer to Libya and with weak rule of law.

JEL Classification: K23, K42

Keywords: international migration, human smuggling, illegal migration, Libyan Civil War

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* We thank Francesco Amodio, Thomas Bauer, Michel Beine, George Borjas, Michael Clemens, Paola Conconi, Benjamin Elsner, Francesco Fasani, Gordon Hanson, Ricardo Hausmann, Jennifer Hunt, Joan Llull, Anna Maria Mayda, Luigi Minale, Hannes Mueller, Gianmarco Ottaviano, Giovanni Peri, Hillel Rapoport, Dean Yang and seminar participants at the Growth Lab (CID (Harvard Kennedy School), SITE-Stockholm School of Economics, IAE Barcelona, Montpellier Business School, University of Bologna, University of Milano-Bicocca, 15th IZA AM2 Meeting held at Harvard Kennedy School, 2nd CEPR/EBRD Conference in London, 11th International Conference on Migration and Development at Stanford, 2nd Applied Microeconomics Workshop in Bolzano, CReAM/RWI Workshop on the Economics of Migration, EPCS-Meeting at CEU in Budapest and the Development Economics and Policy Conference in Goettingen for helpful comments and suggestions. We also thank Robert Manchin and the Gallup Organisation for allowing us access to the Gallup World Poll. We are grateful to Jan Luksic and Giulia Vattuone for excellent research assistance and to Sara Lazzaroni for help with geocoded data. The usual disclaimer applies.

1 Introduction

Worldwide migration pressure is expected to rise with growing demographic and economic differences between developed and developing countries. Yet, legal migration channels are becoming increasingly scarce and congested, destination countries are investing in administrative and physical barriers, and irregular migration has become one of the most controversial public policy issues in many destination countries, especially in Europe and in the U.S. In the European case, an additional source of complexity is the multilateral nature of the process of policy design as within Europe, despite the (presumed) commonality of interests in terms of immigration policy, each country has its own specific economic dynamics, policies and political interests.

Apparently, building up barriers has done little to decrease people's willingness to move across international borders (Docquier et al., 2014); rather, a new multi-billion USD industry has emerged which engages in smuggling and trafficking migrants.[1]

The traditional migration push-and-pull factor framework fails to take into account the growing role of the smuggling industry, now the third largest transnational crime, following drug and arms trafficking (Shelley, 2014; UNODC, 2011; Salt, 2003). Some progress has been made by incorporating the smuggling market into the theory on international migration (Friebel and Guriev, 2006, 2012; Tamura, 2010; Auriol and Mesnard, 2016), with drastic effects on policy conclusions about border controls, deportation and the provision of legal channels of migration. However, data on the specificities of smuggling services are hard to come by, similarly to many other irregular or criminal industries. As a consequence, it is very difficult to provide estimates about the impact of smuggling service supply on the flows and composition of migration.

We aim to contribute to filling this gap by estimating a gravity model of migration intentions while using novel variation that directly targets the cost of illegal migration, i.e. an exogenous time series, asymmetric shock to migration distance along smuggling routes. We isolate a causal effect by exploiting the demise of the Gaddafi regime in 2011 as a natural experiment through which the network of migration routes offered by the smuggling industry expanded – in particular by opening up the Central Mediterranean Route (CMR) – thus reducing the distance between pairs of origin and destination countries in a very large portion of the world, namely Africa, the Middle East and Europe. Distance is a proxy for the transport costs of moving (see for example Disdier and Head (2008) looking at trade and Lucas (2001) and Morten and Oliveira (2016) on migration) and the lenght of migration routes directly affects the costs of illegal border crossing. We use the Libyan exogenous shock to smuggling distance across country-pairs as a source of identification of the impact of a change in the cost of migrating illegally on individual intentions to cross borders before and after 2011. Our approach is similar to Feyrer (2009), who uses the closure of the Suez canal

[1] Technically speaking, trafficking entails that migrants do not have agency but are subject to some coercion, while coercion is absent in smuggling. Yet, many crimes are committed against migrants during the smuggling process such that the distinction may have little bite. Furthermore, statistical data often do not clearly distinguish between irregular migration via trafficking or smuggling (UNODC, 2011). Hence, in our paper, we will use the term smuggling for the process of irregular migration, and the services provided and the crimes committed by the agents involved in the industry.

as an exogenous shock to sea distances to identify the effect of transportation costs on trade (see also Pascali, 2017). We, thus, employ a gravity framework and construct bilateral, time varying migration distances along smuggling routes between European and African country pairs. Because there is variation in migration distances between countries, we can include country-pair fixed effects to control for all those characteristics that are time invariant between the respective countries; this includes air distance, but also cultural proximity etc. Hence, identification is achieved through changes in distance along irregular routes – which are fully controlled by smugglers in Africa – so that the effect is coming entirely through changes in the costs of irregular migration. We find a large negative effect of the distance connecting country-pairs along illegal routes on individual migration intentions. Shorter distance, along an expanded irregular smuggling network, increases bilateral migration intentions especially for youth, (medium) skilled individuals and those with a close network abroad. The effect is stronger in countries more exposed to the exogenous shock to distance (i.e. closer to Libya) and with weak rule of law.

Our approach relies crucially on the interpretation of the 2011 collapse of the Gaddafi regime, and in general the turmoil that hit North Africa in 2011, as a natural experiment with unintended consequence being an expansion of the smuggling network. This interpretation warrants some more explanation and institutional background. Border-related bureaucracies and control, coupled with poor infrastructures, lack of transportation means and the complexity of a trip in Africa (e.g. passing through the desert or crossing the Mediterranean), make it very likely for prospective migrants to use smuggling services in the region (Bourbeau, 2012). Smugglers transport migrants from the entire African continent to Europe, offering their services to irregular migrants only. Hence, the availability of smugglers is a necessary condition for South-North migration. At the same time, smugglers only go where customers are, i.e. along the network of smuggling routes: smugglers are therefore also a sufficient condition for illegal migration. This makes African irregular migration qualitatively different from that occuring between Mexico and the US, where the smuggling market is concentrated mainly at the border and hence its spatial dimension plays a minor role.[2]

Major sea routes between Africa-Europe used for irregular migration include the CMR, the East and the West routes. While no changes took place effecting the other routes in the time period under study, the CMR had been closed by the 2008 'Friendship Treaty' signed between Libya and Italy, which allocated significant funds to fight illegal migration, via the Mediterranean. However, border controls and migrants' retention in Libya collapsed in 2011.[3] As documented by Micallef (2017), in the absence of policing and border controls on the Libyan side of the Mediterranean a large-scale smuggling business emerged almost immediately. Africa-to-Europe migration routes form a network (with *hotspots* as nodes) and the opening of the CMR made many nodes in the network closer than before, potentially easing the prospective migrants' chances to move northward.[4] According to

[2]Most of the literature on illegal migration has focused on irregular crossing at the Mexico-US border (e.g., Hanson and Spilimbergo, 1999; Hanson, 2006; Gathmann, 2008; Dolfin and Genicot, 2010).

[3]On February 26, 2011, the Treaty on Friendship, Partnership and Cooperation signed between Italy and Libya on August 31, 2008 was suspended by the Italian government.

[4]Hotspots are those cities, towns or places where the physical interactions between smugglers and migrants take place, such as getting in contact and paying the amount, starting a journey, changing the transportation means, etc.

official statistics by Frontex, the number of people crossing the CMR was 4,500 in 2010, while in 2011 it increased by a factor of almost 15, reaching 64,300.[5] Using such data, we show that the rise in migration flows across the CMR is not offset by a decline in migrants crossing other Mediterranean routes. It is crucial for our research design that we use this shock, but do not focus on the shock itself. In fact we exclude from the analysis the year in which the shock happened (2011), and, more importantly, we also exclude the countries of the region that were directly involved in the Arab Spring. We thus evaluate the unintended effects of an exogenous shock to the cost of migrating illegally as a result of the opening up of the CMR.[6]

For our empirical analysis we combine a novel geocoded data set of irregular migration routes from Africa and the Middle-East to Europe, with a large, repeated cross-country survey data from 2010 and 2012 on individual migration intentions. The survey dataset also includes a large set of household and individual-level characteristics, which allows us to test to what extent illegal migration costs are heterogeneous across the population. Using intentions instead of actual migration, for our purpose, is likely to be an advantage because intentions include both regular and irregular potential migrants, while actual migration data have substantial measurement issues because of the clandestine nature of irregular border-crossing. Furthermore, several contributions have shown that there is a high correlation between intentions and actual migration worldwide (Creighton, 2013; van Dalen and Henkens, 2013; Docquier et al., 2014; Manchin and Orazbayev, 2018). By using Frontex data for the period under investigation we show that the number of irregular migrants that arrived at European ports of entry (by country of origin and year) is highly correlated with the number of people willing to migrate reported by our global survey.

Formal identification is achieved by using the time variation in distance along smuggling routes between origin and destination countries, which resulted from the opening of the CMR, to estimate the impact on indivduals' intention to move from Africa and the Middle-East to European countries. The inclusion of country-pair fixed effects, together with country-by-time fixed effects, control for country–specific push and pull migration determinants, as well as geographical distance, bilateral agreements, economic, language and cultural proximity. Therefore, the impact of the change in distance estimated in our analysis directly captures the impact of the change in transportation costs of moving along smuggling routes. By using interaction terms with time-invariant (air) distance from Libya, we further test the effect of treatment intensity and find that those living closer to Libya have a higher migration elasticity to the smuggling shock. Finally, we investigate the heterogeneous effects of the change in illegal migration costs by interacting the time-varying migration distance with individual-level characteristics. This is intended to shed light on the extent to which access to the smuggling network or the incentive for illegal migration affect the cost of

[5]Frontex is the European Authority in charge of border management and control of the European Schengen Area, in coordination with the border and coast guards of Schengen Area member states. They collect monthly data on irregular migrants arriving in Europe through major South-North migration routes, which are Central Mediterranean, Circular route from Albania/Greece, Eastern Land Border, Eastern Mediterranean, Western African, Western Balkans, Western Mediterranean. See http://frontex.europa.eu/

[6]To illustrate the magnitude of the effect of the shock, consider for instance that the distance along smuggling routes between Ethiopia and Norway decreased by more than 2,000 km between the years 2010 and 2012.

migrating for certain subgroups of the population. By finding a negative average impact of distance on migration intentions, with heterogeneous effects across the population, our results are consistent with a model where the migration decision depends on transportation costs – when it is irregular, these are smuggling costs – which rise with distance. The cost of illegal border crossing, though, is heterogeneous across the population so that individuals with a lower time-equivalent cost of moving (e.g. with higher human capital or social networks) are more willing to migrate.

In the global debate, "tackling the smuggling network" has become one of the most important priorities in curbing the flow of irregular migrants. This paper is the first to assess the role of the smuggling business in triggering – all else equal – the recent South-North immigration pressure. The opportunity to exploit an exogenous source of variation in the cost of illegal migration is rare, and perhaps unique in the migration literature, since migration (enforcement) policies and the middlemen industry for illegal border crossing are typically simultaneously determined. As argued by Clemens (2014) while discussing the role of demand and supply factors in driving emigration from developing countries *"Creative empirical strategies are needed to identify supply effects and demand effects on the shape of the mobility transition"*. Since the length of migration routes directly affects the costs of illegal migration, we exploit spatial variation in irregular routes in the Mediterranean area and use the unique natural experiment of the opening of the CMR due to the demise of the Gaddafi regime as a source of identification. Our micro-level approach offers a way to isolate the relative importance of the human smuggling business in shaping individual migration decisions in developing countries where, even after controlling for all country-specific and bilateral factors, a considerable variation in migration costs and access to intermediaries remains, and is amenable to policy. Finally, we add to the relatively small literature on illegal migration, which has mostly used within–country variation (e.g on Mexico), by providing global evidence on the pervasiness of the (il)legal migration barriers and smuggling costs in the relocation decision across a broader range of countries and settings.

2 South-North illegal migration

With rising border controls and immigration enforcement activities, economic returns to the smuggling business have been growing over recent decades and South-North migration routes have increased in length, difficulty and riskiness in different part of the world (Jandl, 2007; Gathmann, 2008). African migrants crossing borders without visas can move toward Europe through the trans-Saharan and maritime routes.[7] Migration routes tend to be shaped by old routes which were used by caravans and during transhumance through the desert, on the other hand new routes have been slowly developing driven by smuggling competition.[8]

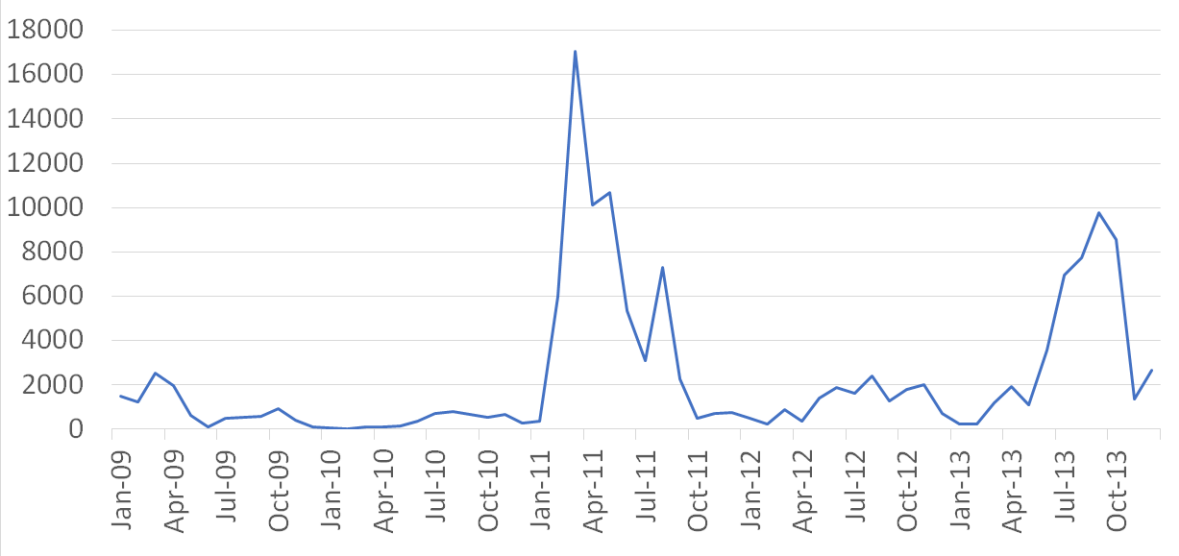
Libya is one of the most important location for people migrating towards Italy and then po-

[7] According to Europol-INTERPOL, more than 90% of the migrants coming to the EU are facilitated, mostly by members of a criminal network using both land and Mediterranean sea routes. Despite the fact that many migrants end their journey prematurely and remain in different sites in North Africa, migratory pressure remains high (almost 2 millions of irregular migrants are estimated to live in Libya and other countries in the Maghreb) (Hammond, 2015).

[8] see iMap website (http://www.imap-migration.org/.

tentially further on to other European destinations. Until 2010 the CMR, connecting Libya with Europe, was a closed route for irregular migration due to the crossing being patrolled by local and international police. This was mainly due to the signature of the Friendship Treaty between Italy in Libya in 2008 which stipulated border control and fighting irregular migration, especially via sea. Ronzitti (2009) reviews the stipulations in this treaty, signed by Berlusconi and Gaddafi, which was meant to control migration via the Mediterranean. In particular, the treaty stipulated joint Italian-Libyan naval patrols to secure the Mediterranean and a satellite detection system that was jointly financed by the EU and Italy meant to control the Libyan land borders. In 2011, though, a wave of sudden protests and uprisings, known as the Arab Spring, shook up the socio–political environment of some African Mediterranean countries. Popular revolts started in Tunisia in December 2010 and in 14 months rulers in Tunisia, Egypt, Libya and Yemen had been forced from power. In particular, in 2011 a significant number of Tunisian people left the country through the central Mediterranean route, while by late 2011, the Gaddafi autocratic regime had collapsed and Libyan borders suddenly became available to undocumented migrants.

Figure 1: Monthly pattern of illegal migration across the Central Mediterranean Route

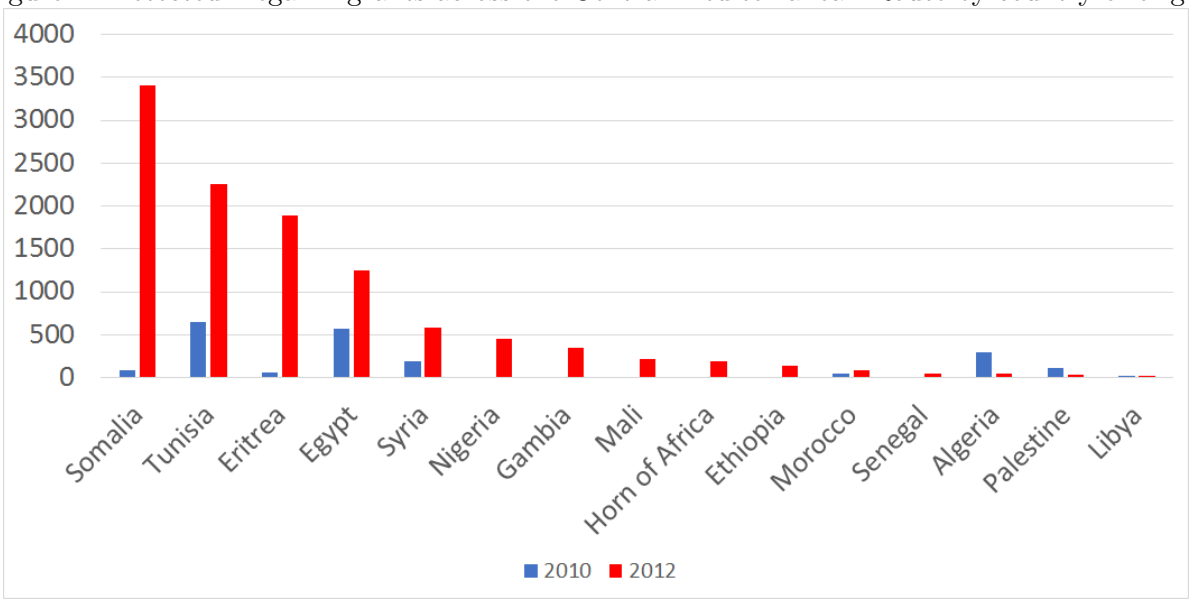


Notes: The figure shows the monthly number of detected illegal migrants (i.e. detected border crossing) arriving in European territory across the Central Mediterranean Route in the period 2010-2012. Source: Frontex)

Using data collected by Frontex on detected migrants across the CMR, Figure 1 shows a flat and close to zero pattern in irregular migration across that route for the year 2010, a large spike in 2011 and a lower average level in 2012, which is however three times larger than that in 2010. In particular, the spike in 2011 comes from people who fled Libya (many of them from migrant workers from sub-Saharan Africa) as the regime collapsed and sea routes were no longer patrolled. This was made possible by the collapse of law and order in the aftermath of Libya's revolution and by the poor economic conditons in the area, which created both the environment and the incentive for the liberalization in the smuggling market as well as the intensification of migrants' exploitation (Micallef, 2017).

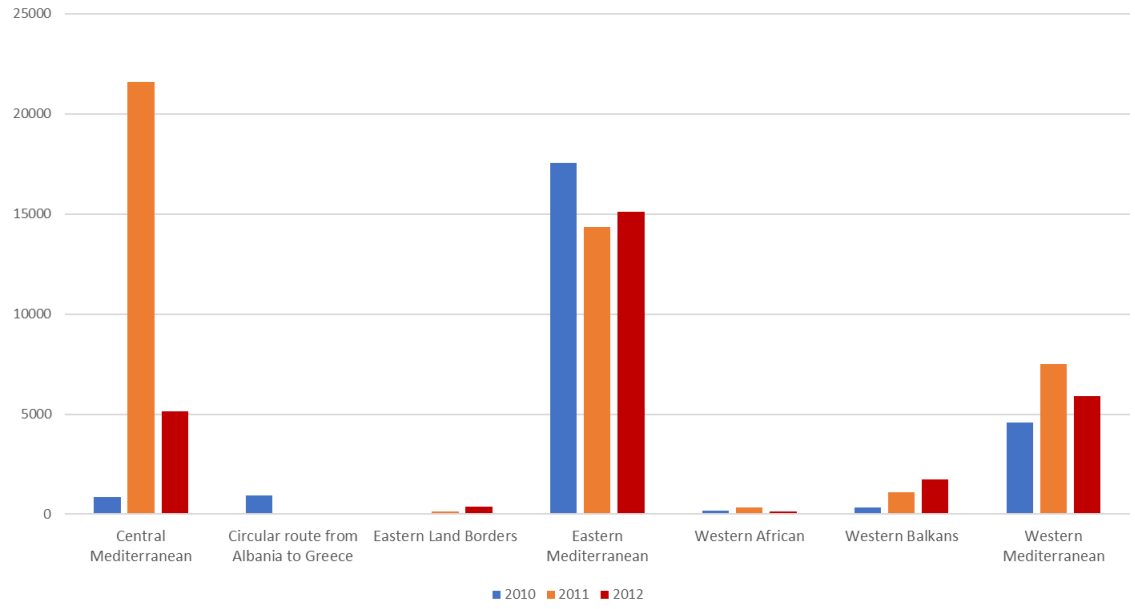
Figure 2 shows variation in detected illegal migrants by origin country crossing the CMR before

Figure 2: Detected illegal migrants across the Central Mediterranean Route by country of origin



Notes: The figure shows the number of detected illegal migrants (i.e. detected border crossing) arriving in European territory across the Central Mediterranean Route from selected origin countries in years 2010 and 2012. Source: Frontex)

Figure 3: Number of detected illegal migrants by migration routes



Notes: The figure shows the number of detected illegal migrants (i.e. detected border crossing) arriving in European territory across different migration routes in years 2010, 2011 and 2012. Source: Frontex.

and after the collapse of Libyan regime. For many countries in the sample we observe large and increasing absolute numbers. Importantly, some of these countries are not close to Libya (see for example Somalia, Eritrea, Syria and Nigeria), suggesting that Libya, from 2011, became the main

human smuggling hub connecting African countries to Europe.[9]

Finally, in Figure 3 we employ Frontex data to compare the use of different smuggling routes from Africa and the Middle East, as measured by detected illegal migrants. The figure shows that migrants from this region make use of essentially three routes, i.e. the Central, Eastern and Western Mediterranean routes. While there is a significant three-fold increase in the use of the CMR after 2010, though, there is not much time variation in the use of the remaining migration routes over the same period.[10]

Overall, the qualitative evidence reported above points to the fact that, after the demise of the Libyan regime and the associated spike in migration in 2011, the CMR re-opened while no major shocks occurred in the rest of the region. We provide more compelling evidence in Section 6 on this. This evidence suggests that the kind of shock we are considering, which translated in the opening of the CMR, indeed increased the possibility (i.e. reduced the cost) of migrating from African to European countries. The empirical analysis below aims at pinning down causally the magnitude of this effect, while muting other confounding forces.

3 Framework and predictions

According to the canonical theory of migration, individuals migrate when the expected utility in a host country net of migration cost is larger than the one associated with staying at home. Initially, this framework of push and pull factors was mainly fitted to a world in which host countries were open for migration. A canonical model of migration in a contemporaneous world in which the bulk of host countries are reluctant to receive migrants is missing, despite some theoretical attempts (Ethier, 1986).

Empirically, it has been shown that migration choices are driven by sizeable cross-country disparities in economic (and non-economic) opportunities (Sjaastad, 1962; Borjas, 1999; Clemens, 2011), and that cross-border flows are shaped by access to legal migration opportunities and enforcement of migration policies at destinations, such as border controls, employer sanctions, deportation policies, amnesties (e.g., Hanson and Spilimbergo, 1999; Ortega and Peri, 2013; Mayda, 2010). The extant literature is consistent in showing that economic incentives and labor market conditions at destinations appear to matter significantly more than restrictive policies on migration (Dao et al., 2018; Docquier et al., 2014). The latter include measures to control legal border crossings, but they do not exclude the possibility of migration occurring through illegal channels. However, over the last decades, legal channels for migration have dried up giving rise to irregular migration flows, which are made possible by a concomitant rise of a profitable intermediate market for migration (Hanson, 2007; Friebel and Guriev, 2006; Gathmann, 2008). Hence, the push and pull framework may not suffice to analyze modern irregular migration without considering the role of the smuggling

[9] In Figure A1 in the Appendix we report detected illegal migrants by origin countries between 2009 and 2012 in order to show the high variation and lack of persistency in migrants' origin over time.

[10] It is worth noting that the number of fatalities is significantly higher along the CMR than for the other sea-routes, so that the number of detected illegal migrants along the CMR may be a more severe undercount with respect to other sea-routes.

market in the decision to migrate irregularly.

One element that is crucial for a better understanding of modern, irregular, international migration is that in many instances, migration is impossible without the help of intermediaries who are often smugglers. Most of the empirical work on irregular migration has looked at the case of migration from Mexico to the US (Hanson, 2006; Hanson and Spilimbergo, 1999; Orrenius and Zavodny, 2005). There is evidence that among those who illegally cross borders, the demand for smugglers has grown, commensurate with rising border control, from an estimated level of 80 percent in 1990 to over 90 percent in the mid to late 2000s (Jandl, 2007; Dolfin and Genicot, 2010; Martin and Miller, 2000). Still, for the Mexico-US case, smugglers facilitate migration, but their services are not absolutely necessary. The situation is quite different in the region we look at - migration from Africa to Europe. Here, because of long distances and adverse conditions, migration is almost impossible without the help of smugglers.

Smugglers connect origin with destination countries by providing services to cross the border, including physical transportation and counterfeit documents (Orrenius, 2014; Micallef, 2017). While there is widespread agreement regarding how important smugglers are, we are missing empirical evidence on how a supply shock of smuggling services would affect migration flows. Measuring the sensitivity of migration intentions and decisions to changes in the supply of smuggling services is certainly important to inform the global debate on tackling the smuggling network, which is seen as a priority in curbing the flow of irregular migration.

Our design focuses on an exogenous shock, and by using a gravity approach we filter out the push and pull factors that are so important for migration. This framework allows us to estimate the average effect of an expansion of smuggling networks which leads to an exogenous reduction in migration distance. In line with a large literature on selection into migration, we are also interested in individual (Borjas, 1987; Chiquiar and Hanson, 2005; Beine et al., 2011; Arcand and Mbaye, 2013), and regional heterogeneities (Mahmoud and Trebesch, 2010; Akee et al., 2014; Cho et al., 2014) in the sensitivity of reacting to this shock.

Individual heterogeneities can be broken down in three categories: First, factors that affect the propensity to migrate, which in our data is measured by the intention to migrate. Here we start from the assumption that very highly skilled migrants, while potentially interested in legal migration, are not migrating through the irregular channels, in particular, because irregular migrants have little chance to integrate themselves into regular labor markets. This results in the well-established flat skill/return profile of irregular migrants providing little if any incentives for the top-skilled people to migrate (except from war zones). For medium-skilled people, the flat skill/return profile also provides less incentives to migrate than for low-skilled people, but medium-skilled people may be able to finance the substantial costs of migration upfront, or through debt, while low-skilled people could not. This discussion implies that it would be the medium-skilled people with some wealth who would react most to a reduction in distance because of an extension of smuggling networks. Second, part of the cost of migration depends on the networks people can draw on, and some people may have better networks than others. Networks are useful for collecting information; and they provide support in finding a job or a place to stay in the host country. They can also provide some

finance through remittances. Third, it should be people who feel less satisfied about their current situation, their prospects, and those who are less connected to their local lives, for instance younger people who are not married.

In terms of regional heterogeneity, a prioris are much weaker. One consideration is that smuggling services are easier to offer where there is little enforcement against them, a possibility we will explore empirically.

4 Data

We use information on potential migrants from two waves of the Gallup's World Poll (GWP) which is a repeated cross-section, nationally representative individual-level dataset covering more than 150 countries over several years.[11] GWP builds on yearly surveys of residents older than 15 years of age and represents more than 98 per cent of the world's adult population (e.g. see Docquier et al. (2014), Dustmann and Okatenko (2014) or Manchin and Orazbayev (2018) for papers using the same dataset).[12] While the GWP contains data from 2005 onwards, we limit our sample to years 2010 and 2012, excluding year 2011 because of the Arab Spring and the associated spike in migration across the Mediterranean sea. The reason for not using other years from the survey is that we do not want confounding factors to bias our analysis. Indeed, before and after the period we consider, other bilateral and multilateral (EU) agreements or migration-policy measures were put in place systematically– also due to the same change of environment we are considering, i.e. the opening of the CMR and the booming of irregular flows (e.g. the Mare Nostrum Operation was launched at the end of 2013 and the Triton operation the following year). We limit our sample to South-North migration to Europe but we exclude Libya from our estimation sample, since this country is affected by both the opening up of the CMR and the demise of the Migration Treaty with Italy (i.e. a pair–specific shock). For the same reason, we further exclude its neighbouring countries, Tunisia and Egypt, as right in 2011 they experienced an internal revolution which led to radically different governmental settings that in turn may have generated bilateral–specific shocks.[13]

By its clandestine nature, irregular migration is not observable and it is empirically difficult to account for its size and composition. An advantage of using intentions to migrate instead of actual migration is that intentions are likely to be a primary determinant of the supply side of

[11] The survey covers each country comprehensively, including rural areas. See further details on the dataset and a full list of available variables in Esipova et al. (2011) and Gallup (2012).

[12] The information is collected from randomly selected, nationally-representative samples of about one thousand individuals per country. In some countries, larger samples are collected in major cities or areas of special interest. Additionally, in some large countries, such as China and Russia, sample sizes increase to at least two thousand respondents. The survey's country samples are probability based (i.e. the weights applied in the survey are used in the empirical analysis of this paper).

[13] Ultimately, our sample of origin countries include Morocco, Algeria, Benin, Burkina Faso, Botswana, Central African Republic, Cameroon, Congo (DR), Congo, Comoros, Djibouti, Gambia, Ghana, Guinea, Kenya, Liberia, Mali, Mauritania, Malawi, Niger, Nigeria, Rwanda, Sudan, Senegal, Sierra Leone, Somalia, Chad, Tanzania, Uganda, South Africa, Zambia, Zimbabwe, Iraq, Israel, Jordan, Lebanon, Syria, Yemen. Destination countries in our sample are Albania, Austria, Belgium, Bulgaria, Czech Republic, Croatia, Serbia, Switzerland, Denmark, Germany, Spain, Estonia, Hungary, Finland, France, Greece, Italy, UK, Ireland, Luxembourg, Latvia, Montenegro, Norway, Sweden, Poland, Romania, Netherlands, Slovenia, Turkey.

international migration flows. Indeed, intentions provide a measure of migration propensities also including potential illegal migrants, which are omitted from most migration statistics. On the other hand, a potential concern when using intentions is whether intentions are "mere words or true plans" (van Dalen and Henkens, 2008). Other studies conducted using migration intentions from GWP show that there is a high correlation between cross-country data on intentions and actual migration flows (see for example Docquier et al. (2014)). In this paper, we use a strict definition of migration intentions, i.e. whether respondents would like to move abroad and whether they plan to do so in the following year. [14]

Key to our study, after answering the individual intention to migrate, the GWP survey asks respondents to indicate a preferred country of destination, which allows us to exploit the bilateral nature of migration intentions and combine them with georeference data on origin–destination pair distance. We focus on the area across the Mediterranean Sea (i.e. Africa, Middle East and Europe) so that our final dataset consists of micro-level information from a representative sample of individuals living in 39 origin countries in Africa and the Middle East, reporting 29 European countries as their preferred destination, in the years 2010 and 2012.

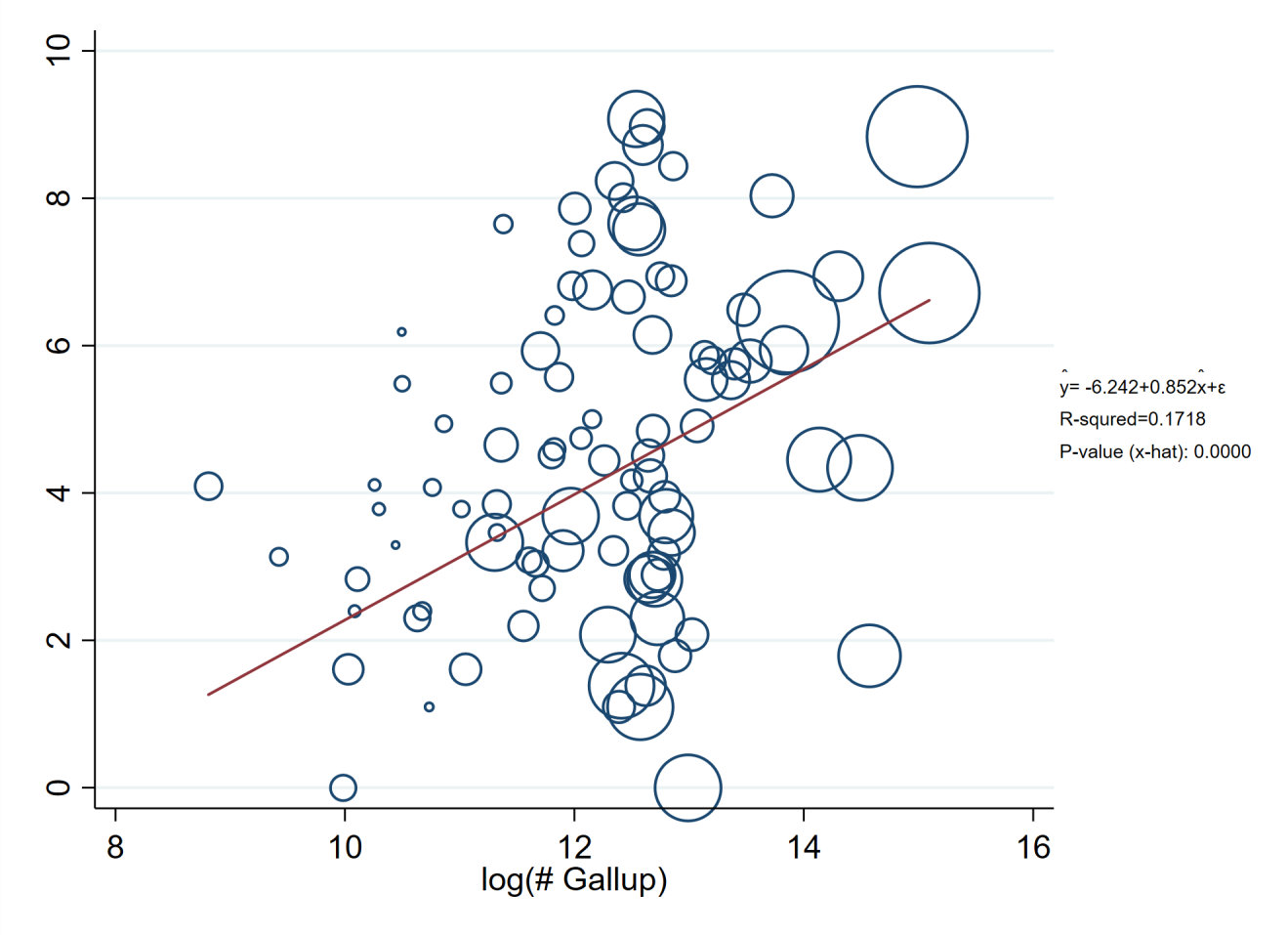
In order to check the extent to which our variable on international migration intention can be a proxy for actual irregular migration flows for the period under investigation, we merged our data with Frontex data on the number of irregular migrants that arrived at European ports of entry, by source country and year. Figure 4 shows that there is a positive correlation between official arrivals recorded by Frontex and the number of individuals willing to migrate from the same country of origin as reported by GWP.[15]

Table 1 reports average emigration rates based on migration intentions for our sample (i.e. aggregate migration intentions as a share of total population). On average, migration intentions increase from 0.71 percent of the population in 2010 to 0.88 percent in 2012. In our sample, migration intentions are mainly concentrated in the youth and male population. Indeed, the share of males in total population with migration intentions is 0.43% in 2010 (0.29% for females), increasing

[14] Migration intentions are measured using the answers to the following questions: (i) "Ideally, if you had the opportunity, would you like to move permanently or temporarily to another country, or would you prefer to continue living in this country?"; (ii) In the next 12 months, are you likely or unlikely to move away from the city or area where you live?"; (iii) Are you planning to move permanently to another country in the next 12 months, or not?"; (iv) "To which country would you like to move?. In particular, question (iii) is asked only starting from the 2010 and only to those who respond positively to question (ii). Hence, while we use all survey questions above as to drop inconsistent responses across them, we focus on question (ii) to identify individuals willing (i.e. planning) to migrate in the following year, out of the relevant population that is defined by respondents to question (ii). See more details on the underlying questions in Manchin and Orazbayev (2018) .

[15] As an extra check for validation, we merged our data with two different datasets containing actual migration. Since these datasets are at aggregate level (country-level instead of individual-level), we aggregated our data using actual population data and survey weights. First, we used bilateral migration flows from the OECD (these contain some missing country-pairs), second, we used bilateral migration stock from (Brücker et al., 2013). The migration stock data provide the number of migrants in the destination country originating from a given country based on census data for the years 1980–2010 for every five years. From this we calculated the yearly average net bilateral flows (by taking the difference between the stocks) and matched this to our data. The correlation between our data on international migration intentions and the actual migration flows obtained from both datasets for 2010 is around 0.7. See also (Creighton, 2013; van Dalen and Henkens, 2013; Docquier et al., 2014) for other evidence on the correlation between intentions and actual migration worldwide.

Figure 4: Gallup World Poll data vs Frontex actual flows



Notes: Source: Frontex and own calculations. The size of the plotted circles are proportional to the size of the population.

to 0.59% in 2012. Similar to males, the share of young people with migration intentions in total population also increases during the period. Moreover, aggregate data reveal a decrease in migration intentions among low-skilled individuals (i.e. those with no more than primary education) which represent more than half of the total population of potential migrants. Instead, migration intentions increase among those with more skills (i.e. secondary education and above) with the share of high-skilled individuals with migration intentions rising from 0.31% to 0.55%.

Table 2 reports migration intentions for the ten countries with highest emigration intention rates (all these countries are above the sample average). Table 3 provides further details on where people from the top five highest emigration countries would like to migrate, listing the two most important destinations for each country. The preferred destinations by country are only a few, with most respondents willing to go to a few selected destination countries in Europe.

Table 1: Emigration intention rates as % of population (Gallup World Poll, 2010-2012)

	2010	2012
Emigration rate	0.71	0.88
Male emigration rate	0.43	0.59
Youth emigration rate (<30)	0.44	0.59
Low-skilled emigration rate	0.40	0.33
High-skilled emigration rate	0.31	0.55

Notes. Emigration rate is the population weighted average across our sample of country-level emigration rates (which are defined as the share of population with migration intentions). Low-skilled is defined as primary education, high-skilled is defined as secondary education and more.

Table 2: Migration shares- Top ten origin countries (GWP, 2010-2012)

Rank	2010		2012	
	Origin country	Emigration rate	Origin country	Emigration rate
1	Senegal	6.58	Comoros	4.17
2	Djibouti	3.78	Sengal	3.49
3	Comoros	2.81	Sudan	2.33
4	Somalia	2.12	Ghana	2.07
5	Mali	1.98	Guinea	1.72
6	Mauritania	1.45	Algeria	1.68
7	Morocco	1.28	Mauritania	1.64
8	Sudan	1.05	Congo Rep.	1.29
9	Ghana	1.02	Morocco	1.29
10	Algeria	0.87	Nigeria	1.18

Table 3: Bilateral migration shares- Top-five origin countries with top-two destinations (Gallup World Poll, 2010-2012)

Rank	2010			2012		
	Origin	Top-2 destination	Emigration rate	Origin	Top-2 destination	Emigration rate
1	Senegal	Spain	2.36	Comoros	France	3.99
		Italy	1.86		Germany	0.177
2	Djibouti	France	2.39	Senegal	France	1.44
		UK	0.48		Spain	1.30
3	Comoros	France	2.48	Sudan	UK	1.25
		UK	0.14		France	0.58
4	Somalia	UK	1.42	Ghana	UK	1.20
		Sweden	0.25		Spain	0.60
5	Mali	France	0.82	Guinea	France	0.76
		Spain	0.60		UK	0.43

4.1 Bilateral Distance

We construct a matrix of bilateral distances from each country of origin (o) to each destination (d) by mapping migration routes between Africa, Middle East and Europe. Unlike air distance, land

and sea migration routes change over time, hence we construct the matrix D_{odt} where t is year 2010 and 2012.[16] The assembling process follows several steps. First, the patterns of international migration routes from countries in Africa/Middle East to Europe have been geolocalized from the maps provided by the iMap platform, which has been developed by ICMPD, Europol and Frontex jointly (a sample map of overland and oversea routes from iMap is reported in Figure A2 in the Appendix).[17] Each country is represented by the coordinates of its capital city, as the migration routes usually go through it and because the location of the capital city is often a good proxy for the center of mass of each country in terms of population. The structure of migration routes represent the network connecting all of the countries in our sample.[18]

In Figure 5 the network of migration routes in 2010 is represented by the red segments connecting the (capitals of) African and European countries (note that the CMR is closed as a direct consequence of the 2008 agreement between Italy and Libya). The blue segments represent the sea routes that after the Arab Spring, and in particular after the end of the Gaddafi regime, became available again at the end of 2011. Hence, the CMR has been added to the 2010 network to obtain the new structure as of 2012.

The distance associated with each origin-destination pair is the minimal geodesic distance calculated by means of a Djkstra algorithm along the segments of the network.[19] Hence, we can measure the effect of the opening of the CMR in 2011 on each origin-destination pair as the difference between the shortest migration route between the two countries not crossing the CMR and the shortest path between the same two countries along all of the routes, now possibly including CMR. In order to avoid too much arbitrariness, we do not impose differential transit costs depending on altitude, ruggedness or other geomorphological characteristics (e.g. rivers, desert, vegetation etc.), so that the cost of moving between nodes maps one to one with the distance.[20] Life risk is also not used to compute adjusted measures of distance for the sake of non-arbitrariness because, while sinkings of boats bringing immigrants across the Libyan Sea break the news, there is only scattered recording and reporting of the many casualties occurring in the thousands of kilometers of desert migrants cross before reaching the sea and land entry ports of Europe.

The resulting matrix can be represented in Figure 6, where each dot is an origin-destination country pair and the horizontal and vertical axes report the distance along smuggling routes in 2010 and 2012, respectively. It is worth noting that, by construction, the addition of links in the network

[16] We constructed a full matrix for each African and European country pair but the coverage in the GWP defines the number of country pairs used in the regression analysis.

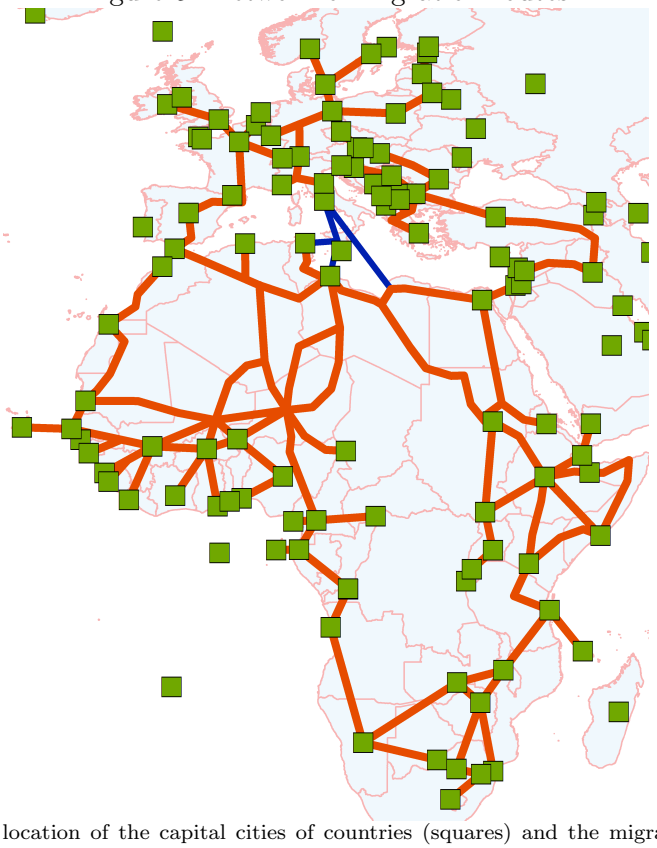
[17] http://www.imap-migration.org/

[18] Those off the migration routes have been connected to their closest neighbouring country using the shortest straight link.

[19] The implicit assumption here is that the cost of connecting two nodes off the migration routes is infinite.

[20] We obtain almost identical results by recoding sea routes being one fifth cheaper than land routes, i.e. rescaling the length of segments across sea by a factor of 0.2. The fact that this modification has little effect on the results can be rationalized as, first, the length of the average route connecting a country pair is in the order of magnitude of thousands of kilometers and the maximum sea distance (between Libya and Italy) is of less then 300 kilometers. Second, the important change between distances across the two periods is the emergence of central Mediterranean route, with its length playing a minor role in the overall change. It is therefore the possibility of finding shorter paths across the network (by means of additional nodes) rather than the shortening of existing segments that mostly contributes to the variation in distances across the two periods.

Figure 5: Network of migration routes



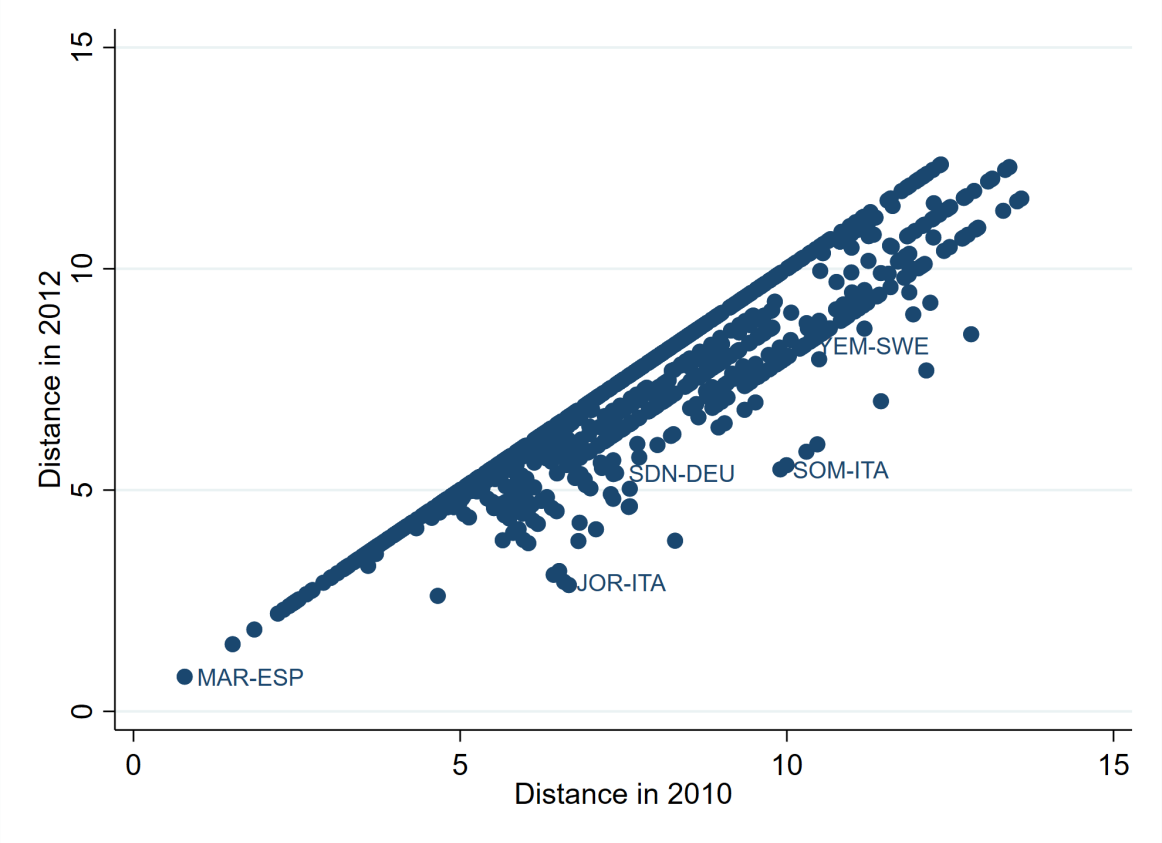
Notes: The figure shows the location of the capital cities of countries (squares) and the migration routes connecting them (lines). Countries not connected are excluded from the sample. Red migration routes relative to year 2010 are obtained from iMap website, while blue ones are those added to construct the network in 2012.

(the 2011 CMR opening) makes the minimal distance between country pairs either unchanged or shorter, particularly for those country-pairs close to the new links. Note that the farther the dots are from the 45-degree line, the closer the country pairs get between 2010 and 2012. Some country-pairs have been labelled as examples, such as Morocco-Spain (the closest pair, which however does not change its bilateral distance over time), Jordan-Italy (the pair experiencing the largest reduction in distance), Yemen-Sweden (a pair made of very distant countries which experienced a sizeable reduction in distance, more than 2000 kilometers).

In Figure 7 we plot how the drop in distance between 2010 and 2012 is distributed at given absolute distances (in 2010), showing that large drops are not only concentrated among those country pairs already close to each other. Figure 8 shows that there is a sizeable number of country pairs for which distance dropped between 2010 and 2012. Finally, Figure 9 shows that some countries (such as Benin, Malawi, and Zambia) did not experience any drop in distance, while others (such as Botswana, Chad and Somalia) became closer to many of the destination countries.[21]

[21] Figure 9 shows only selected countries to improve readability.

Figure 6: Distance between pairs of countries



Notes: The figure shows the distances, in 1,000 Kilometres, between country pairs in 2010 and 2012.

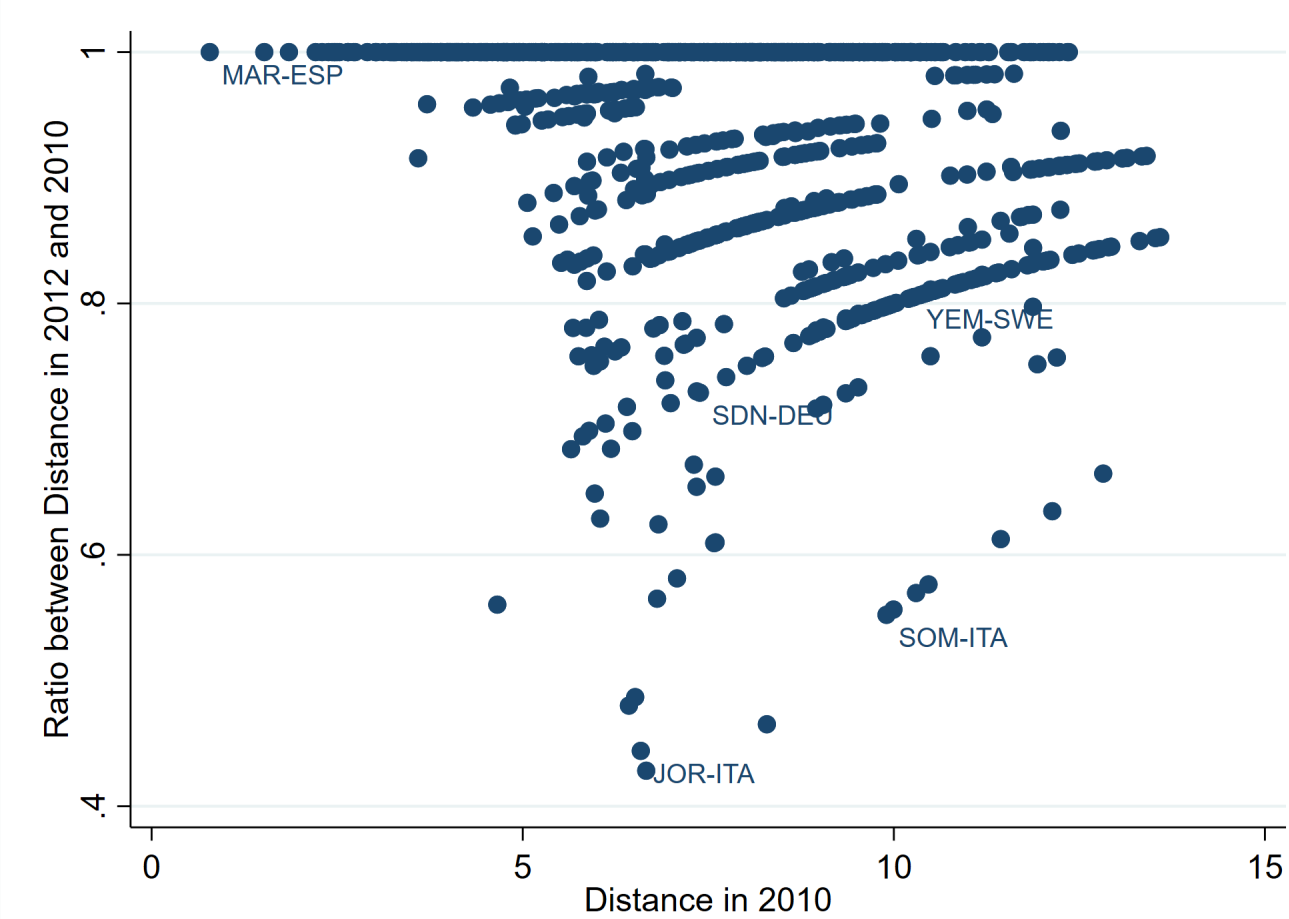
5 Aggregate evidence on the CMR opening

Before turning to our main results on bilateral intentions to migrate, we further use Frontex data on migrant flows arriving at European borders to assess whether the opening of the CMR was coupled with any other major change in the region during the same period of time. This is important in order to rule out a general equilibrium effect whereby the direct effect of the CMR shock is offset by potential migrant relocation along other routes.[22] To do so, we assemble monthly data of arrivals of immigrants collected by Frontex, which classifies individuals in terms of (self-declared) nationality and hub of arrival, the classification of routes being the same proposed in Figure 3. Data is organized thus as a panel of monthly country-level flows arriving in Europe either through the CMR or any other route. Using our smuggling distance matrix, we estimate migration flows as a function of a treatment dummy, which is equal to one if the country experienced a drop in distance from at least one European destination country for the months after December 2011.[23] The empirical specification therefore is as follows:

[22] This general equilibrium effect is mechanically muted in our empirical model, though, as outlined in the following section.

[23] For example, referring to Figure 9, Malawi is coded as zero while Somalia is coded as 1.

Figure 7: Distance between pairs of countries and its reduction



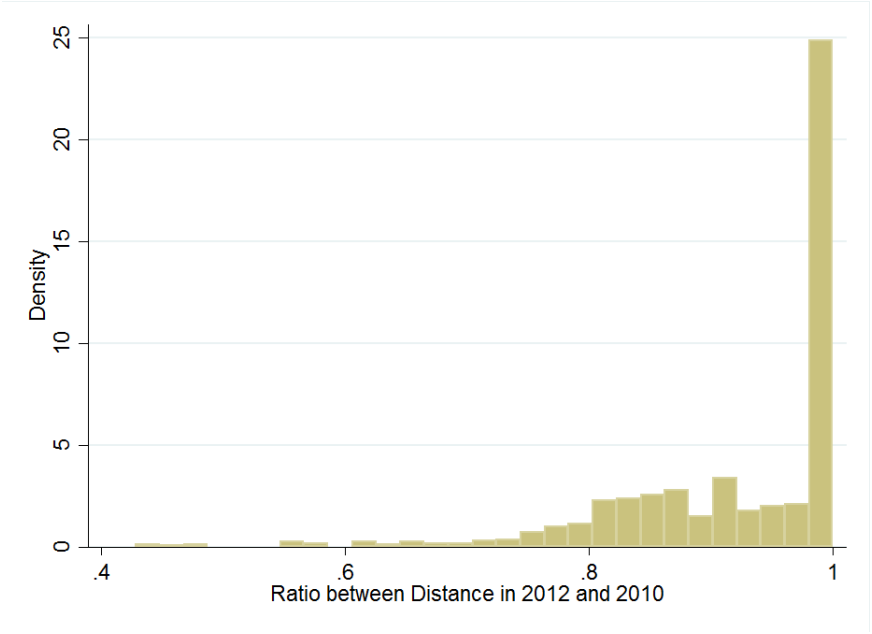
Notes: The figure shows, for each country pair, the ratio between distance in 2012 and 2010 against the distance in 2010, in 1,000 Kilometres.

$$M_{ot}^{R} = \gamma_1 T_{ot} + \delta_o + \tau_t + \epsilon_{ot} \tag{1}$$

where M_{ot}^{R} is the number of immigrants from country o arriving to Europe in month t using the smuggling route R, which can be either the CMR or any other route. T_{ot} is our treatment variable, which is equal to one after January 2012 for those countries o that get closer to at least one European destination country. δ_o are country fixed effects (or a dummy for the treated countries) and τ are month fixed effects or simply the usual pre-post dummy. ϵ_{ot} is an i.i.d. error term.

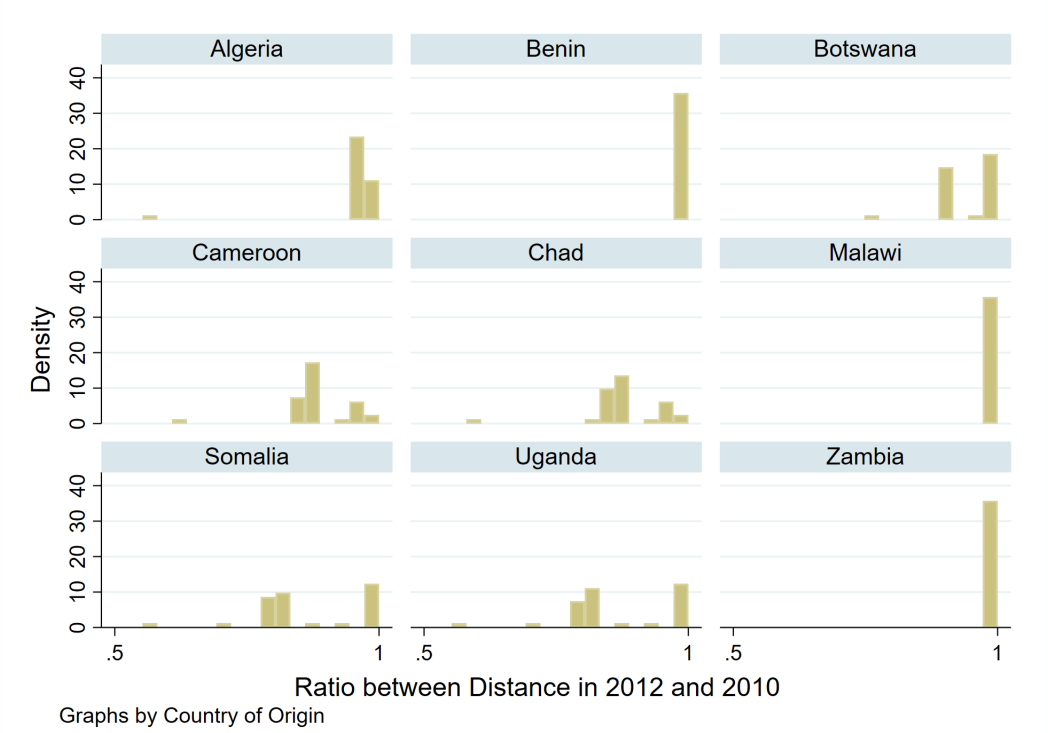
Results presented in the first three columns of Table 4 show that the opening of the CMR significantly increases irregular flows (arrivals) through the same CMR– this is so even after controlling for the lagged flow of migrants that take into account short-term network effects (second row). Importantly, once we use immigrant flows arriving through any other route as the dependent variable, results on the coefficient of the treatment are small, negative and non-significant. This suggests that, in the period we consider, no diversion of flows has been triggered by the opening of the CMR. This aggregate empirical setting is reassuring once we implement our individual-level

Figure 8: Distribution of the 2012-2010 distance ratio.



Notes: The figure shows the distribution, calculated among country pairs, of the ratio between distance in 2012 and 2010.

Figure 9: Distribution of the drop in smuggling distance



Notes: The figure plots the distribution of the drop in smuggling distance from all European countries between year 2010 and 2012 by selected country of origin. Source: Frontex.

analysis as presented in the next section.[24]

[24]Results hold even expanding the sample to months of years 2009 and 2013 and including year 2011 among

Table 4: The impact of CMR opening on monthly arrivals in Europe

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Migrants through CMR			Migrants through other routes		
γ_1	14.3542***	14.3542***	9.2879***	-0.1319	-0.1319	-1.7470
	[3.6010]	[3.6501]	[3.1716]	[12.9292]	[13.0729]	[9.4965]
Lagged Migrants			0.3688**			0.6943***
			[0.1698]			[0.1468]
Observations	864	864	864	864	864	864
Country FE	YES	YES	YES	YES	YES	YES
Post 2011 dummy	YES	NO	NO	YES	NO	NO
Month FE	NO	YES	YES	NO	YES	YES

Notes: The dependent variable is the monthly flow of migrants arriving in Europe using the CMR (columns 1 to 3) or any other routes (columns 4 to 6). The estimation sample is the 12 months of 2010 and the 12 months of 2012. Results are estimated by means of OLS. All regressions include a set of country fixed effects and a dummy for months in year 2012 (columns 1 and 4) or monthly dummies (other columns). Columns 3 and 6 include the one month lag of the dependent variable. Robust standard errors are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1

6 The impact of smuggling distance on individual migration intentions: Empirical Strategy

In our empirical model we use a gravity-like specification. The gravity model has been extensively used to empirically model trade flows since Tinbergen (1962), and the theoretical foundations have been linked to different trade models (see an overview in Head and Mayer (2014)). In addition, the gravity model has also been applied to other types of flows between countries, including migration flows.[25] We employ the gravity framework and exploit an exogenous shock to distance in migration routes to estimate the impact of the latter on individual-level migration intentions to country-specific destinations. Hence, the bilateral estimation equation is as follows:

$$M_{iodt} = \beta_0 + \beta_1 X_{iot} + \beta_2 D_{odt} + v_{ot} + w_{dt} + u_{od} + e_{iodt} \tag{2}$$

where the outcome variable M_{iodt} is a binary indicator of migration intention of individual i to move from country of origin o to country of destination d at time t. The regressor of interest, D_{odt} is the time-varying (log of) distance, measuring the distance between the origin and destination country along migration routes. In addition, we control for a vector of individual covariates, X_{iot}, which include age, gender, education, household size, wealth, urban city residence, satisfaction with local amenities.[26] Importantly, we also include country-pair fixed effects (u_{od}) together with a full set of origin-by-year (v_{ot}) and destination-by-year (w_{dt}) fixed effects.[27] The latter control for

the non-treated. Also, when using a stricter definition of treatment (i.e. countries that got closer to at least two destinations), results remain unchanged.

[25] Beine et al. (2016) provide a good overview of the gravity model's application to international migration flows and lay out also its theoretical basis.

[26] Since recent empirical evidence shows that income considerations are not the only factor influencing migration decisions, our analysis also incorporates non-economic factors. In particular, we control for individuals overall contentment with own living standards and local amenities such as public services, security, and governance (see for example Dustmann and Okatenko (2014) or Manchin and Orazbayev (2018)).

[27] A similar empirical strategy is employed in Pascali (2017), which uses a time-varying (measure of) distance as

all static and dynamic standard socio-economic pull and push drivers of migration at the country level, including economic incentives at origin (e.g. economic downturn, conflict etc.) and migration policy at destination (e.g. new migration laws, change in enforcement, etc.). Country-pair fixed effects absorb all other (time-invariant) bilateral migration costs such as geographical and economic proximity, common language, shared tastes, social networks and bilateral migration policy.[28] Hence, the identification comes from short-run changes – i.e. a reduction – in the length of irregular migration routes, which translate into changes in smuggling services supply. Throughout, estimates allow for arbitrary correlation across both origin and destination countries so that standard errors are two-way clustered. In particular, since we have individual observations which may be correlated (e.g. subject to the same shocks) within the home country (push factors) and the country pair (bilateral factors), we present robust results under within groups correlated errors.[29]

We further explore heterogeneity in the distance effect. In particular, we exploit time-invariant (air) distance from Libya to investigate treatment intensity effects. Indeed, living closer to Libya may entail higher marginal utility from the opening of the CMR than it is the case for those living further away. This is so as, in the absence of the CMR, those living close to Libya and willing to migrate irregularly to the EU would travel through longer migration routes in order to reach alternative hubs (e.g. western or eastern mediterranean routes). Hence, in additional specifications we exploit both time variation in smuggling distance (as above) and geographical variation across countries – in particular air distance from Libya (i.e. intensity of the treatment). We also explore the possibility of having heterogeneous effects across countries endowed with different levels of rule of law.

Finally, by estimating equation (1) we are able to uncover the average causal effect of access to shorter illegal migration routes on the individual-level intention to migrate. Hence, we investigate heterogeneous effects of the human smuggling shock by interacting our measure of availability of human smuggling services (proxied by the time-varying migration distance) with individual-level characteristics. This allows us to uncover the features of individuals who respond more (or less) to the incentive for irregular border crossings. In particular, since international migration is a high risk and costly process (even more along the CMR), we interact our distance measure with individual level characteristics which proxy for differentials in (time-equivalent) migration costs, such as gender, age, education and social networks.

7 Results

We start by estimating the impact of changes in migration route distance on individual migration intentions, as specified in equation (2), controlling for individual-level characteristics, pair and

explanatory variable in a standard gravity trade model.

[28] Given that our time-frame is short, very little change (if any) would have taken place over the period in terms of bilateral migration policies.

[29] More specifically, we use two-way clustered standard errors since we are interested in generalizing results to the whole population in the origin country willing to migrate across all possible country-pairs, beyond those in the sample. See Abadie et al. (2017) for an extensive discussion. One-way clusterings, at the level of either country of origin or country pairs, deliver more precise estimates of the distance coefficient and are available upon request.

country-time fixed effects. The latter controls for all time varying country-specific factors (both origin and destination), and country-pair specific factors. In particular, pair fixed effects include distance and time-invariant (between 2010-2012) common factors such as bilateral (visa) agreements, countries' proximity in terms of language, culture and living standards. Origin- and destination-time fixed effects control for static and dynamic push and pull factors of international migration at the country-level such as (origin and destination) GDP, wages, conflicts, climate shocks and migration policy. Finally, individual characteristics include a vector of controls typically affecting the migration decision including age, gender, marital status, family size (number of children), wealth indicators (two principal component indexes), a dummy for having a family member/friend abroad (migration network), a dummy for urban (city) area, and satisfaction with local amenities.[30] As for the wealth index, we use a principal component analysis based on ten survey questions including household income by quintiles, individual perception/satisfaction with income and standards of living, expectations about future standard of living, and asset ownership.[31] We retain the first two components, which jointly explain 59% of the underlying variation. While the first component, which we call 'wealth', mostly captures actual income and wealth, the second component, which we refer to as 'standard of living', is about the current, and more importantly expected standard of living.[32]

Table 5 reports estimates with a linear probability model of the impact of distance on bilateral migration intentions. So as not to impose a specific functional form for the distance effect, we use a logarithmic, linear and non-linear (quartile dummies) specification of the distance variable (reported in columns (1), (2) and (3) respectively). Throughout, standard errors are two-way clustered at the level of country of origin and country-pair.

Results show a significant negative effect of the change in distance along illegal migration routes between country pairs on the individual intention to migrate bilaterally. The log-linear specification shows that a 10 percent decrease in migration distance increases the probability of willing migrate to a specific destination by almost 0.05 percentage points (p.p.), which represents more than a doubling of the sample mean bilateral migration intentions rate (0.03 percent). According

[30] A bilateral indicator of having a network in each given destination country is available for a subset of individuals, but for the sake of keeping the sample of constant size we use the generic, individual one. Results are however very robust using this latter variable.

[31] By exploiting the unique richness of the GWP, in order to measure wealth we include the following survey questions in the principal component analysis: Income quintile (household income within country quintiles); Perception of present income (Which one of these phrases comes closest to your own feelings about your household income these days?); Current standard of living (Are you satisfied or dissatisfied with your standard of living, all the things you can buy and do?); Changes in standard of living (Right now, do you feel your standard of living is getting better or getting worse?); Mobile phone at home (Does your home have a cellular phone?); Television at home (Does your home have a television); Internet access at home (Does your home have access to the Internet?); Money for food (Have there been times in the past 12 months when you did not have enough money to buy food that you or your family needed?); Money for shelter (Have there been times in the past 12 months when you did not have enough money to provide adequate shelter or housing for you and your family? Since many variables are binary, the analysis is done using polychoric principal component analysis. As a robustness check, we also run standard principal component analysis and results are not affected. See further details on the principal component construction in Manchin and Orazbayev (2018)

[32] Clustering at the level of country pairs alone reduces standard errors in the estimations, in particular for our main explanatory variable.

Table 5: The impact of distance on bilateral migration intentions

	(1)	(2)	(3)
Log smuggling distance	-0.0049*		
	[0.0027]		
Linear smuggling distance		-0.0004*	
		[0.0002]	
First quartile dummy			0.0031**
			[0.0015]
Second quartile dummy			0.0014
			[0.0010]
Third quartile dummy			0.0010
			[0.0008]
Female	-0.0001	-0.0001	-0.0001
	[0.0001]	[0.0001]	[0.0001]
Age	-0.000007**	-0.000007**	-0.000007**
	[0.000003]	[0.000003]	[0.000003]
Married	-0.0001***	-0.0001***	-0.0001***
	[0.0000]	[0.0000]	[0.0000]
Primary education	0.000003	0.000003	0.000003
	[0.0001]	[0.0001]	[0.0001]
Household size	0.000006	0.000006	0.000006
	[0.00001]	[0.00001]	[0.00001]
Close networks abroad	0.0004***	0.0004***	0.0004***
	[0.0001]	[0.0001]	[0.0001]
Wealth	0.0002*	0.0002*	0.0002*
	[0.0001]	[0.0001]	[0.0001]
Standard of living	-0.0005***	-0.0005***	-0.0005***
	[0.0002]	[0.0002]	[0.0002]
Large city	0.0002	0.0002	0.0002
	[0.0002]	[0.0002]	[0.0002]
Satisfaction with the city/area	-0.0002***	-0.0002***	-0.0002***
	[0.0001]	[0.0001]	[0.0001]
Observations	1,217,159	1,217,159	1,217,159
OriginX2012 FE	Yes	Yes	Yes
DestinationX2012 FE	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes

Notes: The dependent variable is a binary indicator for positive bilateral migration intention. Results are estimated with a linear probability model. All regressions include a set of individual-level controls plus country-pair and country-year fixed effects. Standard errors clustered at the level of origin country and country-pair are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1

to the linear specification, a decrease in distance of 1000 Km (2500 Km, one standard deviation) increases the likelihood of migrating by about 12% (30%) at the sample mean. Finally, in the last column of the table we report results with a non-linear quartile-dummy specification of the distance variable, where the fourth quantile is the reference category. Results show that a drop in distance which makes an individual ending up being in the first quartile of the distance distribution significantly increases migration intentions by about 10% at the sample mean. Changes that entail longer distances (higher quartiles) are still positively associated with migration intentions but less precisely estimated. These findings are robust to the inclusion of individual-level controls as well as aggregate – country-by-time and bilateral – fixed effects. Results on the individual level determinants of international migration intentions show the expected sign. In particular, young and

married individuals are less likely to be willing to migrate, whereas being low-skilled (i.e. having no more than primary education) does not play a significant role in the migration intention. On the other hand, *ceteris paribus*, being better off in terms of wealth (and worse off in terms of expected living standards), living in a big city and having a network abroad (i.e. a friend or relative already migrated abroad) significantly increase migration intentions.[33]

By using our estimate of the negative effect of distance, we can shed light on the relative importance of smuggling costs on prospective migration. Indeed, assuming no general equilibrium effects, the number of extra migrants moving from Africa to Europe due to a change in distance, $\widehat{IM}$, can be computed as

$$\widehat{IM} = \widehat{\beta}_2 \sum_o \left(pop_o \sum_d (\Delta dist_{od} \omega_{od}) \right) \tag{3}$$

where $\widehat{\beta}_2$ is the estimated coefficient in the linear specification, pop_o is the population of the country of origin o in year 2010 and $\Delta dist_{od}$ is the change in the irregular distance from country o to country d occurring between year 2010 and 2012. The latter is weighted by ω_{od}, which pertain to the actual bilateral stock of migrants as of 2010 (Brücker et al., 2013). Estimates of the number of emigrants from each source country range between 30 (Mali) and 30,000 (Kenya), with a total estimate of almost 180,000 migrants moving from African country to Europe as a result of the distance effect.[34]

7.1 The distance effect on migration intentions across countries

In order to further explore the elasticity of migration intentions across different contexts or environments, we test the distance effect allowing for heterogeneity across either origin or destination countries in different ways. First, we do so along an absolute geographical dimension of the region we are considering, namely West vs East, and North vs Sub-Saharan Africa (SSA). Indeed, the opportunity cost (in terms of using alternative routes) of crossing the Mediterranean through the CMR may be different according to the individual's country of residence. Moreover, we exploit cross-country variation in air (time-invariant) distance from Libya to test whether people living in 'more intensively treated countries' (i.e. those closer to Libya) react more to the distance shock than individuals living further away. Indeed, if the CMR was closed, people living relatively close to Libya should travel much longer to reach the EU than their peers from other countries. Finally, in order to explore whether country-level characteristics also play a role, we focus on whether the illegal nature of migration is associated with country-specific legal enforcement or rule of law. Hence, we allow for differential effects of smuggling distance between (origin and destination) countries with low vs high levels of rule of law (data source is the World Bank).[35]

[33] Note that individual level variables are only responsible for the extensive margin, i.e. on the decision to migrate or not.

[34] We also use the reported destination country from Gallup data to weight migration distance, i.e. our $M_{iod2010}$ variable, and we obtain an estimate roughly equal to 200,000 emigrants from the origin countries in our sample.

[35] The rule of law index comes from the 2010 WB Worldwide Governance Indicators and captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract

Results reported in Table 6 show that people living in West vs East Africa are not differentially affected by the distance shock (column 1). People living in Southern Africa, instead, are less sensitive to the shock than people living in the Northern area (column 2).[36] In order to explore this further, in column 3 we interact our smuggling distance measure with a dummy variable for countries being above the median distance from Libya – positing that those residing in countries closer to Libya are more 'intensively treated' by the change in the smuggling distance. Results on the interaction term show that the elasticity to the smuggling shock is decreasing (in absolute terms) with distance from Libya, delivering an effect which is not statistically different from zero for those origin countries far away from Libya. The latter results are consistent with the non-linear effects presented in Table 5 above.

Finally, in column 4 we allow countries of origin below the median of the distribution of the rule of law index to experience a differential effect of distance. In this case, the total effect of distance is negative and significantly different from zero only for individuals from countries of origin with relatively low rule of law, suggesting that the smuggling industry may be more widespread in countries with poor governance and institutions.

Table 6: Heterogeneous distance effect across countries

	(1)	(2)	(3)	(4)
Log Smuggling distance	-0.0047*	-0.0061**	-0.0059**	-0.0035
	[0.0025]	[0.0024]	[0.0029]	[0.0025]
Log Smuggling distance * West	0.0010			
	[0.0013]			
Log Smuggling distance * SSA		0.0019***		
		[0.0007]		
Log Smuggling distance * Far from Libya			0.0019**	
			[0.0007]	
Log Smuggling distance * Low ROL origin				-0.0022**
				[0.0008]
Direct effect + Interacted term	-.0057	-0.0042	-0.0040	-0.0056**
	[0.0034]	[0.0027]	[0.0024]	[0.0027]
Observations	1,217,159	1,217,159	1,217,159	1,217,159
Individual level controls	Yes	Yes	Yes	Yes
OriginX2012 FE	Yes	Yes	Yes	Yes
DestinationX2012 FE	Yes	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes

Notes: The dependent variable is a binary indicator for positive bilateral migration intention. Results are estimated with a linear probability model. All regressions include a set of individual-level controls plus country-pair and country-year fixed effects. Standard errors clustered at the level of origin country and country-pair are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1

enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

[36] In our Sub-Saharan dummy, Southern Africa includes Benin, Burkina Faso, Botswana, Central African Republic, Cameroon, Chad, Congo (DR), Congo, Comoros, Djibouti, Gambia, Ghana, Guinea, Kenya, Liberia, Malawi, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Tanzania, Uganda, Zambia, Zimbabwe. Northern Africa includes Algeria, Iraq, Israel, Jordan, Lebanon, Mali, Mauritania, Morocco, Niger, Sudan, Syria, Yemen.

7.2 Heterogenous effects across individuals

In this section we examine the change in the composition of migrants due to the expansion of the smuggling network by estimating differentials in the elasticity of demand for illegal migration across heterogeneous individuals. Hence, we investigate interacted effects in different sub-groups of the population, while controlling for unobserved heterogeneity through country-pair and country-by-time fixed effects. Results are presented in Table 7 where in the first column we report average estimates of the main regressors (we express some of the individual continuous controls above as binary variables); in the remaining columns we report estimates of the main regressors and interacted effects. Results are consistent in showing that a higher distance in migration routes decreases the bilateral individual intention to migrate. Yet, the effect is heterogeneous across sub-groups of the population. In particular, the negative effect of distance is not statistically different between men and women but it is bigger in absolute value for youth (i.e. individuals less than 35 years of age (col 3)) and more educated people (i.e. those with more than a primary education, column (4)). Moreover, while wealth-poor (i.e. those below the second quintile of the wealth distribution) and non-poor individuals are not differentially affected by the distance shock (col 5), those who expect to be poor in terms of living standard do respond more to the smuggling services supply shock (col 6). Finally, those with close social networks abroad (friends or relatives) are also more sensitive to the decrease in distance along the CMR (last column). This is consistent with the argument that the opening of the CMR may not decrease migration monetary costs (as human smuggling is an expensive business) while it may require some skills and social networks (human capital).

In Table 8 we explore even further the compositional effect along the skill dimension by interacting the change in distance with two indicators of secondary and tertiary education respectively (with primary education as the reference category).[37] Results show that a shorter distance along smuggling routes increases the willingness to migrate especially for individuals with secondary education or university drop-outs rather than those with higher education and above. Indeed, the smuggling market is not without costs so that some skills are needed in order to be aware of migration opportunities and be able to afford them in time-equivalent terms. Similarly, evidence shows that more skilled people are more "migratory" than low-skilled individuals, so that lower migration costs – even illegal ones, when legal migration is banned – increase the likelihood to move for relatively more mobile workers.

[37]The GWP defines three categories for educational achievement, namely primary education or less, secondary education completed and some years of university (university drop-out) university education completed and above as tertiary education. Hence, the secondary education category includes relatively skilled individuals.

Table 7: Heterogenous distance effects across individuals

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Smuggling distance	-0.0049*	-0.0053*	-0.0045*	-0.0052*	-0.0051*	-0.0047*	-0.0047*
	[0.0027]	[0.0029]	[0.0025]	[0.0027]	[0.0027]	[0.0026]	[0.0026]
Female	-0.0001	-0.0078	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
	[0.0001]	[0.0052]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Youth (<35)	0.0002***	0.0002***	0.0065*	0.0002***	0.0002***	0.0002***	0.0002***
	[0.0001]	[0.0001]	[0.0034]	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Married	-0.0001**	-0.0001**	-0.0001**	-0.0001**	-0.0001**	-0.0001**	-0.0001**
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Primary education	-0.0000	-0.0000	-0.0000	-0.0046*	-0.0000	-0.0000	-0.0000
	[0.0001]	[0.0001]	[0.0001]	[0.0025]	[0.0001]	[0.0001]	[0.0001]
Household size	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Close networks abroad	0.0004***	0.0004***	0.0004***	0.0004***	0.0004***	0.0004***	0.0145**
	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0062]
Wealth poor (P.C. 1)	-0.0001	-0.0001	-0.0001	-0.0001	-0.0028	-0.0001	-0.0001
	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0031]	[0.0001]	[0.0001]
Wealth poor (P.C. 2)	0.0001***	0.0001***	0.0002***	0.0002***	0.0002***	0.0048*	0.0002***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0026]	[0.0000]
Large city	0.0003*	0.0003*	0.0003*	0.0003*	0.0003*	0.0003*	0.0003*
	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Satisfaction with the city/area	-0.0003***	-0.0003***	-0.0003***	-0.0003***	-0.0003***	-0.0003***	-0.0003***
	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Distance*female		0.0009					
		[0.0006]					
Distance*Youth (<35)			-0.0007*				
			[0.0004]				
Distance*Primary education				0.0005*			
				[0.0003]			
Distance*Wealth poor					0.0003		
					[0.0003]		
Distance*Exp.Liv.Poor						-0.0005*	
						[0.0003]	
Distance*Network							-0.0016**
							[0.0007]
Observations	1,217,159	1,217,159	1,217,159	1,217,159	1,217,159	1,217,159	1,217,159
OriginX2012 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DestinationX2012	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is a binary indicator for positive bilateral migration intention. Results are estimated with a linear probability model. All regressions include a set of country-pair and country-year fixed effects. Standard errors clustered at the level of origin country and country-pair are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1

8 Conclusion

In a world in which income disparities between north and south diverge, and the legal opportunities for migration become increasingly scarce, a global multi-billion USD human smuggling industry has arisen. Understanding and (where possible) predicting migration flows and their composition has become impossible without taking the role of the smuggling industry into account. Specifically, we focus on migration from Africa to Europe, in which migration is only possible through the use of smuggler networks.

To gauge the elasticity of individuals migration intentions to extended smuggling networks, we exploit an exogenous shock that shortened the distances between many African and European country pairs in a heterogeneous way. We find large average effects of the shorter smuggling

Table 8: Heterogenous effects by individual skill-level

VARIABLES	
Smuggling distance	-0.0047*
	[0.0026]
Secondary education	0.0050*
	[0.0026]
Tertiary education and above	0.0003
	[0.0022]
Distance*secondary education	-0.0006*
	[0.0003]
Distance*tertiary education	-0.0000
	[0.0002]
Observations	1,217,159
OriginX2012 FE	Yes
DestinationX2012 FE	Yes
Pair FE	Yes

Notes: The dependent variable is a binary indicator for positive bilateral migration intention. Results are estimated with a linear probability model. All regressions include a set of individual controls as in Table 5 plus country-pair and country-year fixed effects. Standard errors clustered at the level of origin country and country-pair are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1

distance, but, surprisingly, there are no significant differences between females and males, while, less surprisingly, the migration intention of young people and people with relatively high education levels responds more. The effects are also stronger for those who have social ties to people who have already migrated.

Self-selection of the relatively more educated in the migration pool is something that European policymakers should take into account. We also document that the largest effects are in regions that are closer to Libya, and where the rule of law is weak. The latter seems to imply that local conditions may matter substantially, not only because a weaker rule of law may make it easier for smugglers to operate through a ramification of the international illegal network in these countries, but also because a weak rule of law may mask worse living conditions. In line with this conjecture, we find that the intention to migrate negatively correlates with the satisfaction with local living conditions.

It would be tempting to interpret our results as evidence in support for a strategy to tackle smuggler networks in order to reduce migration intentions and hence flows. Whether this is a feasible strategy, though, is at least questionable. The very speed with which the smuggling industry took off in Libya after the demise of the Gaddafi regime seems to indicate that the smugglers would move to other places when attacked. For this strategy to be successful would hence need a substantial amount of policy coordination.

Providing more legal channels seems to be another alternative, but those rejected or anticipating rejection could still take recourse to illegal channels unless their living conditions were to improve. Coordinating with local governments and international organizations in better screening those eligible to migrate to Europe (through quotas, for humanitarian reasons, etc.) and at the same time reinforcing and coordinating the legal apparatus aimed at blocking illegal migrants should reduce potential migrants uncertainty on their possibility to enter Europe, therefore saving them

thousands of kilometers of potentially very dangerous trips.

A final remark relates to our identification strategy. To our knowledge, we are the first to exploit spatial variation in irregular migration routes into Europe as to examine the role of the smuggling business in the recent emigration pressure from Africa. The approach can be used for other important events as well, for instance the EU-Turkey agreements that led to the closure of the Balkan route. Moreover, one can investigate the effect of closure of one route on intentions to migrate along other routes, an experiment that would allow to better understand the elasticity of smuggling supply with respect to different policy variables.

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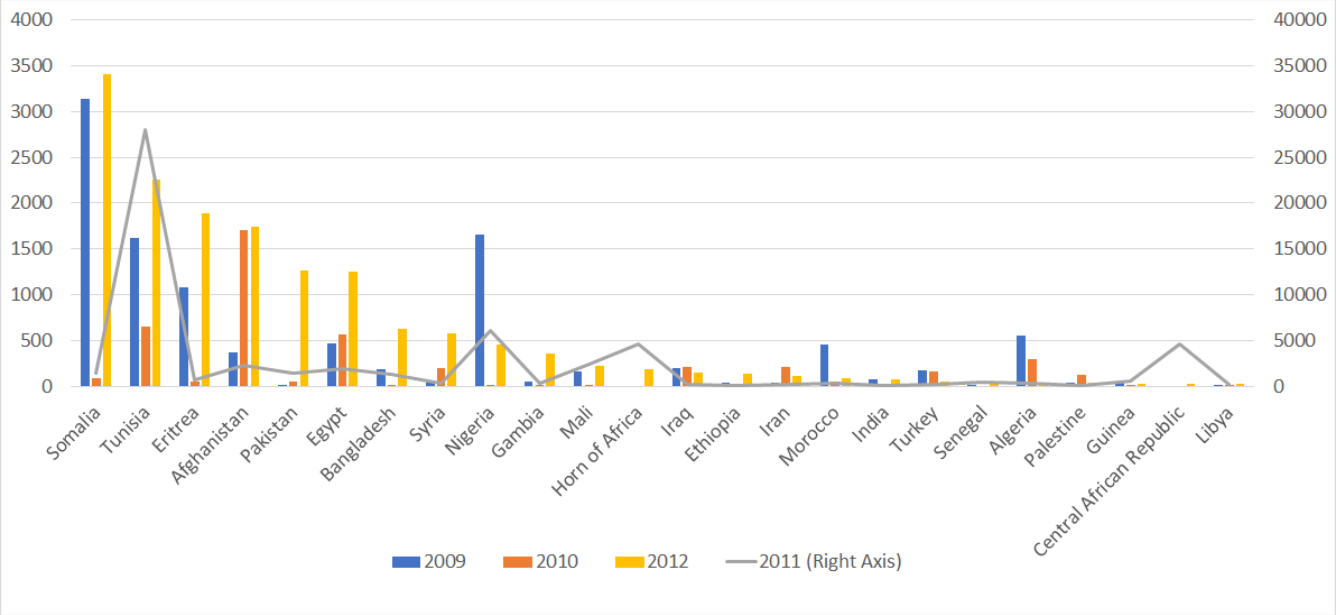
A Appendix

Figure A1: Detected illegal migrants across the Central Mediterranean Route by country of origin



Notes: The figure shows the number of detected illegal migrants (i.e. detected border crossings) arriving in European territory across the Central Mediterranean Route from selected origin countries in years 2009 to 2012. Arrivals for year 2011 are reported on a different scale (right). Source: Frontex

Figure A2: Land and sea irregular migration routes from Africa in 2012

Source: iMap (http://www.imap-migration.org/)