

# The Internetization of International Migration

LUCA MARIA PESANDO , VALENTINA ROTONDI ,  
MANUELA STRANGES , RIDHI KASHYAP   
AND FRANCESCO C. BILLARI 

*The Internet has revolutionized our economies, societies, and everyday lives. Many social phenomena are no longer the same as they were in the pre-Internet era: they have been “Internetized.” We define the Internetization of international migration, and we investigate it by exploring the links between the Internet and migration outcomes all along the migration path, from migration intentions to actual migration. Our analyses leverage a number of sources, both at the micro- and the macro-level, including the Gallup World Poll, the Arab Barometer, data from the International Telecommunication Union, the Italian population register, and unique register data from a migrant reception center in Southern Italy. We also distinguish between economic migrants—those who leave their country of origin with the aim of seeking better economic opportunities elsewhere—and political migrants—those who are forced to leave their countries of origin for political or conflict-related reasons. Our findings point to a consistently positive relationship between the diffusion of the Internet, migration intentions, and migration behaviors, supporting the idea that the Internet is not necessarily a driving force of migration per se, but rather an enabling “supportive agent.” These associations are particularly relevant for economic migrants, at least for migration intentions. Further analyses underscore the importance of the Internet in providing a key informational channel which helps to define clearer migration trajectories.*

---

Luca Maria Pesando is at the Department of Sociology and Centre on Population Dynamics, McGill University, Montréal, Québec, H3A 2T7, Canada. Email: luca-maria.pesando@mcgill.ca. Valentina Rotondi is at the Department of Sociology, Leverhulme Centre for Demographic Science and Nuffield College, University of Oxford, Oxford, OX1 1JD, UK. Manuela Stranges is at the Department of Economics, Statistics and Finance “Giovanni Anania”, University of Calabria, Arcavacata di Rende, 87036, Italy. Ridhi Kashyap is at the Department of Sociology, Leverhulme Centre for Demographic Science and Nuffield College, University of Oxford, Oxford, OX1 1JD, UK. Francesco C. Billari is at the Department of Social and Political Sciences and Carlo F. Dondena Centre for Research on Social Dynamics and Public Policy, Bocconi University, Milan, 20136, Italy.

## Introduction

Migration scholars have defined the current era as *the Age of Migration* (Castles, De Haas, and Miller 2013). Still, the major shift in our societies and economies during the past two decades is linked to the diffusion of the Internet and the digital revolution that comes with it—we are also living in the *Internet Age* (Castells 2002, 2015). Information and communications technologies (ICTs, henceforth), and in particular the diffusion of the Internet, have fundamentally changed every aspect of our social, economic, and political life, with immense implications, including for life-course trajectories and demographic outcomes (e.g., Bellou 2015; Rosenfeld 2017; Billari, Giuntella, and Stella 2019; Danielsbacka, Tanskanen, and Billari 2019; Alexander, Polimis, and Zagheni 2020; Billari, Rotondi, and Trinitapoli 2020; Rotondi et al. 2020). Moreover, the digital revolution brought about by the advent of the Internet has compressed how we perceive time and space (Cairncross 1997). Migration is no exception in this revolution, and a growing literature has hypothesized both a positive and a negative link between ICTs and the decision to migrate (e.g., Dekker, Engbersen, and Faber 2016; Leurs and Smets 2018; Winkler 2017), within the general role of technology in shaping migration (Thornton et al. 2019).

At the population level, the spread of the Internet has been associated with a significant increase in the scale of international migration. In 2019, 272 million international migrants were estimated at a global level (migration stock), increasing from 150 million in 2000. The estimated shares of the world population who are international migrants increased over this period, from 2.8 to 3.5 percent, making migration central to political debates and policy discussions (International Organization for Migration 2020). In what follows, we argue that the Internet has been, and will in the future be, crucially shaping migration and international migration in particular—hence, the *Internetization* of international migration. We empirically study this Internetization of international migration by focusing on the relationship between Internet diffusion at the population level or Internet use at the individual level and migration outcomes following the different steps of the migration path—intention to migrate, decision to migrate, actual migration journey—and conducting analyses on a series of complementary data sources.

There are several reasons to expect the diffusion of the Internet and migration to be related all along the migration path, yet the scholarly literature on the topic does not provide evidence of an unequivocally positive or negative association, thus leaving scope for additional research. On the one hand, the Internet may support the decision to migrate through a number of channels, by encouraging the willingness to move, and lowering the economic, social, and psychological costs associated with migration (positive association). Before migration takes place, the Internet offers more

information on the potential decision to migrate, including information about economic and social life in the destination country, which may potentially encourage people to move (Choo and Mokhtarian 2007; Vilhelmson and Thulin 2013; Withaekx, Schrooten, and Geldof 2015; Dekker, Engbersen, and Faber 2016; Kotyrlo 2020). Furthermore, by providing information about the life of others, the Internet might shift material aspirations upwards (Clark and Senik 2010; Lohmann 2015; Thornton et al. 2019), thereby increasing individuals' willingness to migrate. Internet-mediated communication may cement ties with existing networks for prospective migrants, but also enable new contacts outside of existing networks, which facilitate information flows especially for those otherwise lacking social capital and traditional migrant networks (Dekker and Engbersen 2014). These new, expanded networks, may also bring new destination countries into consideration for migrants, thereby opening up new migration streams. Once migrants have made it across a border, the Internet may provide a relatively cheap, accessible, and flexible form of transnational communication that helps them keep their contacts with those left behind—and thus reduce the psychological and emotional costs of migration (Dekker and Engbersen 2014; Withaekx, Schrooten, and Geldof 2015). On the other hand, the spread of the Internet may reduce the importance of push factors driving migration, such as through increases in trade flows, job opportunities, and economic growth in sending countries (Czernich et al. 2011; Akerman, Gaarder, and Mogstad 2015). It may also reduce pull factors, by enabling forms of remote working and connectivity that weaken the need to relocate to another country (Agrawal et al. 2013) (negative association).

The analyses in this paper are structured following the main steps of the migration path—intention to migrate, decision to migrate, and actual migration. We first analyze the association between the Internet and migration intentions,<sup>1</sup> that is, a subject's willingness to leave her/his country of origin.<sup>2</sup> Second, we analyze the relationship between the spread of the Internet and actual migration. Whenever the data allow, we study separately two groups of migrants, namely economic and political migrants. Economic migrants are defined as those leaving their countries of origin due to unfavorable economic conditions and with the aim of seeking improved living standards and economic opportunities elsewhere.<sup>3</sup> Political migrants are those forced to leave their countries of origin due to violence or discriminatory policies, often without warning. Unlike economic migrants, political migrants are unable to return home without being persecuted until conditions in their countries of origin are safe again. Provided the Internet serves as an "enabling" informational channel, we expect the association between the spread of the Internet and migration to be more salient for economic migrants as compared to political migrants, whose migratory paths are likely to be less predictable and less purposefully planned.

We rely on complementary empirical approaches and sources, with data at both the macro- and the micro (individual) level. First, we focus on migration intentions and estimate panel-data models aggregating migration intentions at the country-level from the Gallup World Poll, a continuous survey of citizens in about 160 countries, representing more than 98 percent of the world's adult population, combined with ICT and other indicators from the World Bank World Development Indicators (WDI), the International Telecommunication Union (ITU), and the Institute for Economics and Peace.<sup>4</sup> We complement the Gallup analysis with individual-level associations between Internet usage and willingness to emigrate, drawing on a sample of roughly 40,000 individuals in 14 countries included in the Arab Barometer (a nonpartisan research network that provides insight into the social, political, and economic attitudes and values of ordinary citizens across the Arab world), the majority of which experienced an upsurge in emigration directed towards Europe in recent years. Second, we focus on migration decisions and take Italy—a country that has witnessed sizeable increases in migrant in-flows in the past two decades—as a case study. Given its relative proximity to North Africa, in recent years Italy has constituted an important escape route to Europe and has emerged both as an important new destination country, as well as a transit country to other parts of Europe for hundreds of thousands of migrants.<sup>5</sup> Using time series and panel data on the stock of migrants—the number of individuals from a foreign country who register as residents in Italy according to the National Institute of Statistics (ISTAT) from 1995 to 2017—linked to information on Internet penetration in the country of origin available from the ITU, we explore the association between Internet penetration in the country of origin and the likelihood of migrating to Italy in the following year or the following five years. Lastly, we analyze data on migrants who have just reached the coasts of Italy crossing the Mediterranean Sea. These migrants have often attempted to reach the Southern coasts of Italy aboard dinghies and in desperate conditions. We can exploit the richness of a novel dataset on the Sant'Anna Cara reception center for migrants and asylum seekers in Calabria, Southern Italy.

To summarize, in our analyses we focus on migration intentions (Domain 1) both at the macro- (Gallup) and the micro-levels (Arab Barometer) and, similarly, we address actual migration (Domain 2) both at the macro (Italian population register) and the micro-levels (Sant'Anna Cara reception center). Table 1 summarizes our approach and the main features of each data source. Across both levels of analysis, our results point to a positive association between Internet access/penetration and both willingness to emigrate and actual migration decisions. In each of our analyses, we further explore different forms of heterogeneity, such as for whom or the types of migration that Internet access enables.

**TABLE 1 Overview and details of data sources used in the analysis**

	Gallup World Poll	Arab Barometer
<i>Domain 1: Migration intentions</i>		
Focus	Association between Internet use and willingness to migrate to another country	Association between Internet use and intensity of Internet use and intention to emigrate
Variation	Country level, overtime	Individual level, cross-sectional
Coverage	154 countries, all over the world	14 Arab countries
Timeframe	2006–2017	2006–2009 (wave I); 2010–2011 (wave II); 2012–2014 (wave III); 2016–2017 (wave IV)
Internet variable	Percentage of population using the Internet from International Communication Union (ITU)	Internet use and frequency of use directly from survey
Other controls	World Bank Development Indicators and Institute for Economics and Peace	Directly from survey
<i>Domain 2: Actual migration</i>		
	ISTAT Population Register	Sant’Anna Cara reception center
Focus	Association between Internet use in origin country and actual migration to Italy	Association between Internet use in origin country and actual migration to Italy and towards other European countries (through Italy)
Variation	Country level, overtime	Country level and individual level, cross sectional
Coverage	Thirty origin countries, predominantly from Europe and Central Asia (ECA)	Twenty-five origin countries, mainly from Middle East and North Africa (MENA) and sub-Saharan Africa (SSA)
Timeframe	1995–2017	2008–2018 and 2011–2012
Internet variable	Percentage of population using the Internet from International Communication Union (ITU)	Percentage of population using the Internet from International Communication Union (ITU) and digital skills from survey
Other controls	World Bank Development Indicators and GeoDist Database from CEPII	Directly from survey

The remainder of this paper is structured as follows. The second section introduces the Internetization of international migration, also reviewing the relevant literature and outlining the mechanisms through which the Internet can positively or negatively shape migration outcomes; the third section presents the different sources of data used in the empirical analysis; the fourth section presents our results. Lastly, we conclude with a discussion of the findings, limitations, and suggestions for future research.

### Background and perspectives

Internetization, in general, refers to the pervasive effects of the Internet on social and economic phenomena. This notion acknowledges that

Internetized social and economic phenomena become radically different from the same phenomena in the pre-Internetized era. The social theorist Leopoldina Fortunati defines and discusses Internetization in relation to the evolution of mass media (Fortunati 2005). For mass media, the presence of the Internet on the one side allows, and even forces, traditional media to be active online in order to be visible and seen. On the other side, it changes the way classic mass media exist as they change and their traditional forms (e.g., in print, audio, or video) also become Internetized. Fortunati sees the Internetization process in two stages. In the first stage, traditional activities are shaped by the online world. In the second stage, offline activities become transformed by the existence of the Internet. A related concept is Luciano Floridi's *onlife* notion (Floridi 2015), which emphasizes the pervasive changes that the Internet has brought about in all aspects of life, with the distinction between offline and online activities becoming meaningless.

Migration is no exception to the Internetization of social phenomena, including the pervasive changes that affect also the so-called offline behaviors around migration. First, traditional migration behaviors are influenced by the spread of the Internet. In the second stage, migration becomes a different phenomenon altogether. This two-way link runs through various mechanisms.

On the one hand (positive link), by facilitating access to information and the formation, growth, and maintenance of (remote) global and diaspora communities (Oiarzabal and Reips 2012), the Internet has changed the perceived cost of migration to such an extent that the experience of migration before and after the advent of the Internet can hardly be compared (Alonso and Oiarzabal 2010). The Internet lowers the cost of communication across borders and facilitates access to information about destination countries (Hiller and Franz 2004; Beine, Docquier, and Ozden 2011; Vilhelmson and Thulin 2013; Dekker, Engbersen, and Faber 2016), which may make the decision to migrate easier. Qualitative studies such as Hiller and Franz (2004), Burrell and Anderson (2008), and Dekker, Engbersen, and Faber (2016), and survey-based evidence from Thulin and Vilhelmson (2014) provide support for this idea. The Internet may also reduce other mobility costs, such as travel logistics and visa procedures (Choo and Mokhtarian 2007).

Social networks matter for enabling migration (Massey et al. 1993), and the Internet provides more media-rich forms of communication with existing networks, but also opens up new pools of contacts ("latent ties") that can act as providers of information about destination countries to those who may otherwise lack existing networks (Hiller and Franz 2004; Burrell and Anderson 2008; Dekker and Engbersen 2014; Dekker, Engbersen, and Faber 2016). These new and larger pools of ties also have the potential to facilitate new migration streams directed to destination countries which may previously not have been on the radar of migration decisions shaped

by closer and smaller networks. Quantitative support for the role of online media in facilitating existing, as well as latent ties, is provided by Dekker, Engbersen, and Faber (2016). Internet-mediated communication may also serve to lower the emotional and psychological costs of migration once migrants move, and qualitative case studies in different contexts provide evidence for how the Internet enables caregiving from a distance and the maintenance of transnational family ties (Baldassar 2016; Nedelcu and Wyss 2016). Indeed, further evidence that the Internet has permeated migration behaviors comes from the fact that the “digital traces” of Internet-mediated communication (e.g., e-mail, social media use) can themselves aid the demographic measurement of international migration (Zagheni and Weber 2012; Zagheni, Weber, and Gummadi 2017; Cesare et al. 2018).

The Internet may indirectly shape migration through another channel. By providing information about the life of others, the Internet shifts material aspirations upwards (Hiller and Franz 2004; Lohmann 2015; Dekker, Engbersen, and Faber 2016). Access to information is, in fact, a crucial asset that people use to evaluate their own living conditions, income, and happiness relative to others. A group of studies has shown that media and communication technologies drive material aspirations upwards. Bruni and Stanca (2006) show that for heavy television viewers—people who watch TV for more than two hours per day—an income increase is worth less in terms of both life and financial satisfaction with respect to low-frequency TV viewers, a result extensively confirmed by Frey, Benesch, and Stutzer (2007). Hyll and Schneider (2013) show that television consumption causally increases material aspirations defined as individual assessments of the importance of material possessions.

However, when compared to monological sources of technology, such as television or radio, the Internet is distinct in several respects (Gergen 2002). While monological technologies imply a unidirectional communication flow, without allowing any interaction, dialogical communication technologies imply an interactive communication flow that is more instantaneous and enables connections with networks outside of one’s own. Different platforms such as social networking sites, virtual communities and forums, blogs, microblogs, as well as messenger and chat services enabled by the Internet provide avenues for media-rich communication that allows for several individuals to communicate at once (Boyd and Ellison 2007). Furthermore, the Internet transcends national and international boundaries, which broadcast television and radio generally do not transcend. The Internet therefore expands one’s own reference group, including persons in destination countries to whom an individual compares himself or herself. Clark and Senik (2010) show that Internet users attach greater importance to income comparisons relative to non-users, a result largely confirmed by Lohmann (2015). On the same line, Sabatini and Sarracino (2016) find that online social network users have a higher probability to

compare their achievements to those of others, resulting in lower satisfaction with their income. Evidence in line with the unique nature of dialogical communication also comes from studies on mobile phones, which find a positive link between mobile phone diffusion and migration outcomes. Examples are Czaika and Parsons (2017) for highly skilled migration to OECD countries, Schaub (2012) for sub-Saharan Africa, Muto (2012) for rural-to-urban migration in Uganda, and Aker, Clemens, and Ksoll (2011) in Niger.

On the other hand (negative link), the Internet can also lower the importance of push or pull factors in the decisions to migrate (Winkler 2017). For instance, the Internet could contribute to economic growth and job creation in the home country by increasing trade or Foreign Direct Investment (FDI) flows (Freund and Weinhold 2004; Czernich et al. 2011), as well as the demand for skilled workers (Akerman, Gaarder, and Mogstad 2015). The Internet can also contribute to improving institutions at home, thereby lowering migration incentives (Elbahnasawy 2014). Not least, the Internet may enhance the possibilities that individuals work remotely online, thus reducing the need to physically relocate to another country (Agrawal et al. 2013). If any of these factors outweigh the decline in mobility costs brought about by the Internet, we might then observe a negative—rather than a positive—association between the Internet and migration intentions and/or decisions. Evidence in line with this latter finding is supported, for instance, by Winkler (2017) in a study of migrant stocks across 33 OECD countries and by Cooke and Shuttleworth (2017) in a study of interstate (internal) migration in the United States.

What the broad implications of the Internetization of international migration are, and whether the relationship between Internet and migration outcomes is positive or negative remains ultimately an empirical question. The answer to this question may depend on the context of analysis and on the migration stream considered. We here posit that Internet access and usage bear, overall, a positive relationship with information seeking and with people's aspirations as they are induced to compare themselves to a virtual reference group that is living in other—often wealthier—countries and is broader than their local social comparators. We expect the mechanisms to be linked to knowledge accumulation and economic aspirations and, in more general terms, to be more applicable to moves that are intentional and carefully planned than those undertaken, for instance, in desperation. We thus expect the Internet to be more strongly associated with migration outcomes for economic migrants, whose migration trajectories are more likely to be planned and predictable. Unlike political migrants, who might be pushed, for instance, by the sudden explosion of a civil conflict (Bohra-Mishra and Massey 2011), economic migrants' decisions are more likely to benefit from access to information regarding the migration process, as well as shaped by aspirations about brighter futures in their destination countries. We may also expect the associations to be more salient for groups whose access to

information and networks to enable the migration decision are limited in others ways, such as women or individuals with fewer socioeconomic resources (e.g., less education).<sup>6</sup>

In our investigation, we refrain from claiming that Internet access or diffusion drives or “causes” international migration. While the combination of data sources and methodological approaches that we employ is rich and permits to rule out some concerns of reverse causality and/or selection on observables, we cannot fully rule out endogeneity driven by selection on unobservable characteristics. By not making any strong causal claim throughout the analysis, our study thus builds on the idea carried forward by Thulin and Vilhelmson (2014) that the Internet might be one—among many—“supportive agents” when making migration decisions, rather than their main or sole driver.

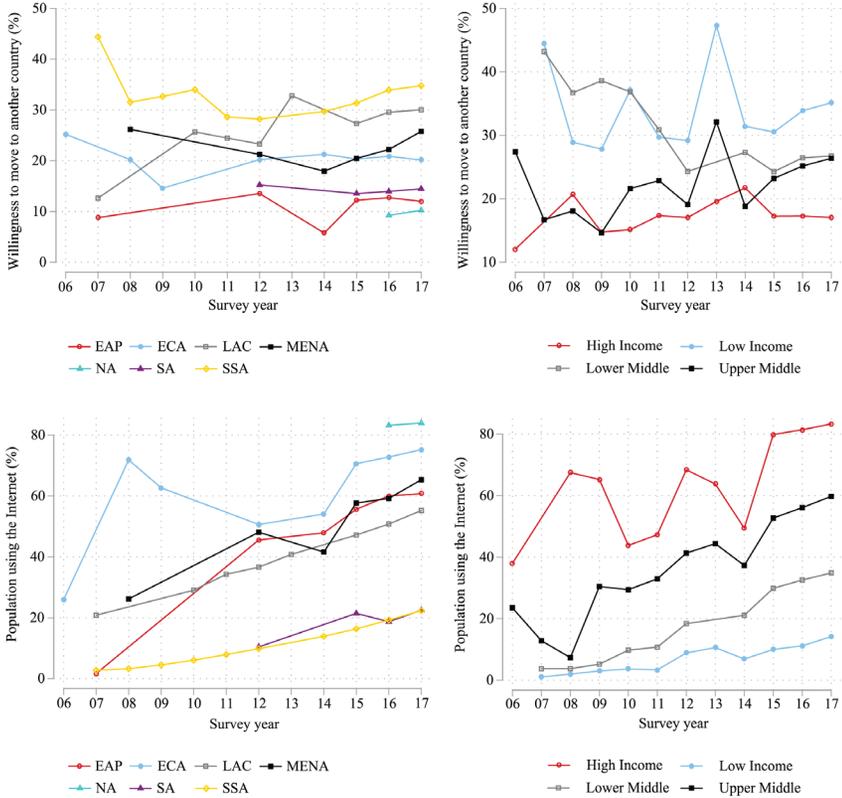
## Data and methods

This project makes use of the four different data sources summarized in Table 1 above and further described below. Detailed descriptive statistics for all variables used in the analysis from each dataset are available in the online Appendix Table A1.<sup>7</sup>

### Migration intentions: The Gallup World Poll

We first use data from the Gallup World Poll, a continuous survey of citizens in 160 countries, representing more than 98 percent of the world’s adult population. The Gallup World Poll consists of more than 100 global questions as well as region-specific items, and it includes questions pertaining to these areas: law and order, food and shelter, institutions and infrastructure, good jobs, well-being, and brain gain. Relevant to our work, Gallup includes a question on whether the respondent is willing to move permanently to another country. We use this variable as a proxy for migration intentions. As Gallup provides individual-level data on migration intentions, but incomplete information on Internet usage, we run panel-data models at the macrolevel, aggregating up migration intentions information. In doing so, we obtain complete information for 154 countries. We augment these data by merging information on country-level predictors—including Internet usage, defined as the percentage of the population using Internet—from external sources such as the World Bank WDI and the International Telecommunication Union (ITU). Alongside standard controls proxying for socioeconomic development obtained from the WDI such as GDP per capita, unemployment, percentage of the population that is rural, and total population, we also include the Global Peace Index (GPI) as a predictor of migration intentions<sup>8</sup>—an index produced by the Institute for Economics and Peace since 2008. The GPI ranks 163 independent states and

**FIGURE 1 Overtime trends in willingness to move to another country (top panel) and population using the Internet (bottom panel), by region (left) and income group (right), Gallup and ITU data**



NOTES: The migration variable is not available in every year. Regional and income classification from the World Bank. “EAP”: East Asia and Pacific; “ECA”: Europe and Central Asia; “LAC”: Latin America and Caribbean; “MENA”: Middle East and North Africa; “NA”: North America; “SA”: South Asia; “SSA”: Sub-Saharan Africa.  
 SOURCES: Gallup World Poll, World Bank Development Indicators, and ITU.

territories (99.7 percent of the world population) according to their levels of peacefulness, measured as the extent to which they are involved in ongoing domestic and international conflicts. Twenty-three indicators related to peace, security, conflicts, safety, terrorism, and between-country relations are used to obtain the final score. Higher values of the GPI correspond to more conflict, that is, less peace. The inclusion of the GPI as predictor is useful to test our hypothesis on economic versus political migration at the aggregate level. On these data, we estimate a series of fixed-effects models and investigate heterogeneity by year-specific GDP per capita terciles (to test the economic argument) and GPI terciles (to test the political argument).

Using data from Gallup and ITU, Figure 1 provides descriptive statistics on our two main variables of interest, namely willingness to migrate to another country (top panel) and the percentage of the population using the

Internet (bottom panel) over time (2006–2017). To summarize the significant cross-country heterogeneity, we provide trends by broad macroregion (left) and income group (right), with both categorizations defined according to World Bank classifications. Willingness to emigrate is highest in sub-Saharan Africa (SSA), followed by Latin America and the Caribbean (LAC) and Middle East and North Africa (MENA). Conversely, willingness to emigrate is lowest in South Asia (SA), East-Asia and Pacific (EAP), and North America (NA). The panel to the right confirms these trends, providing evidence of a clear gradient in willingness to emigrate by income group, with low-income countries at the top and high-income countries at the bottom. No clear trends over time are apparent, except for an increase in willingness to emigrate in the post financial crisis period (after 2008), alongside a gradual convergence between lower-middle income countries and upper-middle income ones.

Gradients by income group are fully reversed for Internet diffusion, with low-income countries at the bottom and high-income countries at the top. All groups of countries have experienced an increase in Internet diffusion. For instance, in low-income countries Internet diffusion has expanded from about 1 percent in 2007 to almost 18 percent in 2017, while in high-income countries the expansion has been from roughly 40 percent of the population in 2006 to 82 percent. Lower- and upper-middle income countries have experienced some of the steepest increases—see, for instance, EAP in the panel by region, which has undergone an increase from under 5 percent in 2007 to 60 percent in 2017. In LAC and SSA, the increase in Internet diffusion has also been steady.

### **Migration intentions: The Arab Barometer**

To provide a microlevel counterpart to the macrolevel analyses conducted with Gallup, we use data from the four available waves of the Arab Barometer,<sup>9</sup> a project developed by a network of regional barometers in Latin America, Sub-Saharan Africa, East and South Asia. The sample includes 14 countries, covering more than 40,000 individuals.<sup>10</sup> Face-to-face interviews were conducted using multistage random sampling. The questionnaire in the Arab Barometer includes, among others, items on citizens' attitudes about public affairs and governance, religion and religiosity, social capital, family status, employment, and economic morality. One key question on the intention to migrate was also included in the questionnaire ("Do you think about emigrating from your country?"). For ease of interpretation, we recoded the original four-item migration variable into a dummy variable, with "I think about emigrating from my country" = 1 and "I do not think about emigrating from my country" = 0. The survey also asked for additional details on the reason for potentially migrating, namely economic versus political reasons. Internet use is a variable accounting for whether

individuals use the Internet, and how much time they devote to it. More specifically, we consider a dummy variable equal to 1 if the individual declares to use the Internet at least daily (and 0 otherwise). As a robustness check, we also consider a ranking variable (1–5) indicating the intensity of the time spent on the Internet.

On these data, we estimate a series of ordinary least squares (OLS) models adding controls sequentially. Model 1 provides a simple bivariate association between daily use of the Internet and willingness to emigrate; model 2 adds demographic controls such as sex, age, and age squared; model 3 adds controls for socioeconomic status such as marital status, level of education (none, elementary, primary, secondary, and bachelor or above), employment status, and a dummy for generalized trust; model 4 adds income deciles computed by country-wave. This variable reduces sample size significantly;<sup>11</sup> therefore, we omit it from the heterogeneity analyses by sex and education presented in models 5 and 6, respectively. All models include country and survey year dummies and account for sampling weights to make estimates representative of the population of interest.

As our dataset is cross sectional and Internet users may be a selected group who are different from non-users, we attempt to better account for endogeneity through matching Internet users and non-users on observable characteristics that we have in the data. Nonparametric matching models have two distinct advantages over regression-based models: they do not assume any *a priori* functional form for the relationship between Internet and migration outcomes, and they rely on comparing (or “matching”) the treatment observations with a closely matched set of control observations rather than using all the untreated observations in the sample as controls, some of which are simply not comparable with those reporting daily use of the Internet. However, like OLS, nonparametric matching models assume that selection into using the Internet is based only on observable characteristics and is therefore exogenous to individuals’ migration intentions, conditional on including these observable characteristics. Characteristics used for matching are those included in models 3 and 4, and we perform nearest-neighbor matching with Mahalanobis distance matching weighting matrix whereby the relative weight to be placed on each control variable is given by the inverse of the sample variance/covariance matrix.

### **Actual migration: Italian population register from the Italian National Institute of Statistics**

To offer macrolevel evidence on the relationship between Internet and actual migration, we make use of information from the Italian National Institute of Statistics (ISTAT). ISTAT provides detailed time-series data on the number of individuals in the Italian population register, called “Anagrafe,”

considered as resident on the Italian territory in a specific year. Time series are detailed by country of origin, thus allowing us to merge country-level time-series data from origin countries. We assume that individuals were living in their countries of origin in the year prior to their first registration in Italy. We thus study the “migrant stock”—the number of individuals from a foreign country who register as residents on the Italian territory—as a function of country-level variables pertaining to the origin countries, including use of the Internet from ITU measured as in Gallup analyses above. Time series for socioeconomic controls are obtained from the WDI and the GeoDist Database obtained from the Centre d’Études Prospectives et d’Informations Internationales (CEPII). From this latter source, we obtain the distance in kilometers (km) between the origin country and Italy. These data span the timeframe between 1995 and 2017 and provide information on individuals from 30 origin countries.<sup>12</sup> Note that these 30 countries cover a wide span of development stages—ranging from Nigeria to the United States—and do not exhaust all possible origin countries. Oftentimes, migrants entering Italy from the most disadvantaged countries are not immediately registered in the “Anagrafe.” We nonetheless believe that this wider range of countries represents a strength of these data, as it allows us to complement the evidence from other data sources (such as the one introduced below) that pertains largely to migrants from low-income countries. Methodologically, we provide descriptive evidence on the association between Internet penetration in a country (at time  $t - 1$ ) and migration stock (at time  $t$ ), and we run lagged OLS and fixed-effects (FE) models exploiting the panel nature of the country-level dataset. We also provide, in line with Winkler (2017) and Kotyrló (2020), robustness checks using Internet penetration at time  $t - 5$ .

### **Actual migration: Individual-level data from the Sant’Anna Cara reception center, Calabria, Italy**

Migrants reaching the coasts of Italy through the Mediterranean Sea are usually assigned to CDAs (Centri di Accoglienza, or Centers of Hospitality), or CARAs (Centri di Accoglienza per Richiedenti Asilo, or Reception Centers for Asylum Seekers). CDAs are centers where new arrivals are transferred to receive first aid and registration. CARAs are instead centers where asylum seekers without identity documents (or whose documents have been confiscated by smugglers) or who refuse to undergo border controls are sent in order to be identified and apply for recognition of their refugee status. We exploit the richness of a novel dataset including register data corresponding to the exhaustive list of migrant entries to the Sant’Anna Cara reception center, a multipurpose CDA/CARA located in Crotona, one of the five provincial capitals of Calabria in the South of Italy, between 2008 and 2018.<sup>13</sup>

This center started its host activities in 1998. The data stem from administrative registers of the center, filled and kept by officers working in the center after migrants enter the structure. The dataset includes the exhaustive list of entries from January 1, 2008 to December 31, 2018, covering a total number of 40,157 migrants. Register data include only a limited number of variables, namely the date of entry in the center and date of exit, the reason for departure (if any), sex, date of birth (hence, age), and country of origin. Reasons for departure include voluntary departure, obtaining any kind of protection (humanitarian protection, political asylum, subsidiary protection, temporary residence permit), and other reasons (including transfer to another reception center).<sup>14</sup> Most of those who depart voluntarily from the center wish to reach another country in Europe (Stranges and Wolff 2018). Typically, irregular migrants engage, predeparture and postarrival, in intense information-seeking—which may be further enhanced by the Internet—on questions such as (i) Where in Europe am I most likely to be granted refugee status?; (ii) Where will I receive the most attractive support package while my application is being considered?; (iii) Where am I least likely to be sent back to Italy under the Dublin Regulation?; and (iv) Where is it easiest to “disappear” if my application is definitively rejected? The “reason for departure” variable is thus important for our project as it allows to study the association between Internet use and the trajectories of migrants once they reach the center.

We group all reasons for departure related to the obtainment of a form of national or international protection and consider the three following reasons: voluntary departure, any form of protection, and all other reasons combined. Since each migrant may be affected by one of these mutually exclusive events, we use a competing risk model (Fine and Gray 1999) and we estimate models for the three reasons for departure simultaneously, relying on a flexible parametric survival specification. These models, originally proposed by Royston and Parmar (2002), are more flexible than standard parametric methods as they allow to capture a wide range of hazard shapes using splines to model the log-cumulative hazard function. In our estimations—which assume proportional hazards—the cause-specific hazard for a migrant with observable characteristics depends on a baseline hazard which is specific to each cause and cause-specific parameters. The cumulative hazard function is modeled as a natural cubic spline function of log time. The overall dataset (2008–2018) includes no individual variable related to technology use and skills, hence—in line with the above analyses—we merge a country-level variable on Internet diffusion from ITU lagged at time  $t - 1$ . The control variables are sex, age groups, and country of origin. No other covariates of interest are included in this broader sample.

For the period 2011–2012, due to a special statistical survey conducted in the center, we instead have individual-level information on the education and skills of migrants, including digital skills. We use this reduced

**TABLE 2 Country-level associations between Internet use and willingness to move to another country, Gallup data**

	Willingness to move to another country			
	(1)	(2)	(3)	(4)
Use of Internet (percentage of population)	-0.175***	0.022	0.231***	0.118**
	(0.02)	(0.03)	(0.04)	(0.05)
GDP per capita (ln)		-10.835***	-16.342***	-12.966***
		(0.86)	(3.60)	(3.59)
Unemployment (%)		0.357***	0.602***	0.837***
		(0.08)	(0.17)	(0.17)
Population (ln)		9.499***	8.209	6.741
		(0.96)	(7.50)	(7.59)
Rural population (%)		-0.328***	-0.425	-0.469*
		(0.03)	(0.26)	(0.26)
Global Peace Index		0.291	-4.029**	-3.747*
		(1.08)	(1.99)	(1.99)
Constant	31.835***	154.048***	318.654***	264.891**
	(0.76)	(9.29)	(101.72)	(114.20)
Year dummies	No	No	No	Yes
Country dummies	No	No	Yes	Yes
Observations	756	694	694	694
R-squared	0.146	0.362	0.897	0.908

\*\*\**p* < 0.01; \*\**p* < 0.05; \**p* < 0.1.

NOTES: Standard errors in parentheses. Some observations are lost between model 1 and model 2 due to the lack of the GPI for some country-year combinations.

SOURCES: Gallup World Poll, WDI, ITU, Institute for Economics and Peace.

sample (approximately 2,000 migrants) to complement the above analyses by investigating whether the digital skills of migrants—and in particular their knowledge of the Internet—are associated with specific migration trajectories.

## Results

### Migration intentions: Evidence from the Gallup World Poll

Table 2 provides results on the macro-level associations between the share of the population in a country using the Internet and the willingness to move permanently to another country as recorded in Gallup. Results from column 1 suggest that the raw association between the use of the Internet and migration intentions is negative and strongly significant. Yet, additional models with controls and country and year fixed effects added sequentially suggest that this negative association is wholly driven by a country’s measures of development, such as GDP per capita. In fact, our full specification (model 4) displays a positive and statistically significant association between

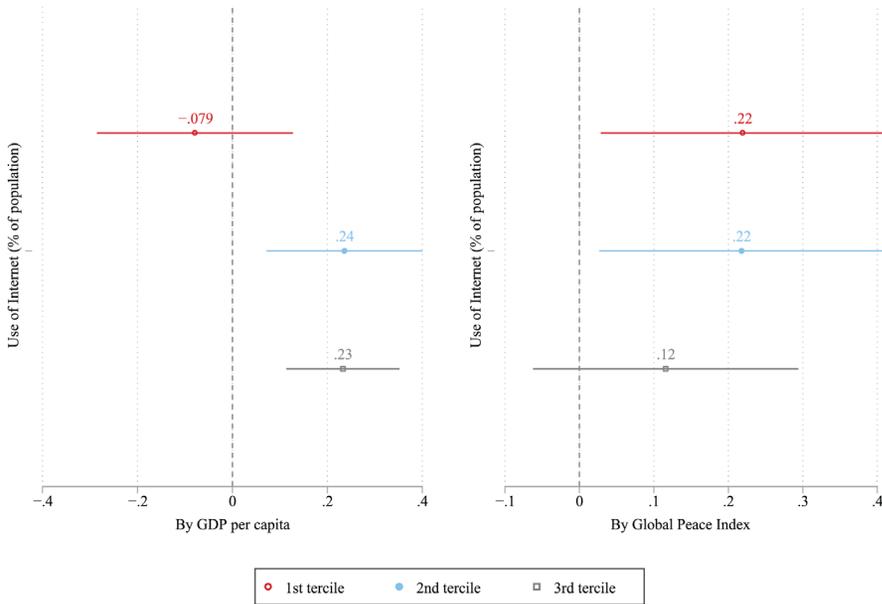
the use of the Internet and the willingness to move elsewhere. Estimates suggest that a ten-unit (percent) increase in the population using the Internet is associated with a 1.2 unit (percent) increase in the population willing to migrate elsewhere. The sign of economic variables is in line with expectations, and the share of the total labor force that is unemployed emerges a particularly strong positive predictor (or, push factor) of out-migration intentions. In Online Appendix Table A2, we conduct some additional analyses interacting Internet diffusion with year dummies capturing the years in which the median values of Internet usage were reached both in the overall sample (“Overall”) and for each region separately (“Regional”). For instance, the “overall” model adds an interaction term between Internet diffusion and a time dummy corresponding to the year (2012) in which the median of 35 percent Internet users was reached taking all countries combined. Conversely, the “regional” model relies on a dummy built based on regional-level medians and corresponding years. The positive coefficients on the interaction terms suggest that when the “inflection point” of Internet diffusion is reached, the Internet is an even stronger predictor of willingness to emigrate. Stated otherwise, these ancillary analyses suggest that Internet diffusion itself is a driving force underlying the observed trends.

Figure 2 provides estimates separately by tertiles of GDP per capita and of the GPI, to test the economic versus political migration argument—corresponding detailed estimates with coefficients on all controls are reported in Online Appendix Table A3. Our results suggest that the positive association between Internet use and migration intentions is not observed in the poorest (lowest tertile) group of countries by GDP per capita, while it is strong and significant in the middle and upper groups of countries by GDP per capita (terciles 2 and 3). As for the latter (GPI), we show that the strongest associations between Internet use and willingness to move are observed for the groups of countries that have lower GPIs, that is, less conflict. In the group of countries with high conflict prevalence (GPI tercile 3), the positive association decreases in magnitude and turns insignificant. These two pieces of evidence combined corroborate the idea that economic migration—rather than political or conflict-related—is more positively associated with Internet access and diffusion.

### **Migration intentions: Evidence from the Arab Barometer**

Figure 3 shows the distribution of willingness to migrate from selected origin countries. This willingness is highest in Sudan, with about 55 percent of individuals willing to migrate elsewhere, and lowest in Kuwait, with about 12 percent of individuals willing to emigrate. Across all countries considered, at least 10 percent of the population is willing to migrate elsewhere, a rather sizeable estimate.

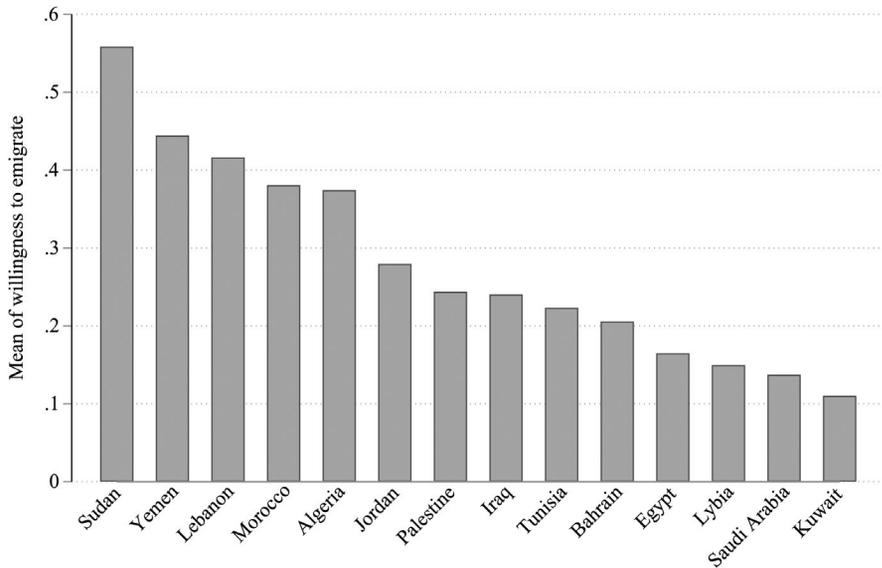
**FIGURE 2 Country-level associations between Internet use and willingness to move to another country, heterogeneity by GDP and GPI terciles, Gallup data**



NOTES: Whiskers represent 95% confidence intervals. Complete estimates with controls are in Appendix Table A3.

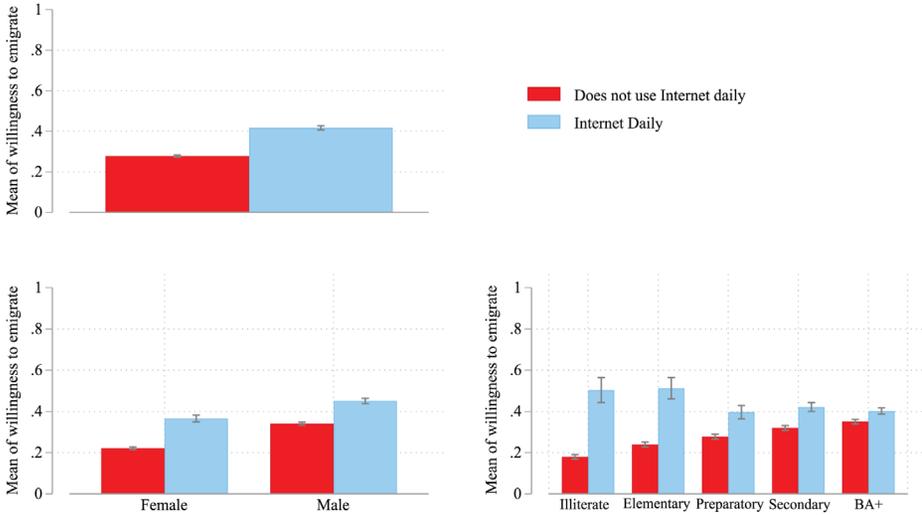
SOURCES: Gallup World Poll, WDI, ITU, Institute for Economics and Peace (IEP).

**FIGURE 3 Willingness to emigrate from selected origin countries**



SOURCE: Arab Barometer.

**FIGURE 4 Willingness to migrate by Internet use (upper panel) and by Internet use and sex (bottom-left panel) and education (bottom-right panel)**



SOURCE: Arab Barometer.

Internet use is positively correlated with willingness to emigrate, and this correlation is especially strong for women (Figure 4, bottom-left) and for less-educated individuals (Figure 4, bottom-right). This bivariate evidence linking Internet use and willingness to emigrate is confirmed by a series of linear probability models (LPM) reported in Table 3. Model 1—providing the bivariate association controlling for country and survey year dummies—suggests that using Internet daily is associated with a 15 percentage-point higher willingness to emigrate. This estimate decreases in magnitude yet remains statistically significant at the 1% level after adding demographic controls (model 2), socioeconomic controls (model 3), and income deciles by country-wave (model 4). On average, using Internet daily is associated with an 8 percentage-point higher willingness to emigrate (30–40 percent increase). The coefficient on Internet use is rather sizeable when compared, for instance, with holding a high level of education (0.081 for Internet use versus 0.061 for BA and above in model 3). These estimates also suggest that use of the Internet measures an individual characteristic that matters above and beyond socioeconomic status. The interaction terms show that women are those who benefit the most from the technology (model 5), as the coefficient on daily Internet use for men is reduced by about a third (0.102 for women and 0.066 for men). The interaction terms of Internet use with education are not statistically significant (model 6), although signs are consistent with the idea that benefits of the Internet are lower the higher the level of education.

**TABLE 3 Individual-level associations between daily Internet use and willingness to migrate to another country, Arab Barometer data**

	Considered emigrating: Any reason					
	(1)	(2)	(3)	(4)	(5)	(6)
					Interaction sex	Interaction education
Using Internet daily	0.153*** (0.01)	0.100*** (0.01)	0.081*** (0.01)	0.085*** (0.01)	0.102*** (0.01)	0.158** (0.07)
Sex (male = 1)		0.119*** (0.01)	0.118*** (0.01)	0.101*** (0.01)	0.127*** (0.01)	0.101*** (0.01)
Age		-0.008*** (0.00)	-0.002 (0.00)	-0.001 (0.00)	-0.002 (0.00)	-0.001 (0.00)
Age squared		0.000** (0.00)	-0.000** (0.00)	-0.000** (0.00)	-0.000*** (0.00)	-0.000** (0.00)
Married (yes = 1)			-0.073*** (0.01)	-0.042*** (0.01)	-0.073*** (0.01)	-0.041*** (0.01)
Education (Ref.: none)						
Elementary			0.011 (0.01)	-0.008 (0.02)	0.011 (0.01)	-0.006 (0.02)
Preparatory/basic			0.022** (0.01)	-0.012 (0.02)	0.021* (0.01)	-0.008 (0.02)
Secondary			0.047*** (0.01)	0.017 (0.02)	0.046*** (0.01)	0.019 (0.02)
BA and above			0.061*** (0.01)	0.022 (0.02)	0.061*** (0.01)	0.035* (0.02)
Employed (yes = 1)			-0.031*** (0.01)	0.002 (0.01)	-0.033*** (0.01)	0.002 (0.01)
General trust			-0.074*** (0.01)	-0.075*** (0.01)	-0.074*** (0.01)	-0.075*** (0.01)
Income deciles (by country-wave)				-0.004** (0.00)		-0.004** (0.00)
Internet daily = 1 × sex (male = 1)					-0.036** (0.02)	
Internet daily = 1 × Elementary						-0.030 (0.08)
Internet daily = 1 × Preparatory/Basic						-0.066 (0.07)
Internet daily = 1 × Secondary						-0.061 (0.07)
Internet daily = 1 × BA and above						-0.091 (0.07)

/...

**TABLE 3 (continued)**

	Considered emigrating: Any reason					
	(1)	(2)	(3)	(4)	(5) Interaction sex	(6) Interaction education
Constant	0.258*** (0.00)	0.504*** (0.02)	0.386*** (0.03)	0.413*** (0.05)	0.379*** (0.03)	0.407*** (0.05)
R-squared	0.02	0.147	0.163	0.144	0.164	0.145
Observations	33,828	33,775	28,384	14,490	28,384	14,490

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.1$ .

NOTES: Linear probability models (LPM). Standard errors in parentheses. Country and wave dummies included in all specifications.

SOURCE: Arab Barometer.

Table 4 reports estimates from model 3 above and further separate willingness to emigrate by reason of migration. Results shows that the association between Internet use and willingness to emigrate is stronger for those who claim to be willing to emigrate for economic reasons—5.5 percentage-point increase against a 0.8 percentage-point increase for political reasons. This finding aligns with the hypothesis discussed above that economic migrants' decisions might be more likely to benefit from access to information regarding the migration process. Also, these estimates provide a fully consistent micro-level counterpart to the macro-level results by GDP per capita and GPI terciles obtained with Gallup data and presented in Figure 2.

Moreover, Table 5 shows that what seems to matter the most is access to the Internet (extensive margin), rather than the intensive margin of using it. As a matter of fact, there is no statistical difference between using the Internet several times a year (or monthly) versus daily in terms of estimated coefficient and statistical significance, and this finding holds irrespective of specification. The real difference is between individuals who make no use of the Internet versus those who use it. Lastly, Table 6 reports the average treatment effect (ATE) for daily Internet use obtained through nearest-neighbor matching techniques with Mahalanobis distance metric. Results are consistent with those reported in Table 3 and suggest that the difference in willingness to emigrate between individuals using versus not using Internet daily is roughly 9.8 percentage points (panel a), even after accounting for income deciles by country-wave (model 2). When disaggregating by reason of migration, our results are in line with those presented in Table 4, suggesting an ATE on Internet use that is three to four times as big when predicting economic (panel b) rather than political migration (panel c).

### Actual migration: Evidence from the Italian Population Register

Figure 5 provides raw descriptive evidence on the association between Internet use in the origin country in the year prior to registration in Italy ( $t - 1$ ) and the stock of individuals who register as residents in Italy in the following

**TABLE 4 Individual-level associations between daily Internet use and willingness to migrate to another country, heterogeneous associations by reason of migration, Arab Barometer data**

	Considered emigrating	
	(1) Economic reasons	(2) Political reasons
Using Internet daily	0.055*** (0.01)	0.008** (0.00)
Sex (male = 1)	0.125*** (0.01)	0.009*** (0.00)
Age	-0.001 (0.00)	-0.000 (0.00)
Age squared	-0.000*** (0.00)	-0.000 (0.00)
Married (yes = 1)	-0.074*** (0.01)	-0.000 (0.00)
Education (Ref.: none)		
Elementary	0.019* (0.01)	-0.009** (0.00)
Preparatory/basic	0.023** (0.01)	-0.008** (0.00)
Secondary	0.012 (0.01)	0.000 (0.00)
BA and above	0.023** (0.01)	0.002 (0.00)
Employed (yes = 1)	-0.021*** (0.01)	-0.003 (0.00)
General trust	-0.040*** (0.01)	-0.010*** (0.00)
Constant	0.232*** (0.03)	0.027*** (0.01)
R-squared	0.128	0.017
Observations	24,507	21,300

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.1$ .

NOTES: Linear probability models (LPM). Standard errors in parentheses. Country and wave dummies included in all specifications.

SOURCE: Arab Barometer.

year ( $t$ )—Figure A1 in the Online Appendix reproduces the same association removing the few clear outliers. In line with the results presented up to now, the figure provides evidence of a positive association between the two variables. Note, though, that these are time-series data from 30 origin countries covering more than 20 years. Therefore, in what follows we present regression analyses accounting for time and year fixed effects and controlling for potential country-level—from the country of origin—confounders.

Table 7 provides estimates of the association depicted in the above figure, accounting for controls and gradually adding time (column 3) and country of origin (column 4) fixed effects. Model 5 includes all controls and

**TABLE 5 Individual-level associations between Internet use and willingness to migrate to another country, by intensity of Internet use, Arab Barometer data**

	Considered emigrating: Any reason			
	(1)	(2)	(3)	(4)
Internet use/intensity (Ref.: no use)				
Several times a year	0.181*** (0.02)	0.106*** (0.02)	0.098*** (0.02)	0.093*** (0.03)
At least once a month	0.162*** (0.01)	0.092*** (0.01)	0.082*** (0.01)	0.095*** (0.02)
At least once a week	0.164*** (0.01)	0.093*** (0.01)	0.086*** (0.01)	0.091*** (0.02)
Daily or almost daily	0.198*** (0.01)	0.137*** (0.01)	0.121*** (0.01)	0.125*** (0.01)
Sex (male = 1)		0.112*** (0.01)	0.115*** (0.01)	0.101*** (0.01)
Age		-0.008*** (0.00)	-0.001 (0.00)	0.000 (0.00)
Age squared		0.000** (0.00)	-0.000*** (0.00)	-0.000** (0.00)
Married (yes = 1)			-0.068*** (0.01)	-0.037*** (0.01)
Education (ref.: none)				
Elementary			0.01 (0.01)	-0.008 (0.02)
Preparatory/basic			0.014 (0.01)	-0.017 (0.02)
Secondary			0.030*** (0.01)	0.004 (0.02)
BA and above			0.036*** (0.01)	0.002 (0.02)
Employed (yes = 1)			-0.034*** (0.01)	-0.002 (0.01)
General trust			-0.073*** (0.01)	-0.074*** (0.01)
Income deciles (by country-wave)				-0.005*** (0.00)
Constant	0.213*** (0.00)	0.437*** (0.02)	0.335*** (0.03)	0.363*** (0.05)
R-squared	0.040	0.153	0.168	0.149
Observations	33,828	33,775	28,384	14,490

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.1$ .

NOTES: Linear probability models (LPM). Standard errors in parentheses. Country and wave dummies included in all specifications.

SOURCE: Arab Barometer.

**TABLE 6 Individual-level association between daily Internet use and willingness to migrate to another country, average treatment effect from nonparametric matching techniques, Arab Barometer data**

	(1)	(2)
<b>(a) Considered emigrating: Any reason</b>		
Average treatment effect		
Using Internet daily	0.098*** (0.01)	0.097*** (0.02)
Observations	33,729	14,490
<b>(b) Economic reasons</b>		
Average treatment effect		
Using Internet daily	0.057*** (0.01)	0.055*** (0.02)
Observations	28,872	12,372
<b>(c) Political reasons</b>		
Average treatment effect		
Using Internet daily	0.017*** (0.01)	0.014*** (0.01)
Observations	24,917	10,370

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.1$ .

NOTES: Nearest-neighbor matching, average treatment effect reported. Distance metric: Mahalanobis. Matching performed using variables appearing in column 3 of Table 3 for specification (1), while column 4 of Table 3 for specification (2). In other words, specification (2) adds income deciles computed at the country level, hence the reduction in sample size. Standard errors in parentheses.

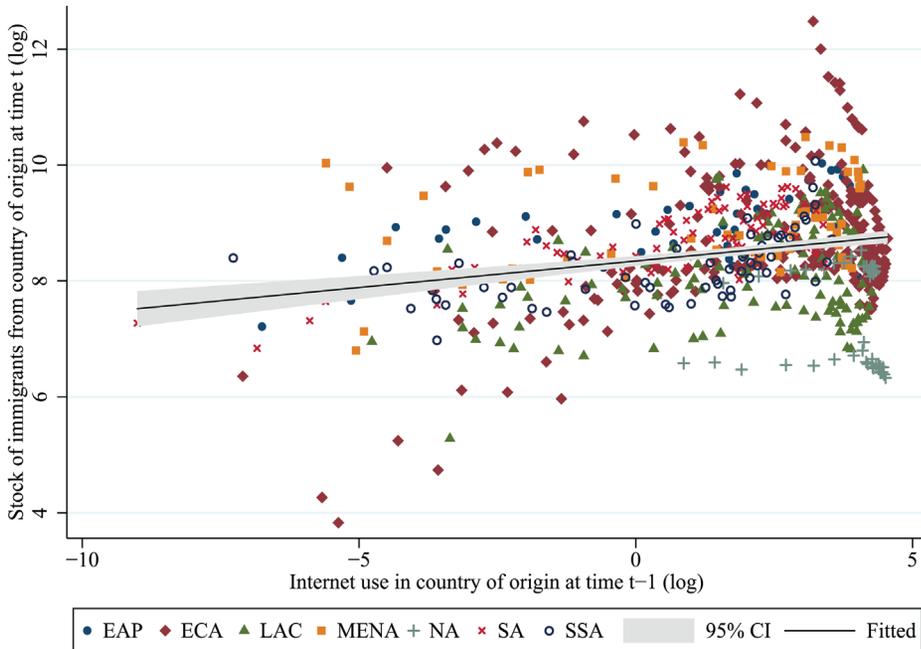
SOURCE: Arab Barometer.

both year and country dummies. Results show a remarkably stable association between Internet use at time  $t - 1$  and migration stock at time  $t$ . As both the predictor and the outcome are expressed in log, the coefficient of interest is the elasticity of migrant stock with respect to Internet use. Columns 2–5 suggest that a 10 percent change in Internet penetration is associated with a 1.5–2 percent increase in the stock of migrants, approximately—an estimate that is remarkably similar to the one obtained for migration intentions with Gallup data. To make our methodological strategy more in line with Kotyrlo (2020) and Winkler (2017), we rerun estimates with Internet use at time  $t - 5$ . Results, shown in Online Appendix Table A4, are slightly weakened in magnitude yet substantively unchanged. A 10 percent change in Internet penetration (columns 2–5) is associated with a 0.8–1.1 percent increase in the stock of migrants, approximately. We thus rely on our estimates in Table 6 to preserve as high a number of country-year observations as possible.

**Actual migration: Evidence from the Sant’Anna Cara reception center**

Table 8 shows the role of migrants’ characteristics and Internet diffusion in the country of origin on the various risks of leaving a migrants’ center

**FIGURE 5 Bivariate association between Internet use in country of origin ( $t - 1$ ) and stock of migrants who register as residents in Italy ( $t$ ) from selected origin countries**



NOTES: Bivariate correlation = 0.24 (dropping to 0.15 after removing the few outliers). Regional classification from the World Bank. “EAP”: East Asia and Pacific (China, Philippines); “ECA”: Europe and Central Asia (Albania, France, Germany, Macedonia, Moldova, Poland, United Kingdom, Romania, Russia, Switzerland, Ukraine); “LAC”: Latin America and Caribbean (Argentina, Brazil, Ecuador, Peru, Venezuela); “MENA”: Middle-East and North Africa (Egypt, Morocco, Tunisia); “NA”: North America (United States, Canada); “SA”: South Asia (Bangladesh, India, Pakistan, Sri Lanka); “SSA”: Sub-Saharan Africa (Ghana, Nigeria, Senegal).

SOURCES: Italian National Institute of Statistics (ISTAT), ITU.

using competing-risk survival analysis.<sup>15</sup> Overall, we document a positive and statistically significant association between Internet diffusion in the country of origin (panel a) and voluntary departure from the Sant’Anna Cara reception center (hazard ratio, HR = 1.030) and seeking any form of protection (HR = 1.038). Previous work has shown that voluntary departure from the center is linked to a strong desire to leave Italy and reach another country, as Italy would only be the point of entry for several migrants who intend to reach another destination before even applying for international protection (Stranges and Wolff 2018). We thus interpret voluntary departure as an indicator of clarity of migration plans. The positive association with seeking any form of protection also suggests the existence of an informational channel which may be further boosted by access to the Internet (e.g., to gain clearer information on international treaties and/or national laws). The association is instead negative with respect to the “other reasons” outcome. This is a residual category—less tied to migrants’ individual will—which includes, among others, migrants who are trans-

**TABLE 7 Country-level associations between use of the Internet in the origin country at time  $t - 1$  and stock of migrants registering in Italy at time  $t$ , ISTAT data**

	Individuals newly registered in Italy coming from abroad				
	(1)	(2)	(3)	(4)	(5)
Internet use (ln, $t - 1$ )	0.092*** (0.02)	0.165*** (0.02)	0.168*** (0.04)	0.204*** (0.03)	0.197*** (0.04)
Controls pertaining to country of origin					
GDP per capita in PPP (ln, $t - 1$ )		-0.486*** (0.07)	-0.470*** (0.07)	0.022 (0.21)	0.536** (0.24)
Unemployment (% total, $t - 1$ )		0.009 (0.01)	0.007 (0.01)	0.093*** (0.01)	0.089*** (0.01)
Population (ln, $t - 1$ )		0.205*** (0.03)	0.204*** (0.03)	-1.498*** (0.52)	-0.692 (0.66)
Rural population (% , $t - 1$ )		0.005* (0.00)	0.005* (0.00)	0.053*** (0.02)	0.058*** (0.02)
Population 15–64 (% total, $t - 1$ )		0.012 (0.01)	0.013 (0.01)	0.053** (0.02)	0.042* (0.02)
Distance to Italy (km, ln)		-0.361*** (0.04)	-0.359*** (0.04)		
Constant	8.344*** (0.05)	10.898*** (0.81)	10.398*** (0.90)	27.919*** (9.16)	9.490 (12.21)
Year dummies	No	No	Yes	No	Yes
Country gummies	No	No	No	Yes	Yes
Observations	678	652	652	652	652
R-squared	0.059	0.335	0.376	0.701	0.735

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.1$ .

NOTES: Ordinary least squares . Standard errors in parentheses.

SOURCES: ISTAT, World Bank Development Indicators, ITU, GeoDist Database from the Centre d'Études Prospectives et d'Informations Internationales (CEPII).

ferred to another center in Italy (transfer), who did not obtain any kind of international protection (refusal), or who were expelled (expulsion). As the category is heterogeneous, interpreting this negative association is harder, albeit it can point to the idea of less planned migration trajectories.

Results on voluntary departure are further supported by complementary analyses conducted on the restricted subsample collected in 2011–2012, which includes additional covariates—such as migrants’ educational level—alongside digital skills and Internet knowledge. Findings reported in Table 8, panel b, suggest that the risk of voluntary departure from the center is 83 percent higher for those who have digital skills, even after controlling for their educational level.<sup>16</sup> As previously explained, Italy is very often not the intended destination for the migrants who reach the center. Therefore, those migrants with higher Internet knowledge may have acquired more information about how to circumvent the Dublin Regulation and escape from Italy to reach another country. Dissimilarities in the results for the

**TABLE 8 Flexible parametric survival hazard ratios for competing risks of exiting from Sant'Anna Cara reception center, 2008–2018 full sample (panel a) and 2011–2012 subsample (panel b)**

	Voluntary departure	Any form of protection	Other reasons
<b>(a) Country-level variation</b>			
Internet diffusion ( $t - 1$ )	1.030*** (0.00)	1.038*** (0.00)	0.956*** (0.00)
Female	1.306*** (0.04)	1.141*** (0.03)	1.188*** (0.04)
Constant	0.027*** (0.00)	0.037*** (0.01)	0.006*** (0.00)
Age dummies	Yes	Yes	Yes
Country of origin dummies	Yes	Yes	Yes
Observations	40,157	40,157	40,157
Log likelihood	-38,843.22	-49,721.03	-21,060.03
<b>(b) Individual-level variation</b>			
Internet knowledge	1.829*** (0.11)	0.723** (0.07)	1.216 (0.15)
Female	0.093*** (0.03)	0.972 (0.20)	3.946*** (0.69)
Education medium- high (Ref.: low)	1.205* (0.09)	1.340 (0.22)	1.081 (0.22)
Entered the center with family members (Ref.: no)	3.216*** (0.87)	0.662 (0.30)	0.460* (0.18)
Constant	0.022*** (0.02)	0.008*** (0.01)	0.000 (0.000)
Age dummies	Yes	Yes	Yes
Observations	2,034	2,034	2,034
Log likelihood	-3,367.90	-989.66	-497.98

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.1$ .

NOTES: Estimates from competing risk models, with robust standard errors in parentheses. *Panel a*: No individual-level Internet knowledge available for the full sample. Sample restricted to countries with at least 100 migrants. Libya is the omitted (reference) country. *Panel b*: No country dummies are included here because the majority of migrants come from few countries, mostly Tunisia.

SOURCES: Sant'Anna Cara reception center, ITU.

cause “Any form of protection” between the whole dataset and the reduced one may be due to the different composition of the two samples. While the complete sample 2008–2018 has a wide number of nationalities, the reduced sample 2011–2012 features an excess of migrants from Tunisia (close to 65 percent), who rarely received any form of international or national protection. Escaping from the explosive situation in their country due to the Arab spring, they reached Italy mainly as an entry country to reach other European countries.

## Conclusions and discussion

Using a number of complementary data sources to track different stages of the migration path, we have documented that international migrations have become Internetized, in the sense that the Internet acts as a strong supportive agent of migration decisions. Our analyses highlighted strong and robust associations between Internet diffusion and migration intentions, migrant stocks, and migration outcomes, both at the macro- and micro-levels. Results on migration intentions suggested that, at the macro-level, countries with higher proportions of Internet users are also those with greater shares of individuals willing to emigrate, net of measures of socioeconomic development. With individual-level data, we found that this association holds and is stronger among women and the less educated, and that the extensive margin of Internet use (using versus not using) is what matters—rather than the intensity of use. Both sets of analyses allowed to conclude that the association between Internet and migration intentions is stronger when migration occurs for economic reasons, or for economic migrants, relative to political migrants. These findings are aligned with our expectation that the role of the Internet may matter more for those migrants whose migratory paths are more carefully planned.

Turning to analyses of actual migration using data on Italy, we also found robust and significant macro-level associations between Internet use in the country of origin and the presence of migrants from that country in the Italian population register in the following year. Approximately, a 10 percent change in Internet use in the origin country is associated with a 1.5–2 percent increase in the stock of migrants who register in Italy, net of controls and country and year-fixed effects. Individual-level data from the Sant’Anna Cara reception center in Calabria corroborated the finding of a positive association between Internet diffusion in the origin country in the previous year—and individual-level knowledge of the Internet—and voluntary departure from the center in search of better economic opportunities. Although these two latter sources of data were less well suited to trace a distinction between economic and political migrants (mainly because the first only records “regular” migrants, while the second only records “irregular” migrants), we believe our findings are consistent with the idea that Internet use is associated with clearer and better-defined migration trajectories, such as the ones envisioned by economic migrants. In short, evidence from analyses on actual migration is consistent with evidence from analyses on migration intentions to the extent that it suggests that the information advantage provided by the Internet is key in enabling better clarity in migration plans. Focusing specifically on the Sant’Anna Cara reception center, we speculate that migrants with higher Internet skills may have acquired more information about how to circumvent the Dublin Regulation and quickly escape from Italy to seek better economic opportunities elsewhere.

Building on a growing literature that has highlighted the implications of the digital revolution for demographic processes, our work is among the first to provide large-scale and multifaceted empirical evidence of the significant interrelations between the role of the Internet and migration outcomes. Analyzing different datasets enabled us to target different stages of the migration process adopting complementary analytical perspectives. Our findings across the different sources and analytical strategies provided robust and consistent evidence of the important role of the Internet. Although our analyses cannot be deemed causal, we took a number of steps in our different analyses to mitigate issues linked to reverse causality and selection. In our analyses, we drew on lagged ICT predictors to ensure that Internet diffusion measures preceded migration events. In the micro-level analyses, with the Arab Barometer, we better accounted for selection in the population of Internet and non-Internet users through the use of matching techniques to compare groups that are similar on other observables. We further included a range of different control variables, and country and time fixed effects, to net out other relevant factors that may affect the associations observed between the Internet and migration outcomes. Nevertheless, we acknowledge that other forms of unobserved selection could remain. Given the consistent and complementary evidence of a positive association between Internet and migration outcomes across the different datasets that we find, we interpret our findings as aligning with the idea carried forward by Thulin and Vilhelmson (2014) that the Internet is not necessarily a driving force of migration *per se*, but rather an enabling “supportive agent.”

Although we were not able to directly test mechanisms at work in our analyses, drawing on existing theoretical literature we speculated that Internet affects migration intentions through a number of different channels. This includes through exposure to the life of others and by shaping individual aspirations, enabling access to relevant information and opportunities to facilitate the migration decision, as well as providing access to wider networks, which in turn also help migrants to more effectively adapt to life in their new countries upon arrival. These associations are likely to be more salient for those with purposeful, planned mobility, such as economic migrants, and potentially also for those who may lack access to information and networks to enable migration decisions through other means (e.g., women or less-educated individuals).

Going back to the existing literature on the topic, our analyses across data sources highlighted a positive association between Internet and migration which, differently from Cooke and Shuttleworth (2017), Winkler (2017), and Kotyrlo (2020) supported the idea that the decline in mobility and information costs brought about by the digital revolution outweighs the lowered importance of push and pull factors triggered by the Internet—such as higher economic growth and demand for skilled workers in the sending countries. Indeed, there remains a large degree of variability across find-

ings in the burgeoning literature on Internet and migration outcomes. For what concerns our findings and their departure from the above-mentioned studies, we believe the discrepancies are due to a different analytical focus in terms of destination country—migrant stock in Italy in the present study versus migrant stocks across 33 OECD countries in Winkler (2017)—a different type of migration—international migration in the present study versus internal migration in Cooke and Shuttleworth (2017)—and, most importantly, the very specific and recent nature of migration to Italy, which has emerged in recent years as a country of immigration. We are confident that these discrepancies will stimulate further novel research on the topic and highlight additional sources of variability such as, for instance, country-specific policy responses to recent migration flows.

Finally, our findings also contribute to the growing literature on digital demography, in which Internet-generated data, or “digital traces” are used to study migration and other demographic phenomena (e.g., Zagheni and Weber 2012; Zagheni, Weber, and Gummadi 2017; Cesare et al. 2018; Alexander, Polimis, and Zagheni 2020). The Internetization idea makes a theoretical contribution to this growing literature, as it clarifies that once any demographic phenomenon can be observed through digital breadcrumbs, it can be considered as different, possibly radically different, from the same phenomenon observed in the pre-Internet era. Our work suggests that the Internet acts not just as an instrument to observe migration behaviors, but indeed actively supports the migration process.

---

## Notes

Funding and acknowledgments: This project received funding from the European Research Council (ERC) under the European Union’s Horizon 2020 research and innovation programme (Grant no. 694262), project DisCont - Discontinuities in Household and Family Formation (PI: Billari). We also acknowledge support through the Global Family Change (GFC) Project, a collaboration between the University of Pennsylvania, University of Oxford (Nuffield College), Bocconi University, and the Centro de Estudios Demográficos (CED) at the Universitat Autònoma de Barcelona. Funding for the GFC Project is provided through the National Science Foundation (NSF) Grant no. 1729185 (PIs: Kohler & Furstenberg). LMP also acknowledges help and support from Lauris Olson at the library of the University of Pennsylvania, who helped with obtaining access to the Gallup World Poll. These data were

accessed first when LMP was a Postdoctoral Fellow at the University of Pennsylvania. VR and RK acknowledge support from the Leverhulme Trust within the Leverhulme Centre for Demographic Science.

1 In the literature, the same phenomenon is often named differently, with terms broadly meant to capture potential migration such as individual aspirations, intentions to migrate, migration potential, or migration desires (Carling and Collins 2018).

2 Migration intentions have already been the topic of a growing scientific literature. (See, for instance, Becerra 2012; Hoffman, Marsiglia, and Ayers 2015; Falco and Rotondi 2016; Migali and Scipioni 2019.) Falco and Rotondi (2016) show that migration intentions are correlated with actual migrations flows.

3 This group of people is also referred to as migrant workers, see for instance [https://ec.europa.eu/home-affairs/what-we-do/networks/european\\_migration\\_network/glossary\\_search/migrant-worker\\_en](https://ec.europa.eu/home-affairs/what-we-do/networks/european_migration_network/glossary_search/migrant-worker_en). Unless the economic conditions they face are so severe as to cause generalized violence and disturb the public order, economic migrants usually do not fall within the criteria for asylum seeking and are not eligible to receive international protection.

4 The Institute for Economics and Peace (IEP) is a global think tank headquartered in Sydney, Australia, with branches in New York City, Mexico City, and The Hague. For additional details, see <https://www.economicsandpeace.org/>.

5 According to the Italian National Institute of Statistics (ISTAT) in 2018, 8.5 out of 100 residents in Italy were foreigners. This figure was 3 in 2004.

6 While our data permit to distinguish—and thus theorize about—economic versus political migration, the same cannot be done for permanent versus circular migration. While this is mostly a limitation inherent to the type of data used, we believe this does not pose serious theoretical challenges. Provided the informational channel is the crucial one, if the Internet plays any role in affecting temporary migration, it also affects—likely more strongly—moves that are permanent, and thus more consequential in nature.

7 Appendixes are available at the supporting information tab at [wileyonlinelibrary.com/journal/pdr](http://wileyonlinelibrary.com/journal/pdr).

8 <http://visionofhumanity.org/indexes/global-peace-index/>

9 <https://www.arabbarometer.org/>

10 The countries included in the Arab Barometer are Algeria, Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Palestine, Saudi Arabia, Sudan, Tunisia, and Yemen.

11 For comparability reasons, we used income in dollars which is not reported in waves 1 and 4.

12 The included countries of origin are from “EAP”: East Asia and Pacific (China, Philippines); “ECA”: Europe and Central Asia (Albania, France, Germany, Macedonia, Moldova, Poland, United Kingdom, Romania, Russia, Switzerland, Ukraine); “LAC”: Latin America and Caribbean (Argentina, Brazil, Ecuador, Peru, Venezuela); “MENA”: Middle-East and North Africa (Egypt, Morocco, Tunisia); “NA”: North America (United States, Canada); “SA”: South Asia (Bangladesh, India, Pakistan, Sri Lanka); “SSA”: Sub-Saharan Africa (Ghana, Nigeria, Senegal).

13 With a GDP per capita of 15,309 euros (vs. 25,586.4 euros in Italy as a whole), an incidence of poverty at the household level of 26.9 percent (10.4 percent in Italy as a whole), and an unemployment rate of 19.4 percent (11.7 percent in Italy as a whole) Calabria is one of the poorest Italian regions according to the National Institute of Statistics - ISTAT; see: <http://noi-italia.istat.it/>

14 See Stranges and Wolff (2018) for further details on the dataset.

15 The included countries of origin are Libya, Eritrea, Afghanistan, Pakistan, Nigeria, Tunisia, Iraq, Somalia, Syria, Bangladesh, Ivory Coast, Gambia, Mali, Sudan, Senegal, Egypt, Ghana, Ethiopia, Guinea, Morocco, Turkey, Iran, Burkina Faso, Togo, and Cameroon.

16 For these analyses, it was not possible to add the country-level variables from the countries of origin as—as mentioned in the text—the subsample has an overrepresentation of migrants from Tunisia (due to the Arab spring), while other nationalities are not widely represented, leading to a lack of convergence of the model. Additionally, most migrants were immediately transferred to another center or expelled, and the number of migrants obtaining any form of protection was low, which could partly explain the unexpected negative coefficient on the Internet for the “any form of protection” cause of exit.

## References

- Agrawal, Ajay, John Horton, Nicola Lacetera, and Elizabeth Lyons. 2013. "Digitization and the Contract Labor Market: A Research Agenda." *NBER Working Paper Series*, wp19525, National Bureau of Economic Research, Cambridge, MA.
- Aker, Jenny C., Michael A. Clemens, and Christopher Ksoll. 2011. "Mobiles and Mobility: The Effect of Mobile Phones on Migration in Niger." *Proceedings of the German Development Economics Conference*, Berlin, No. 2, ZBW—Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel und Hamburg.
- Akerman, Anders, Ingvil Gaarder, and Magne Mogstad. 2015. "The Skill Complementarity of Broadband Internet." *The Quarterly Journal of Economics* 130(4): 1781–1824.
- Alexander, Monica, Kivan Polimis, and Emilio Zagheni. 2020. "Combining Social Media and Survey Data to Nowcast Migrant Stocks in the United States." *Population Research and Policy Review* Online First, <https://doi.org/10.1007/s11113-020-09599-3>.
- Alonso, Andoni, and Pedro J. Oiarzabal. 2010. *Diasporas in the New Media Age: Identity, Politics, and Community*. Reno, NV: University of Nevada Press.
- Baldassar, Loretta. 2016. "De-Demonizing Distance in Mobile Family Lives: Co-Presence, Care Circulation and Polymedia as Vibrant Matter." *Global Networks* 16(2): 145–163.
- Becerra, David. 2012. "The Impact of Anti-Immigration Policies and Perceived Discrimination in the United States on Migration Intentions Among Mexican Adolescents." *International Migration* 50(4) 20–32.
- Beine, Michel, Frédéric Docquier, and Çağlar Özden. 2011. "Diasporas." *Journal of Development Economics* 95(1): 30–41.
- Bellou, Andriana. 2015. "The Impact of Internet Diffusion on Marriage Rates: Evidence from the Broadband Market." *Journal of Population Economics* 28(2): 265–297.
- Billari, Francesco C., Valentina Rotondi, and Jenny Trinitapoli. 2020. "Mobile Phones, Digital Inequality and Fertility: Longitudinal Evidence from Malawi." *Demographic Research* 42(37): 1057–1096.
- Billari, Francesco C., Osea Giuntella, and Luca Stella. 2019. "Does Broadband Internet Affect Fertility?" *Population Studies* 73(3): 297–316.
- Bohra-Mishra, Pratikshya, and Douglas S. Massey. 2011. "Individual Decisions to Migrate During Civil Conflict." *Demography* 48(2): 401–424.
- Boyd, Danah M., and Nicole B. Ellison. 2007. "Social Network Sites: Definition, History, and Scholarship." *Journal of Computer-Mediated Communication* 13(1): 210–230.
- Bruni, Luigino, and Luca Stanca. 2006. "Income Aspirations, Television and Happiness: Evidence from the World Values Survey." *Kyklos* 59(2): 209–225.
- Burrell, Jenna, and Ken Anderson. 2008. "'I Have Great Desires to Look Beyond my World': Trajectories of Information and Communication Technology Use Among Ghanaians Living Abroad." *New Media & Society* 10(2): 203–224.
- Cairncross, Frances. 1997. *The Death of Distance: How the Communications Revolution Is Changing Our Lives*. Number C20-21. Harvard Business School. <https://hbswk.hbs.edu/archive/the-death-of-distance-how-the-communications-revolution-is-changing-our-lives-distance-isn-t-what-it-used-to-be>. Accessed September 26, 2020.
- Carling, Jørgen, and Francis Collins. 2018. "Aspiration, Desire and Drivers of Migration." *Journal of Ethnic and Migration Studies*, 44(6): 909–926.
- Castells, Manuel. 2002. *The Internet Galaxy: Reflections on the Internet, Business, and Society*. Oxford, UK: Oxford University Press.
- . 2015. *Networks of Outrage and Hope: Social Movements in the Internet Age*. 2nd edition. Hoboken, NJ: John Wiley & Sons.
- Castles, Stephen, Hein De Haas, and Mark J. Miller. 2013. *The Age of Migration: International Population Movements in the Modern World*. London, UK: Palgrave Macmillan.
- Cesare, Nina, Hedwig Lee, Tyler McCormick, Emma Spiro, and Emilio Zagheni. 2018. "Promises and Pitfalls of Using Digital Traces for Demographic Research." *Demography* 55(5): 1979–1999.

- Choo, Sangho, and Patricia L. Mokhtarian. 2007. "Telecommunications and Travel Demand and Supply: Aggregate Structural Equation Models for the US." *Transportation Research Part A: Policy and Practice* 41(1): 4–18.
- Clark, Andrew E., and Claudia Senik. 2010. "Who Compares to Whom? The Anatomy of Income Comparisons in Europe." *The Economic Journal* 120(544): 573–594.
- Cooke, Thomas John, and Ian Shuttleworth. 2017. "Migration and the Internet." *Migration Letters* 14(3): 331–342.
- Czaika, Mathias, and Christopher R. Parsons. 2017. "The Gravity of High-Skilled Migration Policies." *Demography* 54(2): 603–630.
- Czernich, Nina, Oliver Falck, Tobias Kretschmer, and Ludger Woessmann. 2011. "Broadband Infrastructure and Economic Growth." *The Economic Journal* 121(552): 502–532.
- Danielsbacka, Mirkka, Antti O. Tanskanen, and Francesco C. Billari. 2019. "Who Meets Online? Personality Traits and Sociodemographic Characteristics Associated with Online Partnering in Germany." *Personality and Individual Differences* 143: 139–144.
- Dekker, Rianne, and Godfried Engbersen. 2014. "How Social Media Transform Migrant Networks and Facilitate Migration." *Global Networks* 14(4): 401–418.
- Dekker, Rianne, Godfried Engbersen, and Marije Faber. 2016. "The Use of Online Media in Migration Networks." *Population, Space and Place* 22(6): 539–551.
- Elbahnasawy, Nasr G. 2014. "E-Government, Internet Adoption, and Corruption: An Empirical Investigation." *World Development* 57: 114–126.
- Falco, Chiara, and Valentina Rotondi. 2016. "The Less Extreme, The More You Leave: Radical Islam and Willingness to Migrate." *World Development* 88: 122–133.
- Fine, Jason P., and Robert J. Gray. 1999. "A Proportional Hazards Model for the Subdistribution of a Competing Risk." *Journal of the American Statistical Association* 94(446): 496–509.
- Floridi, Luciano. 2015. *The Online Manifesto: Being Human in a Hyperconnected Era*. New York City, NY: Springer International Publishing.
- Fortunati, Leopoldina. 2005. "Mediatization of the Net and Internetization of the Mass Media." *International Communication Gazette* 67(1): 27–44.
- Freund, Caroline L., and Weinhold, Diana. 2004. "The Effect of the Internet on International Trade." *Journal of International Economics* 62(1): 171–189.
- Frey, Bruno S., Christine Benesch, and Alois Stutzer. 2007. "Does Watching TV Make Us Happy?" *Journal of Economic Psychology* 28(3): 283–313.
- Gergen, Kenneth J. 2002. "The Challenge of Absent Presence." In *Perpetual Contact*, 227–241. Cambridge, UK: Cambridge University Press.
- Hiller, Harry H., and Tara M. Franz. 2004. "New Ties, Old Ties and Lost Ties: The Use of the Internet in Diaspora." *New Media & Society* 6(6): 731–752.
- Hoffman, Steven, Flavio Francisco Marsiglia, and Stephanie L. Ayers. 2015. "Religiosity and Migration Aspirations Among Mexican Youth." *Journal of International Migration and Integration* 16(1): 173–186.
- Hyll, Walter, and Schneider, Lutz. 2013. "The Causal Effect of Watching TV on Material Aspirations: Evidence From the "Valley of the Innocent"." *Journal of Economic Behavior & Organization* 86: 37–51.
- International Organization for Migration. 2020. "World Migration Report 2020." Technical Report, International Organization for Migration. [https://www.un.org/sites/un2.un.org/files/wmr\\_2020.pdf](https://www.un.org/sites/un2.un.org/files/wmr_2020.pdf). Accessed September 26, 2020.
- Kotyrlo, Elena. 2020. "Impact of Modern Information and Communication Tools on International Migration." *International Migration* 58(4): 195–213.
- Leurs, Koen, and Kevin Smets. 2018. "Five Questions for Digital Migration Studies: Learning from Digital Connectivity and Forced Migration into Europe." *Social Media + Society* 4: 1–16.
- Lohmann, Steffen. 2015. "Information Technologies and Subjective Well-Being: Does the Internet Raise Material Aspirations?" *Oxford Economic Papers* 67(3): 740–759.
- Massey, Douglas S., Joaquin Arango, Graeme Hugo, Ali Kouaouci, Adela Pellegrino, and J. Edward Taylor. 1993. "Theories of International Migration: A Review and Appraisal." *Population and Development Review* 19(3): 431–466.

- Migali, Silvia, and Marco Scipioni. 2019. "Who's About to Leave? A Global Survey of Aspirations and Intentions to Migrate." *International Migration* 57(5): 181–200.
- Muto, Megumi. 2012. "The Impacts of Mobile Phones and Personal Networks on Rural-to-Urban Migration: Evidence from Uganda." *Journal of African Economies* 21(5): 787–807.
- Nedelcu, Mihaela, and Malika Wyss. 2016. "'Doing Family' Through ICT-Mediated Ordinary Co-Presence: Transnational Communication Practices of Romanian Migrants in Switzerland." *Global Networks* 16(2): 202–218.
- Oiarzabal, Pedro J., and Ulf-Dietrich Reips. 2012. "Migration and Diaspora in the Age of Information and Communication Technologies." *Journal of Ethnic and Migration Studies* 38(9): 1333–1338.
- Rosenfeld, Michael J. 2017. "Marriage, Choice, and Couplehood in the Age of the Internet." *Sociological Science*, 4: 490–510.
- Rotondi, Valentina, Ridhi Kashyap, Luca Maria Pesando, Simone Spinelli, and Francesco C. Billari. 2020. "Leveraging Mobile Phones to Attain Sustainable Development." *Proceedings of the National Academy of Sciences* 117(24): 13413–13420.
- Royston, Patrick, and Mahesh K. B. Parmar. 2002. "Flexible Parametric Proportional-Hazards and Proportional-Odds Models for Censored Survival Data, with Application to Prognostic Modeling and Estimation of Treatment Effects." *Statistics in Medicine* 21(15): 2175–2197.
- Sabatini, Fabio, and Francesco Sarracino. 2016. "Keeping Up With the E-Joneses: Do Online Social Networks Raise Social Comparisons?" *ETA: Economic theory and Applications* 234936, Fondazione Eni Enrico Mattei (FEEM).
- Schaub, Max Leonard. 2012. Lines Across the Desert: Mobile Phone Use and Mobility in the Context of Trans-Saharan Migration." *Information Technology for Development* 18(2): 126–144.
- Stranges, Manuela, and François-Charles Wolff. 2018. "From Hell to Heaven? Evidence of Migration Trajectories from an Italian Refugee Centre." *Demographic Research* 39(36): 963–990.
- Thornton, Arland, Nathalie E. Williams, Prem Bhandari, Linda Young-DeMarco, Cathy Sun, Jeffrey Swindle, Christina Hughes, and Yu Xie. 2019. "Influences of Material Aspirations on Migration." *Demography* 56(1): 75–102.
- Thulin, Eva, and Bertil Vilhelmson. 2014. "Virtual Practices and Migration Plans: A Qualitative Study of Urban Young Adults." *Population, Space and Place* 20(5): 389–401.
- Vilhelmson, Bertil, and Eva Thulin. 2013. "Does the Internet Encourage People to Move? Investigating Swedish Young Adults' Internal Migration Experiences and Plans." *Geoforum* 47: 209–216.
- Winkler, Hernan. 2017. "How Does the Internet Affect Migration Decisions?" *Applied Economics Letters* 24(16): 1194–1198.
- Withaecx, Sophie, Mieke Schrooten, and Dirk Geldof. 2015. "Living Across Borders: The Everyday Experiences of Moroccan and Brazilian Transmigrants in Belgium." *Crossings: Journal of Migration & Culture* 6(1): 23–40.
- Zagheni, Emilio, and Ingmar Weber. 2012. "You Are Where You E-mail: Using E-mail Data to Estimate International Migration Rates." In *Proceedings of the 4th Annual ACM Web Science Conference*, pp. 348–351.
- Zagheni, Emilio, Ingmar Weber, and Krishna Gummadi. 2017. "Leveraging Facebook's Advertising Platform to Monitor Stocks of Migrants." *Population and Development Review* 43(4): 721–734.