I Z A Institute
of Labor Economics
Initiated by Deutsche Post Foundation

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DISCUSSION PAPER SERIES

IZA DP No. 15804

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DECEMBER 2022

ABSTRACT

Broadband Internet and Attitudes Towards Migrants: Evidence from Spain*

In this paper, we empirically evaluate the effect of exposure to broadband Internet on attitudes towards immigrants. We combine innovative survey data from Spain with information on the characteristics of the Spanish telephony infrastructure. To address the endogeneity of Internet availability, we exploit the fact that high-speed Internet in its early phases was supplied through the existing fixed telephone lines. We use landlines penetration as an instrument for broadband diffusion at the municipality level, and use data from both the pre- and post-Internet period to estimate a difference-in-difference instrumental variable model. We document a positive effect of broadband Internet penetration on attitudes towards immigrants at the municipality level. This result is particularly strong among young and urban individuals. Looking at mechanisms, we find that broadband Internet is associated with a better knowledge of (national) immigration dynamics and smaller concerns about the effects of migration on the labor market. Finally, using a combination of survey and electoral data, we find that broadband Internet penetration reduces political support for the Partido Popular, Spain's traditional right-wing party.

JEL Classification:	D72, D83, J15
Keywords:	internet, attitudes, immigration

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1 Introduction

International migration is a highly debated and controversial topic in both political arenas and the public opinion. In Europe, recent migration waves have led to a surge in anti-immigrant sentiment (Eurobarometer, 2018). This sentiment has also been accompanied by a dramatic fall in levels of trust in European institutions and increased voter support for right-wing, anti-immigrant parties.[1] However, existing evidence suggests that individuals are often poorly informed about basic facts related to immigration. A multi-country survey carried out in 2014 by Ipsos MORI shows that public perceptions of the share of immigrants over the total population significantly overestimate the actual figure.[2] Recent work by Alesina et al. (2018) in six Western economies also confirms this bias in native perceptions of both the number and the characteristics of immigrants.

Individual perceptions of, and attitudes towards, immigrants can be formed from a host of sources. Among these, the media are one of the most important, as they constitute a major channel of information and, as such, a key determinant of beliefs (Vliegenthart et al., 2008). With the development of broadband Internet, traditional media sources have been progressively substituted by online news consumption, and the Internet also facilitated access to a larger and more diverse body of information. It is thus important to understand how this change affected native citizens' opinions about migration.

The effect of Internet diffusion on attitudes towards migrants is *a priori* ambiguous. On the one hand, the possibility of accessing news online could make readers better informed: indeed, Internet users can consume and produce information without restrictions and a reasonable cost. To the extent that natives may have biased beliefs about immigrants and their characteristics, Internet access as a source of more accurate information can improve their opinion about immigrants. However, having access to more sources of information does not automatically translate into greater accuracy. This is particularly true in the context of the Internet, where the almost unlimited possibilities of supplying information may generate the risk of an information overflow. As a reaction, people may concentrate their attention on a limited number of topics and areas that they want to read about and which are concordant with their prior opinions. Information overflow may thus lead to a higher degree of ideological segregation and polarisation (Mullainathan and Shleifer, 2005). Additionally, the diffusion of the Internet, much like the diffusion of earlier technological innovations such as the TV (Gentzkow, 2006), may crowd out traditional (and potentially more informative) news sources: for example, Nardotto et al. (2018); Falck et al. (2014) find that Internet reduced the consumption of traditional media, and local newspapers in particular. In this paper, we shed new light on the *causal* effect of Internet access on attitudes towards migrants in Spain.[3]

To answer our research question, we exploit unique and restricted-access data from a survey run by the Spanish Sociological Research Center – the Centro Investigaciones Sociológicas (CIS)

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[1]See, among others, Barone et al. (2016); Halla et al. (2017); Dustmann et al. (2019).

[2]https://www.ipsos.com/ipsos-mori/en-uk/perceptions-are-not-reality-things-world-gets-wrong

[3]Throughout the paper we use the terms "high-speed Internet", "broadband Internet" and "ADSL Internet" interchangeably.

– with the specific purpose of documenting the attitudes of native Spaniards towards migrants. The CIS data comes from a repeated cross-sectional survey run in 1995, 1996 and then every year from 2008 to 2012. We combine this dataset with granular information on broadband penetration and the characteristics of the voice telecommunication infrastructure in Spain, at the municipality level. To address the endogeneity concerns related to the introduction of high-speed Internet across Spain, we exploit the fact that the diffusion of broadband Internet in a given locality is affected by the characteristics of the pre-existing voice telecommunications infrastructure. Specifically, because broadband Internet in its early phases was usually supplied through the telephone landlines, we use landline penetration in a given municipality in the pre-Internet period as a source of exogenous variation for the supply-side constraints to the diffusion of high-speed Internet. Because the characteristics of the pre-existing infrastructure were not randomly distributed, our identification strategy relies on interacting landline penetration with an indicator capturing the time variation between the period before and after the introduction of broadband Internet in Spain. This difference-in-difference instrumental variable strategy that controls for province and year fixed effects relies on the assumption that the correlation between the characteristics of the voice telecommunication infrastructure and unobserved characteristics of local areas did not change with the introduction of high-speed Internet, other than through the diffusion of broadband Internet itself.

Our paper provides three main sets of results. First, looking at the general attitudes of natives in Spain towards immigrants, we find that higher ADSL Internet penetration leads to a significant increase in the share of Spaniards who report thinking that immigration is overall good for the country. The effect of high-speed Internet penetration on attitudes towards migrants is stronger for young respondents, which suggests that higher Internet usage frequency is associated with larger shifts in public opinions. Our results are robust to the use of different measures of broadband access and modifications to the sample or empirical specifications. In particular, our point estimates remain essentially unchanged when running an instrumental variable model that controls for municipality and year fixed effects, instead of province and year fixed effects, thus more tightly controlling for the geographical level at which our instrument is plausibly exogenous.

Second, we find that high-speed Internet availability reduces concerns about the effect of migration on the labor market and leads to a reduction in the likelihood of considering immigration a serious problem facing Spanish society. We further provide suggestive evidence that higher Internet penetration is associated to an improved knowledge about the share of migrants living in Spain.

Third, given the strong association between public views about migrants and support for more open immigration policies and higher levels of redistribution (Facchini et al., 2016; Grigorieff et al., 2020), we examine the effect of broadband Internet penetration on voting behavior. We find that respondents living in municipalities with higher Internet penetration are less likely to report voting for the right-wing party Partido Popular (henceforth PP). This result is confirmed when looking at administrative electoral data on national elections over 1996-2011: municipalities with higher Internet penetration saw a significant decrease in the share of votes cast in favor of PP in the post-Internet period.

Taken together, our results are suggestive of the fact that broadband Internet access in its early phases improved the knowledge of native Spaniards of basic facts about immigration. This in turn led to an improvement in public attitudes towards immigrants, which also resulted in lower support for parties promoting stricter anti-immigrant policies. Our findings thus underscore the important role of new media in shaping political behaviors and opinions.

Our paper contributes to two main strands of the literature. First, we contribute to the large body of work that analyzes the main channels through which natives' perceptions of immigrants are shaped (see Hainmueller and Hopkins (2014) for a review). Existing work has examined the role of migrants' impact on the labor market and public transfers (Dustmann et al., 2005; Facchini and Mayda, 2009; Preston, 2014), as well as cultural difference (Mayda, 2006; Dustmann and Preston, 2007), as determinants of natives' views about immigration. More recently, attention has been drawn to the role of information in shaping public opinions about migrants. Existing experimental evidence suggests that providing individuals with accurate information about the number and characteristics of migrants and their potential benefits to the economy leads to a substantial increase in support for more open immigration policies (Facchini et al., 2016; Alesina et al., 2018; Grigorieff et al., 2020). In this paper, we use data from a representative survey in Spain to generalize the external validity of prior experimental findings and examine the causal role of Internet as a source of information in shaping attitudes towards migrants in Spain. In doing so, we also complement the body of work that has looked at the role of information acquired through *traditional* media sources in shaping public opinions about migration (Héricourt and Spielvogel, 2014; Mastrorocco and Minale, 2018; Benesch et al., 2019). Furthermore, the detailed questions included in the CIS survey allow us to identify the most important channels through which general attitudes towards immigrants are shaped by new information.

Second, we contribute to the literature that has examined the impact of high-speed Internet consumption on political outcomes (see Zhuravskaya et al. (2020) for a review of recent work on Internet and political outcomes, with a special focus on social media).[4] Using similar identification strategies as ours, recent work on voting documents a negative effect of Internet access on voter turnout and political participation in Italy, Germany, and the UK (Falck et al., 2014; Campante et al., 2017; Nardotto et al., 2018). The evidence on the role of Internet in shaping voters' preferences for a particular party is instead more mixed (see Campante et al. (2017) and Falck et al. (2014) for studies in Italy and Germany, respectively). In this paper, we complement this literature by looking at how high-speed Internet shapes opinions about one of the most debated topics in political arenas – international migration – and examining the role of Internet access in driving support for right-wing, anti-immigrant parties.

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[4]Existing literature has also examined the effect of high-speed Internet on health and educational outcomes (Billari et al., 2018, 2019; DiNardi et al., 2019; Malamud et al., 2019; Amaral-Garcia et al., 2021; Golin, 2022) and social capital (see Campante et al. (2021) for a review).

2 The Spanish context

2.1 Broadband Internet

The diffusion of broadband Internet in Spain started later than in other European countries. The first Internet connections officially arrived in Spanish homes in 2000, and it was only in 2004 that Internet providers started offering broadband (ADSL) subscriptions (1 Kbps upstream rate). Furthermore, the pace of diffusion of high-speed Internet over time was also relatively slow in Spain compared to other European countries, possibly because of the high costs for broadband Internet access.[5] According to data from Eurostat, in 2012 only 67% of Spanish households had access to a broadband Internet connection, against much higher coverage in many other European countries, including France (77%), the UK (80%) and Germany (82%). Broadband Internet coverage in 2012 in Spain was below the EU27 average (72%).[6]

Despite the slow diffusion of high-speed Internet, during the years from 2008 to 2012 (our period of interest) the share of Spanish households that had access to a broadband Internet connection rose dramatically. Figure A1 reports the evolution of ADSL Internet coverage in Spain between 2006 and 2012: as shown in the figure, the share of households that had broadband Internet access increased from around 28% in 2006 to almost 80% in 2012. Importantly for our identification strategy (see Section 4), there are also large differences in broadband Internet penetration across provinces in Spain, as shown in Figure A2.

Our period of analysis thus corresponds to the early phases of broadband Internet development in Spain. During this period, a frequent activity that people carried out online was reading the news. Data from the annual "Survey on Equipment and Use of Information and Communication Technologies in Households" show that 42% of Spaniards used the Internet to read online newspapers in 2008.[7] This figure rose to 64% in 2012. By contrast, in 2012 only around 30% of the Spanish population was a registered Facebook user.[8]

2.2 Migration

During the first decade of the 21st century, Spain experienced one of the largest (relative to its population size) migration waves in European history. Between 2002 and 2014, Spain received a cumulative migrant inflow of 7.3 million and a net flow of 4.1 million, making it the second-largest recipient of immigrants in absolute terms among OECD countries, after the United States (Romero,

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[5]According to a 2013 report by the European Commission, broadband access costs in Spain were the second most expensive in Europe. Report available here: https://ec.europa.eu/digital-single-market/en/news/study-retail-broadband-access-prices-2013-smart-20100038

[6]http://ec.europa.eu/eurostat/documents/3433488/5585460/KS-SF-12-050-EN.PDF/39000dab-e2b7-49b2-bc4b-6aad0bf01279, last access September 2022.

[7]The data can be found here: https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=estadistica_C&cid=1254736176741&menu=ultiDatos&idp=1254735976608

[8]Source: https://www.concepto05.com/2012/01/estadisitica-usuarios-de-redes-sociales-en-espana-2012/#:~:text=Seg%C3%BAn%20los%20%C3%BAltimos%20datos%20facilitados,15%20millones%20est%C3%A1n%20en%20Espa%C3%B1a

2015).[9] This demographic surge in the number of immigrants in Spain is shown in Figure A3, which plots the total number of migrants living in Spain in any given year from 1996 to 2017, as well as the immigrant share of the total population. Between 2008 and 2012, the share of foreign-born living in Spain was around 12% of the Spanish population.

In those years, most migrants came to Spain to work, attracted by the vigorous economic growth that characterized the early 2000's, while a small percentage of the migrant population was composed of asylum seekers (Jofre-Monseny et al., 2016). Immigrants to Spain concentrated primarily in the Eastern and Southern regions of the country, where economic development was more advanced (see Figure A4, which plots the share of immigrants over total population in 2008 across Spanish provinces). In terms of country of origin, the immigration wave of the first-decade of the 21st century was highly heterogeneous, with the most significant inflows originating from Ecuador, Morocco, Romania, and Colombia. Finally, according to the National Statistics Office (INE), in 2017 the most represented nationalities amongst immigrants in Spain were Moroccans (16.4%) and Romanians (15%).

The average immigrant arriving in Spain in the early 2000's was relatively high-skilled: according to the 2011 census, 55% (20%) of migrants had attained at least a secondary (tertiary) education. These numbers are close to those for the population of natives – 64% (31%). This supply of relatively skilled immigrants did not worsen the labor market outcomes of native Spaniards, neither in terms of employment rate nor wages (Carrasco et al., 2008). On the contrary, the migration wave was accompanied by an increase in native women's labor supply (Farré et al., 2011) and the income per capita of provinces with high immigration flows (Conde-Ruiz et al., 2008). Furthermore, compared to other European countries with smaller shares of immigrants, Spain recorded lower growth in criminal activity at the beginning of the 21st century (Alonso-Borrego et al., 2012).

2.3 Political context

Traditionally, in Spain, the votes cast at the general elections were distributed among a very small number of political parties. In the period of analysis, the two main political parties in Spain were the right-wing conservative Partido Popular (PP) and the leftist Spanish Socialist Workers' Party (PSOE). Until 2011, these two parties combined attracted more than 70% of the votes.

Of particular interest in the context of our research question is the PP. Although it can hardly be described as far-right and xenophobic, the PP supported and implemented anti-immigrant policies in response to the exceptional wave of immigration of the early 2000's. For example, in 2012 the PP-led government introduced the controversial *Real Decreto-Ley 16/2012*, which prevented undocumented immigrants from accessing services offered by the national healthcare system. Moreover, quantitative content analyses of the PP's manifestos highlight a relatively high proportion of references to the enforcement or encouragement of cultural integration of migrants in Spain (Volkens et al., 2012).

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[9]http://bruegel.org/2015/12/the-remarkable-case-of-spanish-immigration/

3   Data

In this paper, we combine survey data from the Spanish Sociological Research Center – the *Centro Investigaciones Sociológicas* (CIS) – on attitudes towards migrants with information on Internet penetration and the characteristics of the Spanish telecommunication infrastructure, as well as municipality-level characteristics from the National Statistics Office (INE) and the Spanish 2001 Census.

3.1   CIS survey

Research on attitudes towards migrants has been traditionally held back by lack of data on people's perceptions and opinions about the migrant population. Existing data on attitudes towards migrants either come from large multi-country surveys with a broader focus on citizens' concerns and attitudes towards government policies, or are often not representative at the national level and usually limited to attitudes of residents of big cities. In this paper, we leverage data from a unique, repeated cross-sectional survey that was conducted in Spain with the specific purpose of investigating citizens' attitudes towards migration. In the survey, carried out by the CIS, Spanish respondents are asked several questions on their opinion about the migrant population in Spain, their fears and worries linked with immigration, their relationship with migrants and their knowledge about basic facts related to migrants. All interviews were carried out in person in the respondent's house.[10] Crucially, this paper leverages a restricted-access version of the survey, which also includes information on respondents' municipality of residence. We use this information to merge our survey data with information on Internet penetration and characteristics of the telecommunication infrastructure at the municipality level, as well as municipality-level data from the Spanish 2001 Census. More details on our other data sources are provided below.

In the analysis, we exploit data from both the pre- and post-Internet period. For the pre-Internet period, we use the two survey waves that were conducted in 1995 and 1996.[11] For the post-Internet period, we use data from the 2008-2012 survey waves, which are the same years when information on Internet penetration is available. Below we describe in more detail the main variables that are used in the paper.

Throughout the paper, we restrict the sample to observations with non-missing information on our main dependent variable of interest (namely, whether the respondent thinks immigration is overall good for the country) and all relevant individual controls. Our final analysis sample comprises 17,054 observations, of which 4,709 from the pre-Internet period and 12,345 from the post-Internet years.[12] Each wave includes around 2,000 observation and, overall, 885 different

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[10]More information on the CIS and the survey can be found at the following link: http://www.cis.es/cis/opencm/ES/2_bancodatos/estudios/listaTematico.jsp?tema=82&todos=no, last access September 2022.

[11]The survey was not carried out between 1997 and 2007 (included). The 1995 and 1996 waves are largely comparable to the more recent ones – both in terms of geographical representation and in terms of the topics that were included in the survey.

[12]The total number of respondents to the CIS for the years 1995, 1996, 2008-2012 is 19,293.

municipalities are represented. Table A1 provides the distribution of survey responses by year, together with the number of provinces and municipalities that are represented in each survey wave, whereas Table A2 reports summary statistics for the individual characteristics of respondents to the CIS survey and the characteristics of the municipalities in which the respondents live.

Attitudes towards migrants Respondents to the CIS survey are asked to state the extent to which they agree or disagree with the following statement: "Immigration is good for the country". Answers were given on a 5-point Likert scale ranging from "Strongly disagree" to "Strongly agree". From answers to this question we construct a binary indicator that takes value one if the respondent agrees or strongly agrees with the statement. We exclude missing answers or respondents who answered "Do not know".[13] This is the main dependent variable that we use in the analysis, and it captures respondents' overall view about immigration in Spain. Participants to the CIS survey are further asked to state the extent to which they agree or disagree with a battery of statements about immigrants. These are reported in Table 1 below and broadly capture respondents' perceptions about the effect of immigration on the labor market in Spain, preferences for redistribution towards migrants and migrants' rights in the host country. For each statement, answers were given on a 5-point Likert scale, and we again construct binary indicators that take value one if the respondent agrees or strongly agrees with a given statement.[14] Panel A of Table A3 reports summary statistics for the binary indicators we construct capturing respondents' attitudes towards immigrants. The table pools responses from all survey waves used in the analysis. Overall, 43% of respondents agree with the statement that immigration is good for the country. Looking at perceptions about the impact of migration on the labor market, respondents are on average concerned about losing their jobs and having their salaries cut because of immigration: 61% and 73% of respondents agree with the statements that immigrants steal natives' job and immigrants reduce natives' salaries, respectively. However, relatively few respondents believe that migrants should not receive unemployment subsidies (9%). Turning to migrants' rights in Spain, overall respondents are in favor of granting migrants the right to vote and access to Spanish citizenship, but the vast majority of respondents (72%) also believes that migrants should face stricter immigration laws.

Knowledge about immigration Participants to the 2008-2012 waves of the CIS survey are asked to state how many people, out of 100 people living in Spain, they think are of foreign origin. Answers are first elicited on a continuous (0-100) scale, with the option of answering "Do not know". In 2009, 2010 and 2011, participants who answer "Do not know" are presented with a follow-up question where they are asked to choose in which bracket they think the national share of immigrants in Spain lies. Answer options are given in 5 percentage point brackets and also include a "Do not

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[13]In total, 1700 respondents answered "Do not know" (1,081 pre-Internet waves, 619 post-Internet waves). In a robustness check, we show that our results do not change if we include them in the analysis.

[14]Note that, whilst our main measure of attitudes towards migrants in increasing in more positive views about the migrant population, our binary indicators about the perceived impact of migrants on the labor market, preferences for redistribution and integration take value one for negative views.

know" category.[15] For all years, we re-code continuous answers about the share of immigrants in Spain to map the brackets provided in the discrete-choice question. We then construct two binary indicators. The first captures whether respondents correctly estimate the share of immigrants in Spain – i.e., it takes value one if the respondent's guess falls in the category that includes the actual share of immigrants in Spain in a given year. Throughout the period of analysis, the real percentage of immigrants in Spain fluctuated around 13%. Hence, our first indicator takes value one if the respondent's guess about the share of immigrants in Spain is between 11% and 15%, and zero otherwise. Our second indicator captures whether respondents overestimate the share of immigrants in the country. It takes value one if the respondent's guess is 16% or above, and zero otherwise. Both indicators take value zero for respondents who indicated "Do not know" as their answer. Figure B3 shows the distribution of answers to the question on the share of immigrants at the national level (in discrete form). The red lines represent the real share of migrants in Spain. As can be seen from the figure, the vast majority of respondents has incorrect perceptions about the presence of migrants in Spain. The CIS survey also includes similar questions about the share of immigrants *in the municipality of residence* of the respondents. We use answers to these questions to construct equivalent indicators to the ones constructed for guesses about the national share of immigrants, but this time referring to knowledge about the presence of migrants at the local level.

Concerns   Respondents to the CIS are asked open-ended questions about what they think the main problems are for Spanish society at the time of interview, and what the main problems are for them in particular. Participants can list up to three issues in order of (subjective) importance. The open-ended answers are then grouped into broad categories reflecting different types of concerns. From answers to these questions we construct two binary indicators. The first captures whether respondents mention immigration amongst the two most pressing problems for Spain. The second indicator similarly captures whether immigration is one of the two main problems that respondents report being facing.[16]

Voting   Participants to the CIS survey were asked which party they voted for in the last national election. We construct an indicator equal to one if respondents report having voted for the right-wing, conservative party PP, and zero if they report voting for another party or not voting at all.

3.2   Broadband Internet availability

Data on broadband Internet availability are drawn mainly from the *"Anuario Economico de España - La Caixa"* (Economic Yearbook of Spain). The yearbook contains information on the number of

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[15]The brackets provided are: None, between 1-5, 6-10, 11-15, 16-20, 21-25, 26-30, More than 30, Do not know, Prefer not to answer.

[16]Our indicators take value one if immigration is mentioned as either the first or second issue that Spain or the respondent is facing, because the number of problems respondents could report in their answers varied over time but, across all survey waves, respondents could always list at least two problems.

Table 1: **Overview of outcome variables**

Outcome variable	Measurement scale
Attitudes towards migrants	
Immigration is overall good for the country	Binary indicator for agreement
Immigrants:	
Steal natives' jobs	Binary indicator for agreement
Reduce natives' salaries	Binary indicator for agreement
Should not receive unemployment subsidies	Binary indicator for agreement
Should not be allowed to vote	Binary indicator for agreement
Should not be allowed to gain Spanish nationality	Binary indicator for agreement
Should face stricter immigration laws	Binary indicator for agreement
Information about migration	
Estimated share of migrants in Spain	Binary indicator for correct guess
Estimated share of migrants in Spain	Binary indicator for overestimated guess
Estimated share of migrants at local level	Binary indicator for correct guess
Estimated share of migrants at local level	Binary indicator for overestimated guess
Other outcomes	
Voting for right-wing party	Binary indicator for having voted for PP
Concerns about Spain	Binary indicator for immigration being among the top 2 concerns
Personal concerns	Binary indicator for immigration being among the top 2 concerns

Notes: This table provides an overview of the outcome variables that we use in our analysis and their corresponding scales.

broadband lines that were active in Spain for the years 2007, 2008, 2009 and 2012. Data is provided at the municipal level for approximately 3250 municipalities.[17] Since we do not have information on broadband Internet availability for 2010 and 2011, we interpolate the number of broadband lines for these two years.[18] For each survey year, we divide the number of broadband lines by the total population in the municipality, and obtain our main measure of broadband Internet penetration. In robustness checks, we construct an alternative measure of Internet penetration by dividing the number of broadband lines by the number of households in a given municipality. The same database also contains information on the number of landlines in 1996 at the municipal level. As explained in more detail in the next section, we use the number of landlines in 1996 to instrument for broadband Internet availability at the municipality level.

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[17]The Economic Yearbook of Spain provides data on Internet availability for all municipalities with more than 1,000 inhabitants, which cover approximately 96.8% of the population of Spain for the period of analysis.

[18]In a robustness check we show that our results carry through when we exclude the 2010 and 2011 survey waves from the estimation sample.

3.3 Municipality characteristics

We combine data from multiple sources to construct municipality-level controls. More precisely, in our regressions we control for population size, municipality surface and altitude from INE (National Statistics Office) data. This information is available for all years of analysis. Other relevant time-varying controls at the municipality level, including the number of cars, banks and commercial activities, are provided by "Anuario Economico de España - La Caixa". We turn to the 2001 Census to collect additional information on the unemployment rate of the total population and the female population, as well as the population composition in terms of educational attainment.As this information is only available from Census data, we cannot control for trends in these indicators in our analysis. Finally, data about the evolution of the immigrant population, in particular the share and origin of immigrants, come from "Padrón Continuo", the main official Spanish register of foreign people living in the country.

4 Empirical methodology

We analyze the effect of Internet penetration on general attitudes towards immigrants as captured by answers to the following question: "Overall, do you think that immigration is bad, good, or neither bad nor good for the country?". From answers to this question we construct a binary indicator capturing whether respondents think that immigration is good or very good for Spain. The main empirical specification for the contemporaneous effect of Internet penetration on our outcome variable is:

$$y_{imt} = \alpha_0 + \alpha_1 ADSL_{mt} + \alpha_2 X_{it} + \alpha_3 W_{mt} + \tau_t + \phi_p + \epsilon_{imt} \tag{1}$$

where y_{imt} is the attitude of individual i living in municipality m at time t and $ADSL_{mt}$ is broadband Internet penetration in municipality m and year t. Internet penetration is measured as the ratio between the number of broadband lines and the population living in a given municipality in a given year. The main coefficient of interest is α_1, which captures whether attitudes towards migrants differ in municipalities with a higher share of broadband Internet lines. X_{it} is a vector of individual (both time-variant and time-invariant) controls, which include gender, age and its squared term, employment status and educational attainment. W_{mt} is a vector of time-variant and time-invariant municipality controls, including population, surface area, altitude, the share of migrants over the total population as well as the share of EU15 and African immigrants over the immigrant population. We further control for time-invariant municipality characteristics, including the unemployment rate, the female unemployment rate, the share of inhabitants with primary education and the number of cars, banks and commercial activities per capita in 2001. These controls allow us to capture differences in economic development and population composition across municipalities that might be correlated with attitudes towards immigrants. ϕ_p are province fixed

effects, which control for time-invariant differences across provinces.[19] τ_t are year fixed effects, that control for possible trends in attitudes towards migrants over time that are common across provinces.

Estimating the above equation using OLS would be problematic because Internet penetration is unlikely to be random. Indeed, Internet suppliers are more likely to invest in locations where demand is potentially higher, given the characteristics of the location and its inhabitants. Even controlling for a large set of municipality-level controls, other unobservable characteristics that are correlated with Internet penetration might also affect local perceptions of immigrants, making Internet penetration a likely endogenous regressor. To address this concern, we proceed in two ways. First, we estimate the effect of Internet penetration on attitudes towards migrants using information from both the pre- and post-Internet period (i.e. for the years 1995, 1996 and 2008-2012). The introduction of province-level fixed effects, with observations from both before and after the introduction of Internet technology, allows us to overcome the estimation bias attributable to unobserved time-persistent factors. However, there may still be some unobservable time-varying factors that affect both attitudes towards immigrants and Internet availability. To address this issue, we follow Campante et al. (2017) and adopt an instrumental variable strategy combined with a difference-in-difference design that exploits plausibly exogenous variation in supply-side constraints to broadband Internet penetration. This is described in more detail below.

4.1 Identification strategy

Broadband Internet was rolled out in Spain starting in the year 2000.[20] In the early phase of the diffusion of broadband Internet, broadband Internet providers exploited the pre-existing copper telephone landlines to supply ADSL Internet to households. Therefore, a higher number of fixed-lines in a municipality was associated both with smaller costs in providing Internet services and with a greater proximity of households to the local telephone exchange (or Main Distribution Frame - MDF).[21] Figure 1 graphically represents the relationship between landlines per capita in 1996 and broadband Internet penetration at the municipality level, for the years in which information on Internet lines is available. Municipalities with a higher share of landlines per capita in the period prior to the diffusion of ADSL Internet also have a higher broadband Internet penetration in the early phase of its development. Moreover, the diffusion of broadband Internet over time is also not homogeneous across municipalities: locations with a higher number of landlines per capita not only had more Internet lines per capita in 2008, but the penetration of broadband Internet was also faster than in locations with a lower number of landlines per capita.

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[19] Spain is made up of 50 provinces, with populations ranging from 95,258 to 6,458,684.

[20] The first broadband Internet connections in private households date back to the year 2000, when *Telefónica* entered the ADSL supply market. See: https://www.elmundo.es/imasd/docs/cursos/masterperiodismo/2002/rivero-master02-espana.html

[21] One of the most commonly used instruments for Internet availability in the literature (Campante et al., 2017; Falck et al., 2014) is the location of MDFs - which connect the central office switches to lines that go into peoples homes. However, data on the location of MDFs in Spain are not available. Other instruments include location of backbones (Miner, 2015) and rainfall (Nardotto et al., 2018).

It is important to highlight that, in 1996, the use of home telephones was very common and low telephone network coverage was associated with difficulties in bringing the telephone service to the municipality and not with individual choices of not having a telephone line at home. Moreover, the national company responsible for the telephone service – *Telefónica* – was public at the time, and had the mandate of providing telephone services to the largest possible number of citizens, even in areas where it was not economically viable to invest. This reinforces the idea that low telephone network coverage was associated with technical difficulties (due, for instance, to the nature of the terrain or the presence of mountains) in providing the service and not with systematic differences across municipalities in households' willingness to use telephone services.

We combine information on the municipality of residence of respondents to the CIS with information on municipality-level characteristics of the telephone infrastructure in 1996 (i.e., prior to the development of broadband Internet), to calculate the number of landlines per capita in 1996 in the municipality where respondents to the CIS live. We use this variable as a proxy for the level of supply side constraints to the provision of broadband Internet and exploit an instrumental variable design to quantify the causal effect of broadband Internet on attitudes towards migrants.

Using landlines per capita as an instrument for broadband Internet penetration in the post-Internet period would raise concerns related to the fact that the diffusion of landlines across municipalities is itself unlikely to be random. Indeed, Appendix Table B1 shows that bigger municipalities, municipalities with fewer immigrants and with more cars, banks and commercial activities per capita also had a higher number of telephone lines per capita. In all regressions, we thus control for an extensive set of municipality characteristics that could be correlated with both the instrument and our outcome of interest. However, there may still be unobservable factors that affect both the diffusion of landlines and attitudes towards migrants. To address this concern, we exploit data from both the pre- and post-Internet period to estimate a difference-in-difference instrumental variable model.

Our estimating equations are specified as follows:

$$y_{imt} = \beta_0 + \beta_1 ADSL_{mt} + \beta_2 Landlines_m + \beta_3 X_{it} + \beta_4 W_{mt} + \tau_t + \phi_p + \epsilon_{imt} \tag{2}$$

where

$$ADSL_{mt} = \gamma_0 + \gamma_1 Landlines_m \times PostADSL_t + \gamma_2 Landlines_m + \gamma_3 X_{it} + \gamma_4 W_{mt} + \tau_t + \phi_p + \eta_{imt} \tag{3}$$

Here, $PostADSL_t$ is a binary variable that takes value 1 for the years 2008-2012 when broadband Internet was being deployed in Spain, and 0 for 1995 and 1996.[22] $Landlines_m$ is the number of landlines per capita at the municipality level in 1996. All other variables are defined as in equation 1.

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[22]Note that information on broadband Internet penetration is not available for the years 1995 and 1996. However, given that the penetration of broadband Internet in private households in Spain only started in the year 2000, the assumption that Internet penetration is 0 in 1995 and 1996 is reasonable.

In all specifications we control for year and province fixed effects.[23] Standard errors are clustered at the municipality level, which is the same level at which information on broadband Internet is recorded. In our baseline specification, we weight observations to match the population distribution across municipalities covered in each survey year.[24]

The identification assumption behind this instrumental variable difference-in-difference specification is that any change in the impact of the number of fixed telephone lines on the dependent variable occurs only through Internet availability. In other words, any correlation between the instrument and confounding (unobserved) characteristics of the municipality of residence did not change after the introduction of broadband Internet, and we are identifying the causal effect of broadband Internet on attitudes towards migrants off of the change in the impact of landlines on the outcomes of interest, under the assumption that any change in that impact occurs solely through the new technology.

Figure 1: **Landlines per capita and Internet penetration**
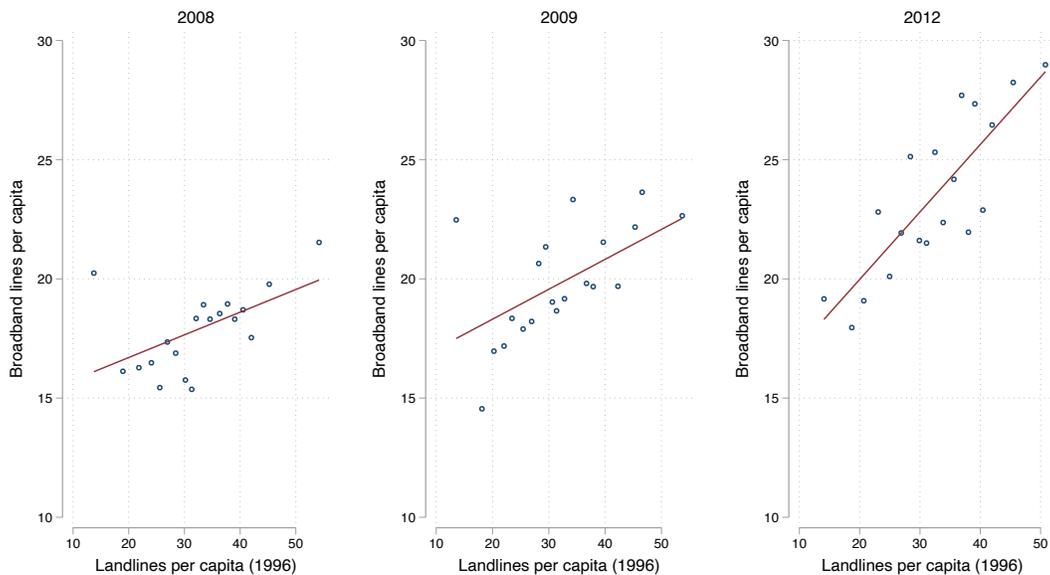
Notes: The different graphs show the relationship between landline penetration in 1996 and Internet penetration in 2008, 2009 and 2012 respectively, when we have information on the number of broadband Internet lines at the municipality level. Landline and broadband Internet penetration are calculated as the number of lines divided by population size, at the municipality level. The x-axis shows landline penetration in bins, and the y-axis shows average Internet penetration for each bin. The red, solid line represents the line of best linear fit.

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[23]In our main specification, we do not use municipality fixed effects because some municipalities only appear either in the pre- or post-Internet period. In a robustness check, we restrict the sample to respondents from municipalities that are observed at least once both in the pre- and post-Internet period and control for municipality fixed-effects instead of province fixed effects. All our results carry through with this more conservative specification (see Table 3).

[24]See Appendix C for more details on the construction of weights.

5 Results

The central question we ask in this paper is how access to broadband Internet shapes attitudes towards immigrants in Spain. We start by analyzing the correlational association between broadband Internet and views about migrants, and then move on to estimating the causal effect of high-speed Internet using the identification strategy described in Section 4.1.

5.1 Preliminary evidence

In recent years, Spain has stood out in the international comparison for its welcoming attitude towards immigrants. Data from the 2018 Eurobarometer survey show that 83% of Spaniards would feel comfortable in all forms of social interactions with an immigrant, against an EU28 average of 57% (see Figure A5). However, these welcoming attitudes towards migrants were by no means prevalent during the period of analysis. For instance, in 2012, the percentage of Spanish respondents to the Eurobarometer agreeing with the statement "Immigrants contribute a lot to your country" was just 48%, one percentage point lower than the EU27 average (Eurobarometer, 2012). Similar attitudes can also be observed in Figure A6, which shows the trend in the nature of CIS respondents' initial reaction, or *first thought*, when asked about immigration. We classify responses as positive or empathetic when respondents mention topics such as "inequality", "poverty" or "lack of human rights", neutral when they mention "foreign people" or specific nationalities/ethnicities, and negative for mentions of "crime", "steal jobs", "reduction in public goods". As can be seen from the graph, for most of the period of analysis (i.e., from 2008 to 2011), around 40% of respondents expressed negative sentiments in relation to the word immigration. When looking at our main measure of attitudes towards immigrants, namely whether respondents think that immigration is good for their country, the CIS data paint a consistent picture: on average, in the post-Internet period 43% of respondents think that immigration is good or very good for the country. In Figure A7 we can see that men, young respondents and respondents with a university degree hold more positive views, on average, whilst unemployed and retired workers are more likely to think immigration is bad for Spain.

We now move on to examine the correlational relationship between our main measure of attitudes towards immigrants and Internet penetration. It is *a priori* not clear in which direction Internet access might impact citizens' views about immigrants. On the one hand, the Internet can provide cheap access to more information, thus potentially diversifying the readers' news content and making accurate information about immigrants more easily available. One the other hand, the risk of information overflow might lead Internet users to only consume news that are concordant with their prior beliefs, thus fostering polarization (Mullainathan and Shleifer, 2005; Gentzkow, 2006).

Figure 2 plots average attitudes towards migrants for the pre- and post-Internet period, separately by quartiles of average Internet penetration in the area where the respondent was living at

the time of the survey.[25] The graph highlights two interesting patterns. First, in the pre-Internet period there is no difference in the share of respondents who hold positive views about immigrants across municipalities with (future) high and low Internet coverage. This provides suggestive evidence that the parallel trend hypothesis holds and, reassuringly for the identification strategy, that our results on the effect of broadband Internet on attitudes towards immigrants are not picking up some underlying trend in attitudes that just happened to be correlated with the diffusion of broadband.

Second, in municipalities with a higher level of Internet coverage, the percentage of respondents reporting that immigration is good for the country increased in the post-Internet period, whereas we observe a drop in the share of respondents holding positive views in municipalities with low Internet penetration. This positive correlation between broadband Internet penetration and attitudes towards migrants is confirmed in an OLS regression framework (see Table B2), where the coefficient of Internet penetration from our preferred specification in Column (5) shows that a one percentage point increase in Internet penetration is associated with an almost one percentage point increase in the share of respondents thinking that immigration is good for Spain.

Figure 2: **Share of respondents with positive attitudes towards immigrants, by Internet penetration**
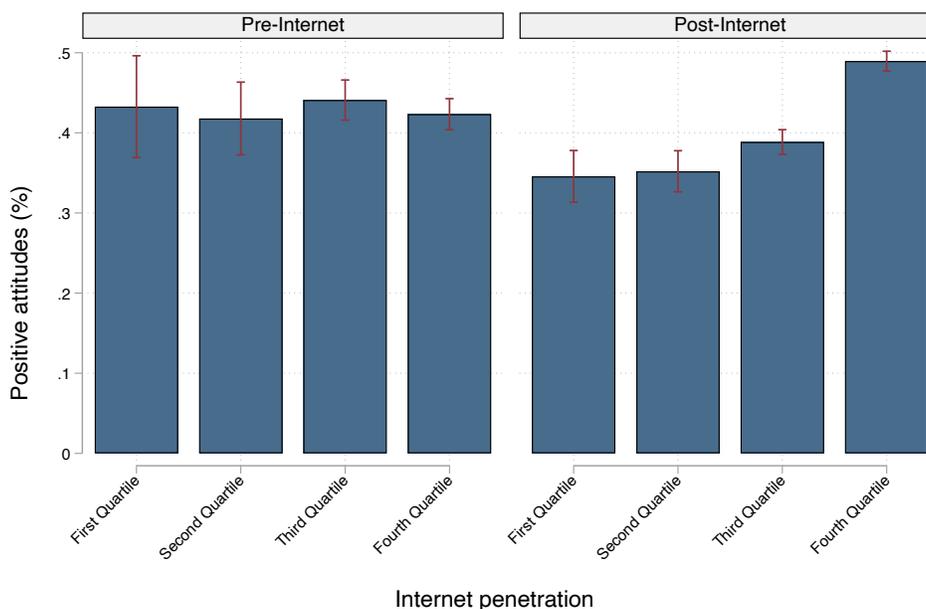
Notes: The graph shows the share of respondents who think that immigration is good or very good for the country (blank and "Don't know" answers excluded) for different levels of Internet penetration, separately for the pre- and post-Internet period. "Pre-Internet" refers to 1995-1996. "Post-Internet" refers to 2008-2012. The Internet penetration quartiles are calculated from the distribution of average Internet penetration in 2008-2012 for all municipalities in Spain. Source: CIS questionnaires.

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[25]To classify municipalities into different quartiles, we take the average share of broadband lines per capita over 2008-2012 and compute the quartiles of the distribution of this variable.

5.2 Main results

As discussed above, the estimation of Equation 1 is problematic due to concerns about the endogeneity of broadband Internet coverage across regions. Therefore, we now move to discussing results for the estimation of our 2SLS specification, as per Equations 2 and 3. Table 2 reports our main results.[26] Column (1) shows the coefficient estimates from the simplest specification where the dependent variable is a binary indicator for thinking that immigration is good for the country, and the only regressors are Internet penetration at the municipality level (our main variable of interest) and the number of landlines per capita in 1996. Internet penetration is instrumented in the first stage regression with the interaction between the number of landlines per capita and a binary indicator for the post-Internet period. The first stage coefficient shows that our instrument is a strong predictor of Internet coverage at the municipality level. The F-statistic for a test of instrument validity is also well above the conventional threshold of 10. Looking at the second stage coefficient, Internet penetration is significantly and positively correlated with welcoming attitudes towards immigrants: a one percentage point increase in Internet penetration is associated with a 0.6 percentage point increase in the share of respondents holding positive views about immigrants. In Columns (2) to (4) we progressively add province and year fixed effects, time-varying municipality and individual controls as well as municipality characteristics from the 2001 Census. The results carry through in all more conservative specifications. In particular, our preferred specification from Column (4) shows that a one percentage point increase in Internet penetration leads to a 4.5 percentage point increase in the share of respondents who think that immigration is good for their country.[27] This corresponds to a 10.3% increase over the sample mean of 43.7% in the pre-Internet period.

5.3 Robustness checks

Reduced form and placebo. We perform a number of checks to assess the robustness of our results. We start by presenting results from a difference-in-difference specification in a reduced form context in Table B5. Here, we run OLS regressions where the dependent variable is our measure of attitudes towards migrants, and the main regressor is our instrumental variable, constructed as the number of landlines per capita in municipality m in 1996 interacted with a binary indicator for the post-Internet period. The coefficient estimates confirm that our instrument is significantly and positively correlated with attitudes towards migrants.

As a placebo check, we split the sample into the pre- and post-Internet period, and examine whether, conditional on all individual and municipality controls, the share of landlines per capita

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[26]Table B3 reports 2SLS coefficients from all the control variables included in the regressions.

[27]In Appendix Table B4 we report results from the same specification, looking at the effect of broadband penetration on the probability of having negative views about immigrants (Panel A), or neutral views (Panel B). As we can see from the table, broadband penetration did not significantly affect the probability of holding negative views about immigrants, although the coefficient is negative. Internet penetration did however significantly decrease the probability that respondents hold neutral views about immigration.

Table 2: **Internet and attitudes towards migrants (IV)**

	(1)	(2)	(3)	(4)
Internet penetration	0.003**	0.057***	0.059***	0.045***
	(0.002)	(0.014)	(0.018)	(0.014)
First stage coefficient	0.539***	0.146***	0.140***	0.181***
Observations:	17054	17054	17054	17026
F-stat.:	713.66	32.23	17.42	31.28
Landlines 1996:	Yes	Yes	Yes	Yes
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes
Census 2001:	No	No	No	Yes

Notes: 2SLS regressions. The dependent variable is a binary indicator equal to one if the respondent thinks immigration is good or very good for the country. Years 1995, 1996; 2008-2012. All regressions control for landline penetration in 1996 at the municipality level. "Fixed effects" refers to year and province fixed effects. "Controls" includes personal and municipality level controls. Personal controls: gender, age, age squared, indicators for employment status and an indicator for having a university degree. Municipal controls: population, surface in Km^2, altitude, % immigrants over total population, % of EU15 migrants, and % of African migrants over immigrant population. "Census 2001" refers to municipality characteristics as per the 2001 Census. These include the unemployment rate for the full population and for the female population, the share of inhabitants with primary education, and number of cars, commercial activities and banks per capita. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level are reported in parentheses. Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

in 1996 is a predictor of attitudes towards migrants, separately for the years 1995-1996 and from 2008 onwards. The results are displayed in Table B6. Panel A shows estimates for the relationship between landlines per capita in 1996 and attitudes towards migrants in the post-Internet period. As we can see from the table, a higher penetration of landlines in 1996 is associated with more positive attitudes towards migrants. Reassuringly, no significant association between landlines per capita and attitudes towards migrants is instead found in the pre-Internet period (see Panel B). Similarly, Figure 3 reports the coefficients from a dynamic reduced form equation where landline penetration is interacted with year dummies, and 1996 is omitted as a point of comparison. As can be seen from the graph, we find no significant effect of landline penetration on attitudes towards migrants in the pre-Internet year. By contrast, landlines per capita are positively and significantly associated with attitudes towards migrants in the years 2008-2012.

Figure 3: **Landlines per capita and attitudes towards migrants (1995-2012)**
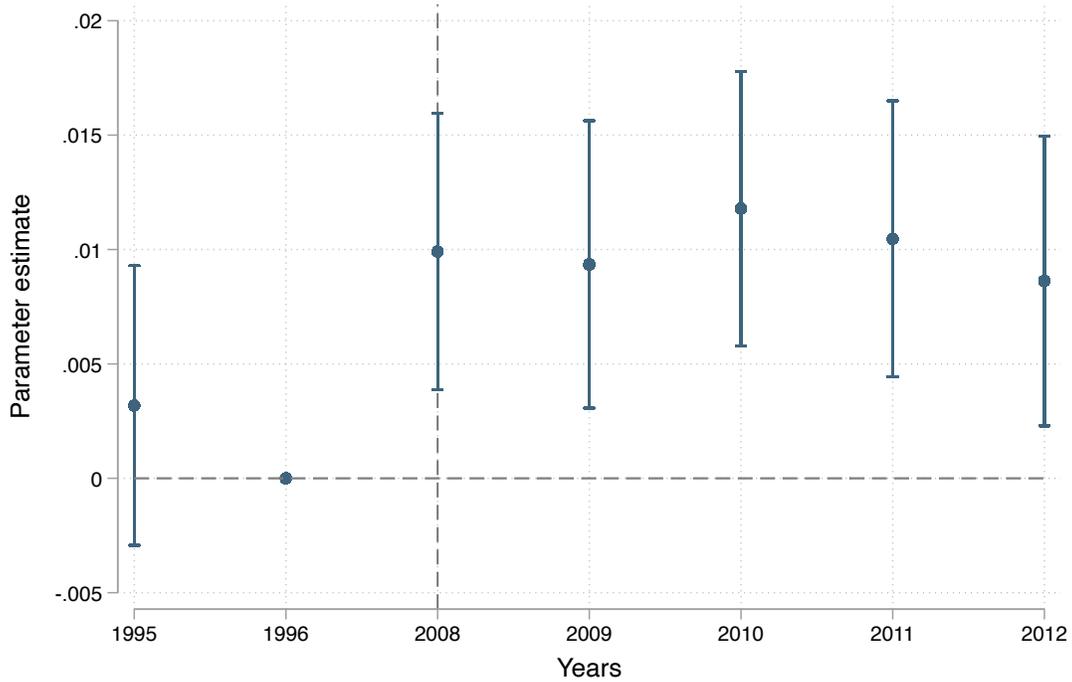
Notes: The graph shows coefficients and 95% confidence intervals from reduced form OLS regressions for the effect of landline penetration in 1996 on attitudes towards migrants, where landline penetration is interacted with year dummies. The base year 1996 is excluded. All regressions include controls and fixed effects as per column (4) of Table 2. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level.

Changes to sample or empirical specification. Additionally, we perform a number of robustness checks to assess whether the results on the effect of Internet penetration on attitudes towards migrants change when modifying the sample or the empirical specification. Figure 4 shows in red the coefficient of interest from our main specification, corresponding to column 4 of Table 2, as well as 2SLS coefficients for broadband Internet penetration for alternative regression models (in blue). First, we start by constructing an alternative version of our measure of Internet penetration by dividing the number of broadband Internet lines by the number of households in municipality m in 1996.[28] The estimated coefficients from a regression model equivalent to the baseline specification are slightly smaller in magnitude (although not significantly so), but remain positive and significant. Second, we augment the model with the introduction of province × year fixed effects instead of separate vectors for province and year fixed effects. This specification more flexibly controls for differential trends in attitudes towards immigrants by province, over time. The introduction of this more conservative vector of fixed effects does not significantly change our results. Similarly,

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[28]This alternative measure has the advantage that it more accurately captures Internet coverage by taking into account differences in household composition. However, a drawback of this measure is that the number of households is only provided in the 2001 Census, and hence time-invariant.

we estimate a model where we interact controls from the 2001 Census with linear time trends, to parametrically control for differential trends in baseline differences across municipalities. The coefficient for Internet penetration remains stable in this alternative specification. Third, we exclude the years 2010 and 2011 from our estimation sample, as information on Internet penetration was not available in those years and our interpolation method may introduce measurement error in our main regressor of interest. Again, our results survive this robustness check. Finally, the two bottom-most coefficients in Figure 4 show that the use of weights constructed to match the distribution of the national population across municipalities is not driving our findings, and that our results are robust to the inclusion of respondents who did not provide a categorical answer the question on whether immigration is good or bad for Spain.[29]

Figure 4: **Internet and attitudes towards migrants – Robustness checks**
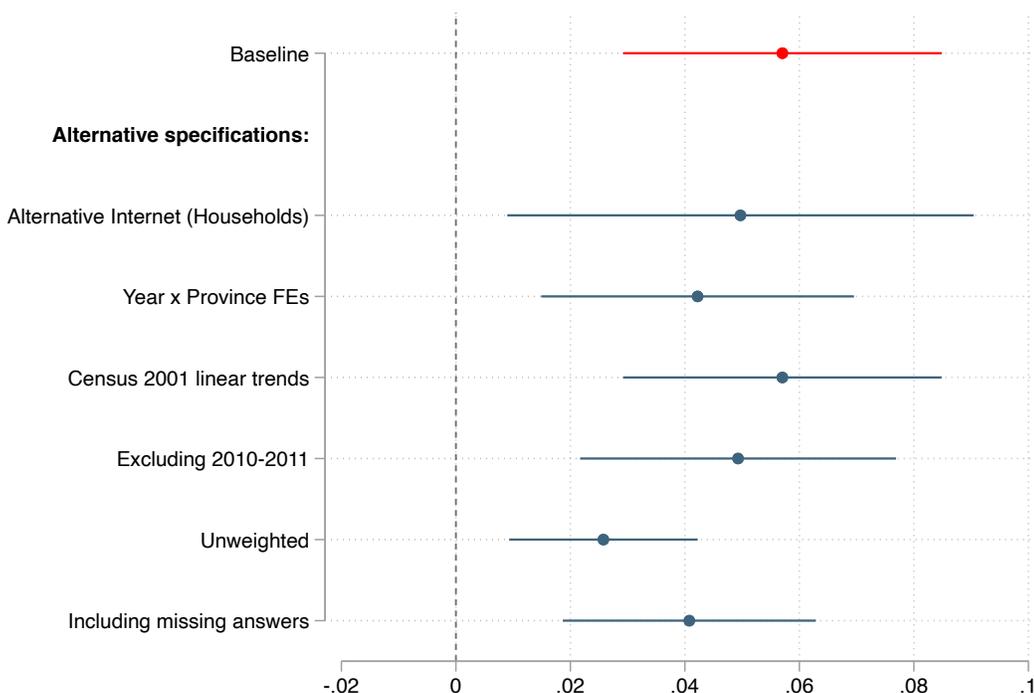
Notes: The graph displays coefficients associated to Internet penetration for different 2SLS model specifications. The dependent variable in all regressions is a binary indicator equal to one if the respondent thinks immigration is good or very good for the country. "Baseline" refers to the model specification in column (4) of Table 2. The "Alternative Internet (Household)" model refers to an equivalent specification where Internet and landline penetration have been constructed as shares relative to the number of households in the municipality. "Year x Province FEs" is a model that includes year × province fixed effects instead of separate vectors for year and province fixed effects. "Census 2001 linear trends" refers to a model where variables from the 2001 Census are interacted with linear trends. "Excluding 2010-2011" refers to a model where the years 2010 and 2011, when Internet penetration has been extrapolated, have been dropped. "Unweighted" refers to unweighted results. "Including missing answers" refers to regressions run on a sample that includes respondents who did not provide a categorical answer to the question on the respondent's opinion about immigration.

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[29]Respondents who did not provide a categorical answer to this question either answered "Do not know" or "Prefer not to answer". We classify these respondents as not having a positive view about immigration.

5.4 Municipality fixed effects

In our main analysis sample, not all municipalities feature in both the pre- and post-Internet period data.[30] This does not allow us to use municipality fixed-effects in our main specification. In a further robustness check, we restrict the sample to respondents living in municipalities that feature at least once in both the pre-Internet years (1995 and 1996) and the post-Internet period (2008-2012). We then estimate the following instrumental variable regression model:

$$y_{imt} = \beta_0 + \beta_1 ADSL_{mt} + \beta_2 X_{it} + \beta_3 W_{mt} + \tau_t + \chi_m + \epsilon_{imt} \tag{4}$$

where

$$ADSL_{mt} = \gamma_0 + \gamma_1 Landlines_m \times PostADSL_t + \gamma_2 X_{it} + \gamma_3 W_{mt} + \tau_t + \chi_m + \eta_{imt} \tag{5}$$

χ_m now includes municipality fixed-effects instead of province fixed effects. The introduction of municipality fixed effects does not allow us to include time-invariant municipality-level controls. Thus, W_{mt} in this specification includes population, the share of immigrants over the total population, and the share of EU15 and African immigrants. All other variables are defined as in our baseline model.

The inclusion of municipality fixed-effects allows us to control more accurately for unobserved characteristics at the geographical level at which variation in landlines per capita is plausibly exogenous. However, this more conservative specification comes at a cost, since we lose almost half of our observations from the baseline model. We present the results from this robustness check in Table 3. Columns (1) and (2) show estimates from a model that includes municipality fixed effects. Reassuringly, the coefficients for Internet penetration are very similar in both significance and magnitude to those from our baseline specification. For a direct comparison of results with a specification that includes province and year fixed effects, in Columns (3) and (4) we run regressions on the restricted sample but with vectors of fixed effects for province and year, instead of municipality and year. The coefficients are virtually identical to those presented in columns (1) and (2). Moreover, the results show that the larger sample size is not driving our main results: running the baseline specification with province and year fixed effects on the restricted sample of respondents that live in municipalities featuring in both the pre- and post-Internet period does not qualitatively nor quantitatively alter our findings from Table 2.

5.5 Heterogeneity

In this section, we investigate whether the positive effect of Internet access on attitudes toward immigrants that we document in Table 2 differs depending on the respondents' characteristics or the characteristics of the municipality where he/she lives.

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[30]Out of the 885 municipalities represented at any time in the sample, for only 156 we have respondents in 1995 or 1996, and then again in one of the survey years from 2008 to 2012.

Table 3: **Internet and attitudes towards migrants (IV) - Municipality fixed effects**

	Mun. FE		Prov. FE	
	(1)	(2)	(3)	(4)
Internet penetration	0.053***	0.052***	0.055***	0.063***
	(0.013)	(0.014)	(0.015)	(0.021)
First stage coefficient	0.179***	0.177***	0.159***	0.149***
Observations:	9835	9835	9835	9835
F-stat.:	39.32	28.03	25.89	14.56
Landlines 1996:	No	No	Yes	Yes
Fixed effects:	Mun.	Mun.	Prov.	Prov.
Controls:	No	Yes	No	Yes

Notes: 2SLS regressions. The dependent variable is a binary indicator equal to one if the respondent thinks immigration is good or very good for the country. Years 1995, 1996; 2008-2012. The sample is restricted to observations from municipalities that appear at least once in both the pre- and post-Internet period. Year fixed effects are included in all specifications. "Fixed effects" refers to municipality fixed effects in columns (1) and (2) and province fixed effects in columns (3) and (4). "Controls" includes personal and municipality level, time varying controls. Personal controls: gender, age, age squared, indicators for employment status and an indicator for having a university degree. Municipal controls: population, % immigrants over total population, % of EU15 migrants, and % of African migrants over immigrant population. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level are reported in parentheses. Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

The first dimension of heterogeneity that we explore is the age of the interviewee. Evidence from Internet usage data shows that younger generations are more frequent users of the Internet. Thus, we expect to find heterogeneity in the results when comparing young vs. old respondents. Figure 5 reports results from our preferred specification, corresponding to the model from Column 4 of Table 2 run on sub-samples of respondents in different age brackets. Specifically, we split our sample into three groups: those aged 35 or younger (N=5,463), those aged between 36 and 50 (N=4,576), and those older than 50 (N=6,987). Consistent with our hypothesis, the magnitude and statistical significance of the coefficient of Internet penetration are higher for younger respondents. Internet access has a positive and significant effect on attitudes towards migrants for individuals falling in the first two age groups – i.e., those who are more likely to use the web to consume information. By contrast, the coefficient becomes insignificant and close to zero for older respondents, suggesting that Internet usage intensity is closely related to the shift in attitudes towards immigrants.

Appendix Figure B1 investigates additional sources of heterogeneity by looking at other respondents' characteristics. We do not observe different effects of Internet access depending on the respondent's gender: both men's and women's attitudes are positively impacted by the Internet. By contrast, we find large heterogeneity in the effect of Internet access by educational groups: only the attitudes of low-educated respondents are affected by broadband Internet access, while the coefficient from regressions run on the high-educated group (i.e., those with a university degree) is close to zero and not significant at conventional levels. A plausible explanation for this heterogeneity is that the group of high-educated respondents was better informed about migrants and held more positive attitudes towards immigrants already in the pre-Internet period.[31] By contrast, a cheap and easy-to-access source of information such as the Internet had a larger effect on the low-educated group that was plausibly less well-informed about migration dynamics than highly-educated respondents. Finally, we investigate whether the effect of Internet access on attitudes towards migrants differs depending on the respondent's employment status. The attitudes of both those in-work and the unemployed are positively affected by Internet penetration. Reassuringly, and consistent with our results on age heterogeneity, the coefficient from a regression run on the sub-sample of retirees is virtually zero. In contrast, when restricting the analysis to the students' sample, the coefficient is significant and larger than that for all other categories. Again, the evidence suggests that the effect of broadband Internet access is larger for heavier users of the technology, such as students and young people.

Lastly, Appendix Figure B2 looks at heterogeneity by characteristics of the respondents' municipality of residence. The positive effect of Internet access on attitudes towards migrants that we find is driven by respondents living in highly populated municipalities, municipalities with a low share of immigrants, and municipalities where EU immigrants constitute a lower fraction of the immigrant population.[32] By contrast, the effect of broadband Internet on attitudes towards immigrants is positive and significant independently of the share of African immigrants in the respondent's municipality of residence.

6 Other results

In this section, we explore the relationship between Internet penetration and other variables linked to attitudes towards migrants.

6.1 Concerns

We start by looking at respondents' views about the main problems that the Spanish society, as well as respondents themselves, are facing. Participants to the CIS survey were asked to indicate

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[31]Indeed, in the pre-Internet period, the share of high-educated respondents who held positive views about immigrants is 52%, against a figure of 42% for the group of respondents without a university degree. The p-value from a test of difference in means between the two groups is 0.0013.

[32]In Appendix Figure B2, high and low share of immigrants refer to municipalities where the share of migrant population is above and below the median, respectively.

Figure 5: **Internet and attitudes towards migrants - Heterogeneity by age**

Notes: The graph shows coefficients for broadband Internet penetration and 95% confidence intervals from 2SLS regressions run on the full sample (red), or on samples restricted to respondents in different age groups, as indicated on the y-axis (blue). The dependent variable is a binary indicator equal to one if the respondent thinks immigration is good or very good for the country. Years 1995, 1996; 2008-2012. All regressions control for landline penetration in 1996 at the municipality level and include controls and fixed effects as per column (4) of Table 2. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level.

what they thought the two main problems were that Spain was facing at the time of the interview. We construct a binary indicator capturing whether respondents mentioned immigration among the two top priorities, and consider this a proxy of respondents' *general concerns*. Furthermore, respondents were asked a similar question about the main problems that they themselves were facing at the time of the interview. We construct an indicator for personal concerns that capture whether respondents mentioned immigration as a primary concern for themselves. In Table B11, we examine the impact of Internet penetration on these outcomes. In Panel A we see that higher Internet penetration leads to a reduction in the likelihood of thinking that immigration is a major problem for Spain: a 10 percentage point higher Internet penetration is associated with an 11 percentage point reduction in the likelihood of mentioning immigration is amongst the top two problems for Spain.[33] Similarly, in Panel B we see that respondents living in municipalities with a higher number of broadband Internet lines per capita are also less likely to think that immigration is amongst the top problems for them.

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[33]Given a mean equal to 0.09 (see Table A3)

We then move to analysing different reasons why natives may be worried about immigration in their country. A large body of literature has identified several channels through which natives' perceptions of immigrants are shaped. Overall, natives seem to be more concerned about immigration when they fear increased competition in the labour market (Mayda, 2006) and reduced access to public goods (Facchini and Mayda, 2009). Cultural and ethnic differences of the immigrant population and their impact on the ability of migrants to integrate in the host country are a further source of negative attitudes of natives towards the migrant population in their country (Dustmann and Preston, 2007).

The CIS survey is particularly well suited to study how these channels shape respondents general attitudes towards migration, as it includes questions that tackle all of the above concerns. In particular, respondents to the CIS are asked to state the extent to which they agree or disagree with the following statements about the impact of migration on the labor market in Spain: (i) "Immigrants steal jobs from natives"; (ii) "Immigrants reduce natives' salaries". Further, participants to the CIS survey were also asked whether they agreed or disagreed with the statement that (iii) "Immigrants should not get access to unemployment benefits", which we interpret as proxying concerns about competition for public goods. Finally, concerns about the integration of migrants in Spain are proxied by agreement with the following statements: (iv) "Immigrants should not be allowed to vote"; (v) "Immigrants should not be allowed to get Spanish nationality"; and (vi) "Immigrants should face stricter immigration laws". From answers to these questions, we construct binary indicators that take value one if the respondent agrees or strongly agrees with the statement, and zero otherwise. As agreement with any of the above statements indicates concerns or negative views towards migrants, we expect all the binary indicators to be negatively correlated with our main dependent variable, which instead captures positive general attitudes towards migrants in Spain.

Appendix Table B7 shows estimates from OLS regressions where the dependent variable is our main outcome of interest (i.e., agreement with the statement that immigration is good for Spain), and the regressors of interest are the binary indicators that we describe above, capturing different channels that might shape general attitudes towards migrants. Columns (1) to (6) show that all our indicators individually correlate with general attitudes towards migrants in the expected way. In column (7) we also show that, when regressing attitudes towards migrants on all our binary indicators, most coefficients are negative and significant. This suggests that our channel variables indeed capture different aspects of respondents' views towards immigration, which independently contribute to their general attitudes.

In Figure 6 we present results from our preferred 2SLS specification to examine how broadband Internet access affects different concerns about migration. The graph shows the 2SLS coefficients associated with Internet penetration, for regressions where the dependent variables are the binary indicators for concerns about migration as reported on the y-axis. As can be seen from the figure, Internet access significantly reduces concerns about the impact of migration on the labor market: respondents exposed to a 1 percentage point higher broadband Internet penetration are around

3.5 and 2 percentage points less likely to agree with the statements that migrants steal jobs from natives and migrants reduce natives' salary, respectively. Whilst coefficients for regressions on the other channels are not statistically significant, we note that broadband Internet access is negatively associated with concerns about access to public goods, and leads to a reduction in the share of respondents who think migrants should not be allowed to vote, obtain Spanish nationality or face stricter immigration laws. Overall, the estimates from Figure 6 confirm our main results: broadband Internet access is associated with an improvement of attitudes towards migrants and a reduction in concerns about immigration in Spain.

Figure 6: **Internet and concerns about immigration**
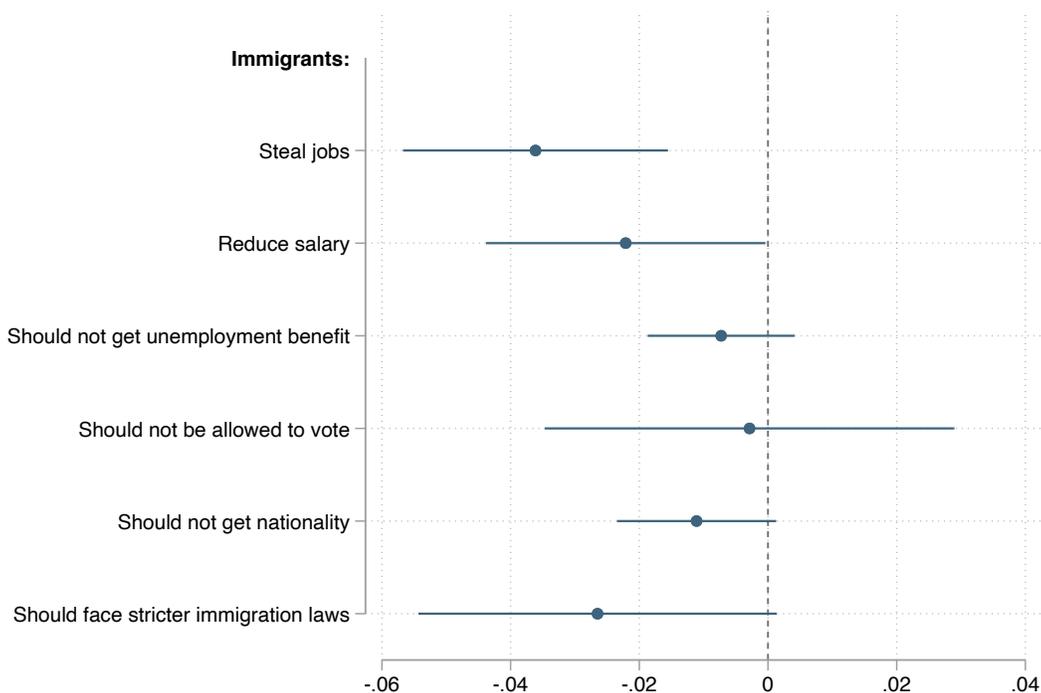
Notes: 2SLS regressions. The graph displays coefficients associated to Internet penetration for different outcome variables capturing specific attitudes towards migrants. The dependent variables are binary indicators for agreeing with the statements labeled on the y-axis. All regressions control for landline penetration in 1996 at the municipality level and include controls and fixed effects as per column (4) of Table 2. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level.

6.2 Information

Having documented that Internet access leads to better attitudes towards migrants, we turn to the question of whether this effect is driven by Internet facilitating access to more accurate information about migration and thus potentially contributing to correcting natives' misperceptions about migrants. We investigate this question by first asking: how well informed are Spanish people about

migrants in their country? Figure B3 shows answer to the question on what share of the Spanish population respondents think is of migrant origin, separately for all survey years from 2008 to 2012. The blue bars correspond to the fraction of respondents that think the migrant share of the population is within a given bracket on the x-axis, whereas the red vertical lines show the actual share of migrants in Spain in any given year. As we can appreciate from the figure, most people in Spain cannot correctly guess the share of immigrants in their country.[34] Rather, across all survey years, the majority of Spanish respondents believes migrants constitute a larger share of the population than they actually do. Across all survey years, only 13% of respondents can accurately guess that immigrants in Spain make up between 11 and 15% of the population.

Next, in Table 4 we turn to the question of whether broadband Internet access is associated with more accurate knowledge about migration in Spain. In Panel A we estimate OLS regressions where the dependent variable takes value one if the respondent can accurately guess the share of migrants in Spain (in brackets of 5 percentage points) and zero otherwise.[35] Results from all specifications show that having access to broadband Internet is associated with a higher likelihood of correctly guessing the share of immigrants in Spain. In Panel B we show that the positive association between broadband Internet access and knowledge about migrants is driven by respondents who have access to high-speed Internet being less likely to overestimate the share of migrants in their country.[36] Appendix Table B9 shows that the results are robust to defining the dependent variable as the absolute difference between the estimated and actual share of migrants living in Spain: respondents living in municipalities with higher Internet penetration are closer in their guess to the actual share of immigrants in Spain.[37]

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[34]This result is not unique for Spain. For example, Alesina et al. (2018) document large misperceptions about migration amongst citizens of France, Germany, Italy, Sweden, the United Kingdom and the United States.

[35]Questions about the share of migrants in Spain are only asked in the post-Internet period. Therefore, we cannot estimate difference-in-difference 2SLS regressions to examine the causal impact of Internet access on knowledge about migration.

[36]As described in Section 3.1, in 2008 and 2012, answers to the question on the share of immigrants in Spain where only elicited in continuous form on a scale from 0-100, with the option of choosing "Don't know" instead of providing a numerical answer. In years 2009, 2010 and 2011, respondents who chose "Don't know" where further asked to guess the share of migrants in Spain by choosing from a list of answers in 5-percentage-point brackets. In Table B8 we exclude respondents who answered "Do not know" and show that results are robust to this different definition of the outcome variable.

[37]Consistent with our results from the heterogeneity analysis presented in Section 5.5, Figure B4 shows that the association between broadband Internet access and information about the national share of immigrants in Spain is strongest, in absolute terms, for young respondents (i.e., those below the age of 35).

Table 4: **Internet and information about national share of migrants (OLS regressions)**

Panel A: Correct guess about share of migrants

	(1)	(2)	(3)	(4)
Internet penetration	0.003**	0.004***	0.004***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Observations:	10742	10742	10742	10729
R^2:	0.00	0.02	0.03	0.03
Landlines 1996:	Yes	Yes	Yes	Yes
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes
Census 2001:	No	No	No	Yes

Panel B: Overestimation of share of migrants

	(1)	(2)	(3)	(4)
Internet penetration	-0.000	-0.006**	-0.006***	-0.005**
	(0.002)	(0.002)	(0.002)	(0.002)
Observations:	10742	10742	10742	10729
R^2:	0.00	0.04	0.08	0.08
Landlines 1996:	Yes	Yes	Yes	Yes
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes
Census 2001:	No	No	No	Yes

Notes: OLS regressions. Dependent variable, Panel A: Dummy equal to one if the respondent reports a correct estimated range of immigrants living in Spain (between 11 and 15%). Dependent variable, Panel B: dummy equal to one if the respondent overestimates the share of immigrants at the national level (>15%). Real share of immigrants: between 12.8% (2012) 13.9% (2009). Years: 2008-2012. All regressions control for landline penetration in 1996 at the municipality level. "Fixed effects" refers to year and province fixed effects. "Controls" includes personal and municipality level controls. Personal controls: gender, age, age squared, indicators for employment status and an indicator for having a university degree. Municipal controls: population, surface in Km^2, altitude, % immigrants over total population, % of EU15 migrants, and % of African migrants over immigrant population. "Census 2001" refers to municipality characteristics as per the 2001 Census. These include the unemployment rate for the full population and for the female population, the share of inhabitants with primary education, and number of cars, commercial activities and banks per capita. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10.

Finally, when it comes to knowledge about migration dynamics, one of the potential effects of the diffusion of high-speed Internet is that it may have accelerated the decline of newspaper readership, most notably for local newspapers (see, e.g., Falck et al., 2014; Nardotto et al., 2018). To the extent that newspapers are the most important source of information on local issues and local politics (Bruns and Himmler, 2011), Internet penetration might have different effects on the level of information about national vs. local migration dynamics. In Table B10 we test this hypothesis. We confirm that respondents living in municipalities with higher high-speed Internet penetration are significantly less likely to correctly estimate the share of immigrants in their local area, whilst at the same time not being more likely to overestimate this share.

6.3 Voting

Finally, we look at the impact of Internet penetration on voting behavior. In particular, our analysis focuses on the performance of the right-wing conservative party PP. We note that the focus of our analysis is not to establish a causal link between changes in attitudes towards migrants and voting behavior, as induced by the diffusion of high-speed Internet. However, given the positive effect of Internet on attitudes towards migrants, and that anti-immigration policies are a salient element in the political agenda of right-wing parties, we expect that areas with higher high-speed Internet penetration would also experience a reduction in support for PP.

Voting in CIS survey We start by evaluating the impact of the Internet on voting behavior in the CIS data. Specifically, we exploit the fact that in the CIS questionnaires respondents were asked which party they voted for in the last national election, and investigate whether Internet penetration changed support for the right-wing, conservative party PP. We run 2SLS regressions using as dependent variable a dummy equal to one if the respondent reported having voted for PP in the last election, and we exclude respondents who reported not having voted at all. Table B12 displays the results. Amongst respondents to the CIS survey, Internet penetration has a negative effect on the probability of voting for the PP: in our preferred specification, a 10 percentage point increase in Internet penetration is associated with a 24 percentage point decrease in the likelihood of voting for PP (see column 4).

Voting from electoral data Voting intentions and behavior in the CIS survey are self-reported and only limited to municipalities that are represented in the study. To overcome these limitations, in our final analysis we turn to administrative electoral data to confirm whether higher Internet penetration is associated with a lower vote share for the PP. Our data includes electoral results from national elections for the years 1996 and 2000 (pre-Internet period), as well as 2008 and 2011 (post-Internet period).[38] For each electoral cycle, we have information on the total number of votes

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[38] Given the lack of precise data about Internet diffusion in 2004, we do not consider the election round that took place in that year. An additional source of concern that led us not to include in the analysis the 2004 elections is the terrorist attack that took place only a few days before the vote.

that went to PP in each municipality, as well as the total number of votes that were cast and the total number of citizens with the right to vote. We use this information to construct two measures of PP support: (i) the share of PP votes over the total of votes cast ('share of votes'), and (ii) the share of PP votes over all citizens with the right to vote ('share of voters'). The latter measure takes into account estimation bias due to a change in voter turnout, which may itself have been affected by the diffusion of high-speed Internet.[39] We then run 2SLS regressions that can be written as follows[40]:

$$PPshare_{mt} = \alpha + \beta ADSL_{mt} + \gamma W_{mt} + \tau_t + \phi_m + \epsilon_{mt} \tag{6}$$

where

$$ADSL_{mt} = \delta + \lambda Landlines_m \times PostADSL_t + \kappa W_{mt} + \rho_t + \xi_m + \eta_{mt} \tag{7}$$

where $PPshare_{mt}$ is the share of PP votes in municipality m and electoral cycle t, W_{mt} includes the population, share of immigrants over the total population, share of EU immigrants and share of African immigrants in municipality m and electoral cycle t.[41] τ_t and ϕ_m are electoral year and municipality fixed effects. $PostADSL_t$ is a binary indicator taking value one for the years 2008 and 2011, and 0 for 1996 and 2000, and $Landlines_m$ refers to the number of fixed telephone lines per capita in municipality m in 1996.

The results from regressions using these administrative data, presented in Table 5, confirm our findings using self-reports from the CIS data: municipalities with higher broadband Internet penetration saw a significant drop in support for PP. This is true both when looking at PP votes as a share of all votes cast (columns 1 and 2), and when taking into account changes in voter turnout, which may have been partly influenced by Internet development itself (columns 3 and 4). The effect of Internet penetration on support for PP is sizeable: a one percentage point increase in Internet penetration leads to a 1 percentage point decrease in the share of PP votes over all citizens with voting rights (see column 4). Given an average PP vote share of around 30% in the pre-Internet era, the effect that we document corresponds to a 3% decrease in support for PP relative to the pre-Internet mean.

Taken together, our evidence suggests that the development of broadband Internet improved native Spaniards' attitudes towards migrants and reduced their concerns about the impact of migration on the economy and the labor market. This in turn led to a decrease in support for right-wing parties that promoted and introduced anti-immigrant policies.

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[39]Nardotto et al. (2018); Campante et al. (2017) provide evidence of a negative effect of broadband Internet on electoral participation in the United Kingdom and Italy, respectively.

[40]The 2SLS equations are formulated in a similar way as equations 4 and 5 in Section 5.4.

[41]We restrict the sample to municipalities for which we have non missing information on the controls and the electoral results. Further, as information on Internet penetration is only available for municipalities with more than 1000 inhabitants, we drop observations from small municipalities.

Table 5: **Internet and support for PP (IV) - Electoral data**

	Share of votes		Share of voters	
	(1)	(2)	(3)	(4)
Internet penetration	-1.585***	-1.519***	-1.033***	-1.003***
	(0.201)	(0.192)	(0.136)	(0.132)
instrument	0.167***	0.170***	0.167***	0.170***
Observations	8184	8184	8184	8184
F-stat.:	50.21	48.58	50.21	48.58
Landlines 1996:	No	No	No	No
Fixed effects:	Mun.	Mun.	Mun.	Mun.
Controls:	No	Yes	No	Yes

Notes: 2SLS regressions. The dependent variable is the share of votes for PP (0-100). In columns (1) and (2) the share is calculated as 100 times the number of votes for PP over the total number of votes, whilst in columns (3) and (4) the share of PP votes is calculated as 100 times the number of votes for PP over the number of people who were entitled to vote. Years 1996, 2000, 2008, 2011. Year fixed effects are included in all specifications. "Fixed effects" refers to municipality fixed effects. "Controls" includes population, % immigrants over total population, % of EU15 migrants, and % of African migrants over immigrant population. The sample is restricted to municipalities with non-missing information on all the controls and outcome variables. Standard errors clustered at the municipality level are reported in parentheses. Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

7 Conclusion

In this paper, we shed new light on the impact of broadband Internet availability in the early phases of its development on attitudes towards migrants of native citizens in Spain. To answer our research question, we leverage data from a unique, repeated cross-sectional survey carried out by the Spanish Sociological Research Center with the purpose of documenting the attitudes of Spanish citizens towards migration, and combine these with municipality-level data on the telephony network in Spain. We address endogeneity concerns related to broadband Internet availability by exploiting characteristics of the pre-existing telephony network to instrument for broadband penetration at the municipality level. In our main specification, we use information from both the pre- and post-Internet period to estimate a difference-in-difference instrumental variable model, which controls for a large number of individual and municipality characteristics, as well as province and year fixed effects.

We find that higher broadband Internet penetration leads to more positive attitudes towards migrants, as proxied by a larger share of respondents agreeing with the statement that migration is overall good for their country. Our results are robust across a number of robustness checks. In particular, our point estimates remain virtually unchanged when restricting the sample to a balanced panel of respondents living in municipalities that appear in our data in both the pre- and post-Internet years and running a specification with municipality fixed effects. Our heterogeneity analysis shows that the effect of broadband Internet penetration on attitudes towards migrants is strongest amongst young respondents, which is suggestive of the fact that the effect that we find operates through higher Internet usage intensity.

Looking at potential channels through which the Internet could shape general attitudes towards migrants, we find that broadband Internet access reduces concerns related to the impact of migrants on the labor market. We also provide suggestive evidence that Spanish natives living in municipalities with higher Internet penetration are better informed about the share of migrants living in their country. Finally, our results on the effect of high-speed Internet availability on attitudes towards immigrants also chime in with our findings that broadband Internet availability reduces the likelihood of considering immigration a primary concern for Spain, and that higher broadband Internet penetration leads to a reduction in support for the conservative party PP.

Taken together, our results suggest that the availability of a new and cheap source of information – broadband Internet – has made Spanish natives more aware of the dynamics of migration in their country and reduced their (potentially stereotypical) concerns about migrants. This, in turn, has led to a decrease in the support of Spanish voters for conservative parties that promote restrictive immigration policies.

We note that our results speak to the role of broadband Internet in the early phases of its development. In the second decade of the 21st century, the diffusion of smartphones and social media has brought about drastic changes in the type of activities that Internet users carry out online, with social media being associated to an increased polarization in the political debate. How

these new technological developments and online sources of information affect attitudes towards migrants and related political preferences is an interesting question for future research.

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A Data description

Table A1: **CIS Summary statistics by year**

	Observations	Provinces	Municipalities	Average resp. per mun.
1995	2877	47	176	16.35
1996	1832	41	134	13.67
2008	2507	47	208	12.05
2009	2590	44	256	10.12
2010	2544	48	263	9.67
2011	2586	50	256	10.10
2012	2118	41	205	10.33

Notes: The table shows the distribution of respondents to the CIS survey by year, together with the number of provinces and municipalities that are represented in each survey year. The last column reports the average number of respondents per municipality in a given survey wave. The sample is restricted to respondents with non-missing information on the variable capturing general attitudes towards immigrants and background characteristics as reported in Table A2.

Table A2: **Municipality and individual characteristics**

Panel A: Municipality characteristics

	N	Mean	SD
Population (in 1000s)	17054		
Area (km^2)	17054		
Altitude	17054		
Share of immigrants	17054		
Share of EU immigrants	17054		
Share of African immigrants	17054		

Panel B: Individual characteristics

	N	Mean	SD
Female	17054		
Age	17054		
University degree	17054		
Working	17054		
Unemployed	17054		
Student	17054		
Retired	17054		

Notes: The table shows descriptive statistics for the characteristics of municipalities where respondents to the CIS survey live at the time of data collection (Panel A) and the individual characteristics of respondents (Panel B). The sample refers to all respondents to survey waves 1995, 1996 and 2008-2012 with non-missing information on our main variable capturing attitudes towards immigrants and the variables reported in this table.

Table A3: **Outcome variables**

Panel A: Attitudes towards migrants

	N	Mean	SD
Immigration is overall good for the country	17054		
Immigrants steal natives' jobs	16250		
Immigrants reduce natives' salary	16101		
Immigrants should not get unemployment benefits	16280		
Immigrants should not be allowed to vote	15390		
Immigrants should not get Spanish nationality	15350		
Immigrants should face stricter immigration laws	14973		

Panel B: Information about migrants

	N	Mean	SD
Correct guess - National share of migrants	10742		
Overestimation - National share of migrants	10742		
Correct guess - Local share of migrants	10997		
Overestimation - Local share of migrants	10997		

Panel C: Other outcomes

	N	Mean	SD
Concerns about Spain	14602		
Personal concerns	13814		
Voted for PP	14514		

Notes: The table shows the number of observations, mean and standard deviation of all outcome variables used in the analysis, for the full analysis sample. Panel A reports descriptive statistics for variable capturing attitudes towards immigrants. Panel B shows descriptive statistics for variables on information about immigrants. Panel C reports statistics on variables capturing concerns and voting intentions.

Figure A1: **Share of households covered by ADSL Internet (2006-2012)**
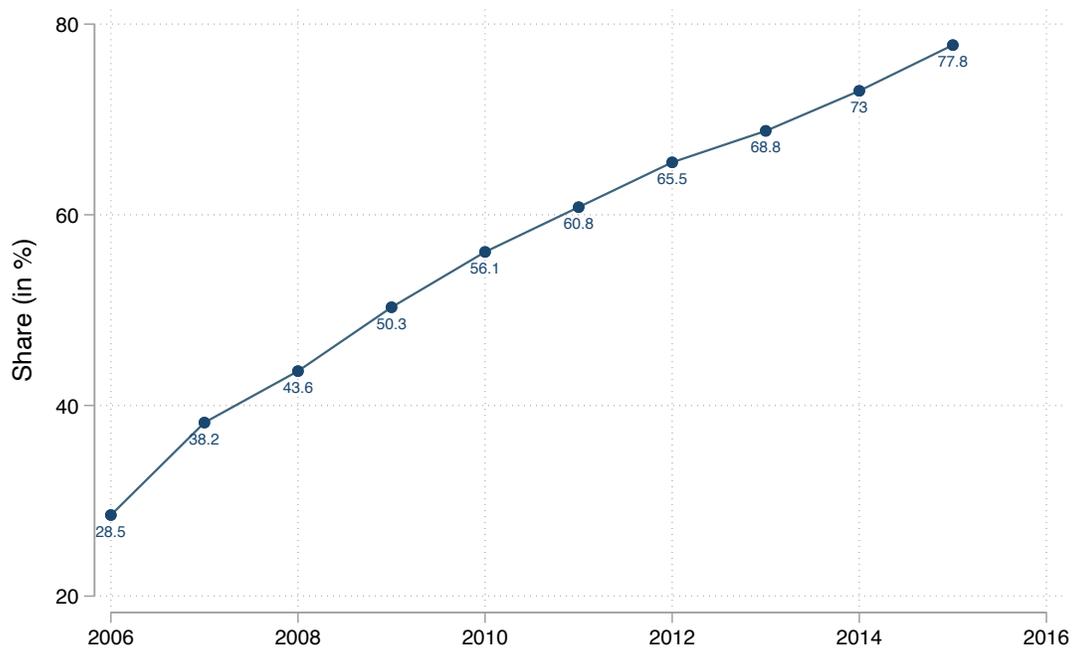
Notes: The graph shows the share of households that had access to high-speed (ADSL) Internet is Spain (blue), separately for every year between 2006 and 2012. Source: Spanish Statistical Office - INE.

Figure A2: **Share of households covered by ADSL at the province level (2006-2012)**
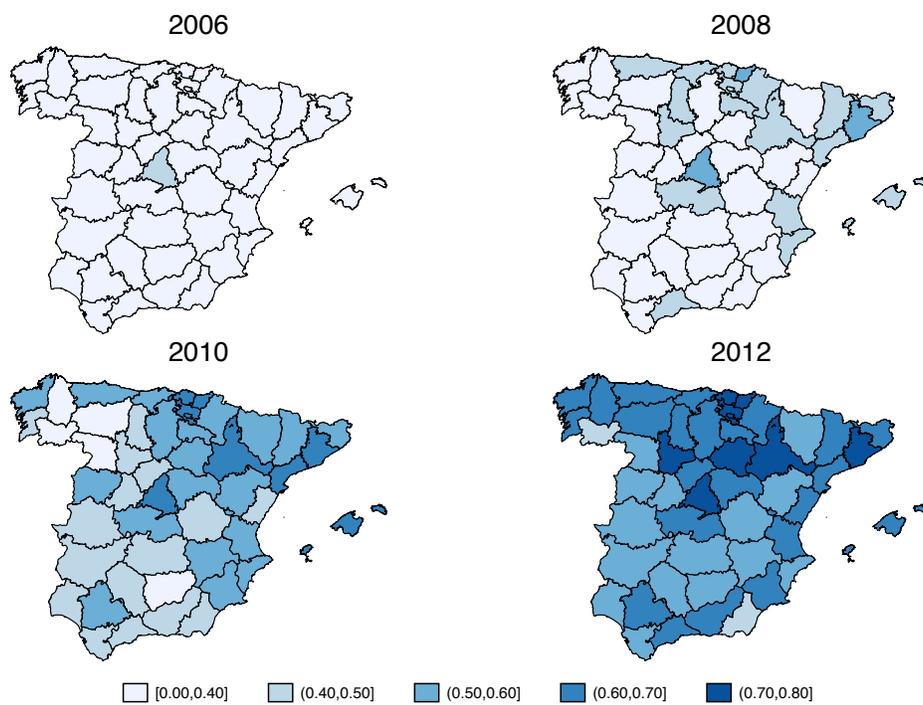
Notes: The graph shows the share of households that had access to high-speed (ADSL) Internet for each province in Spain, separately for the years 2006, 2008, 2010 and 2012. Source: Spanish Statistical Office - INE.

Figure A3: **Migrant population in Spain (1996-2017)**
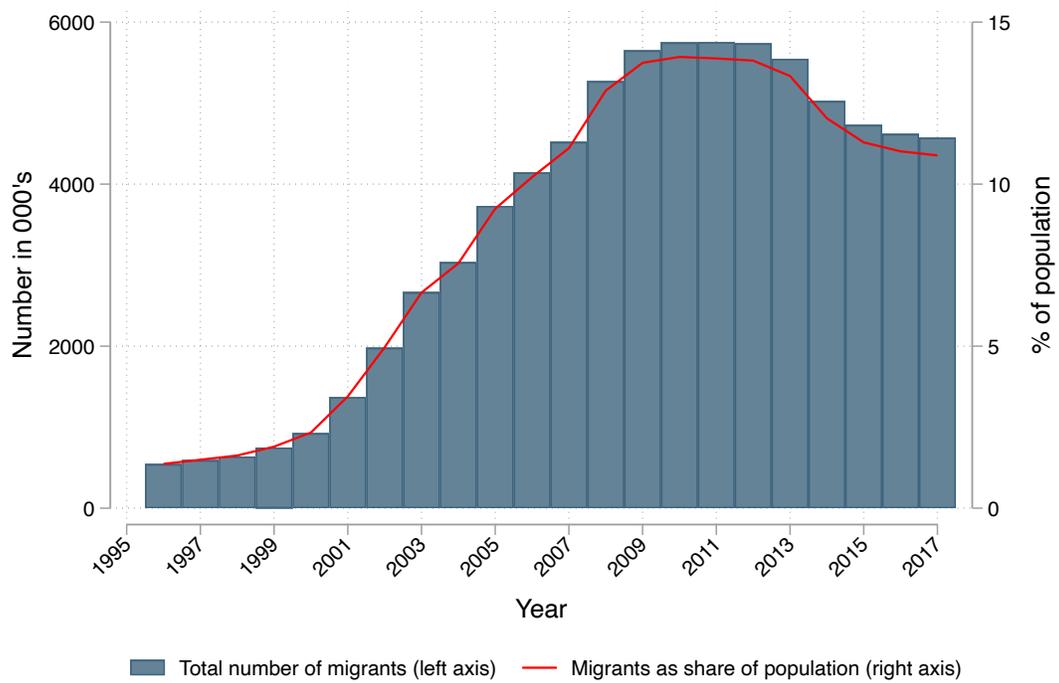
Notes: The graph shows the number of migrants living in Spain (blue bars) as well as the immigrant share over the total population of Spain (red line) in every year from 1996 to 2017. Source: Spanish Statistical Office - INE.

Figure A4: **Migrant population across provinces in Spain (2008)**

| □ [0.00,0.05] | □ (0.05,0.10] | ■ (0.10,0.15] | ■ (0.15,0.20] | ■ (0.20,0.25] |
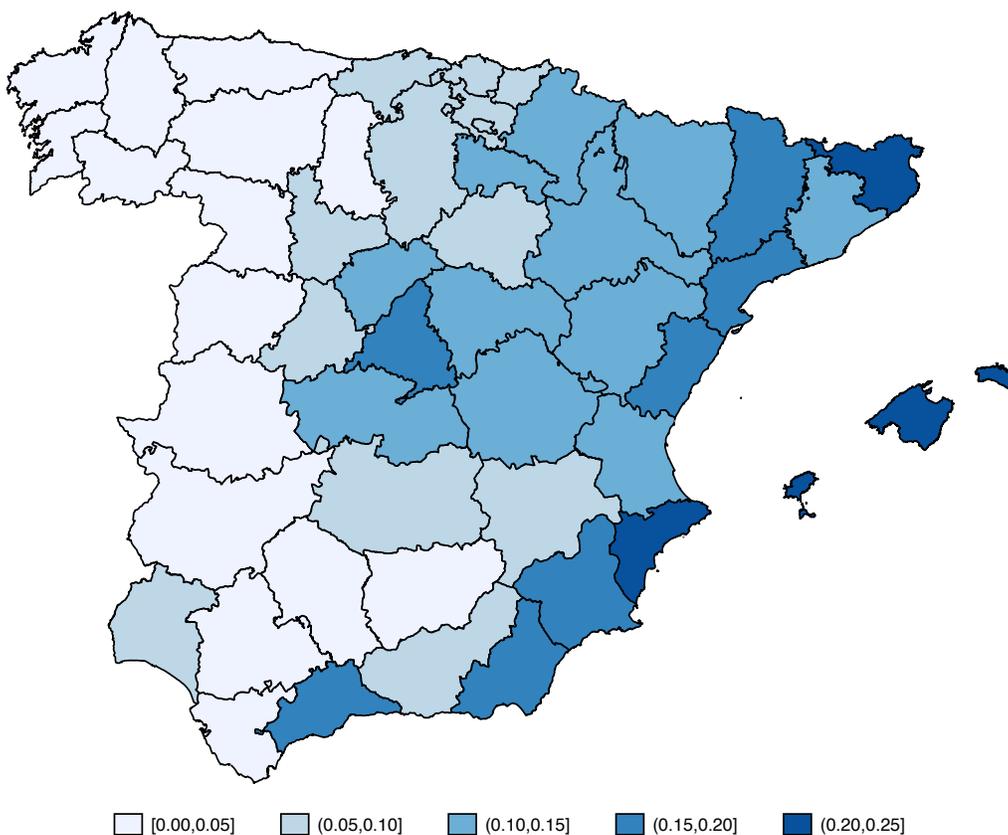
Notes: The map shows the share of migrants over the total population across provinces in Spain. Year: 2008. Source: Spanish Statistical Office - INE.

Figure A5: **Attitudes towards immigrants across EU countries**

Would you personally feel comfortable having an immigrant as your manager, work colleague, neighbor, doctor, family member or friend?
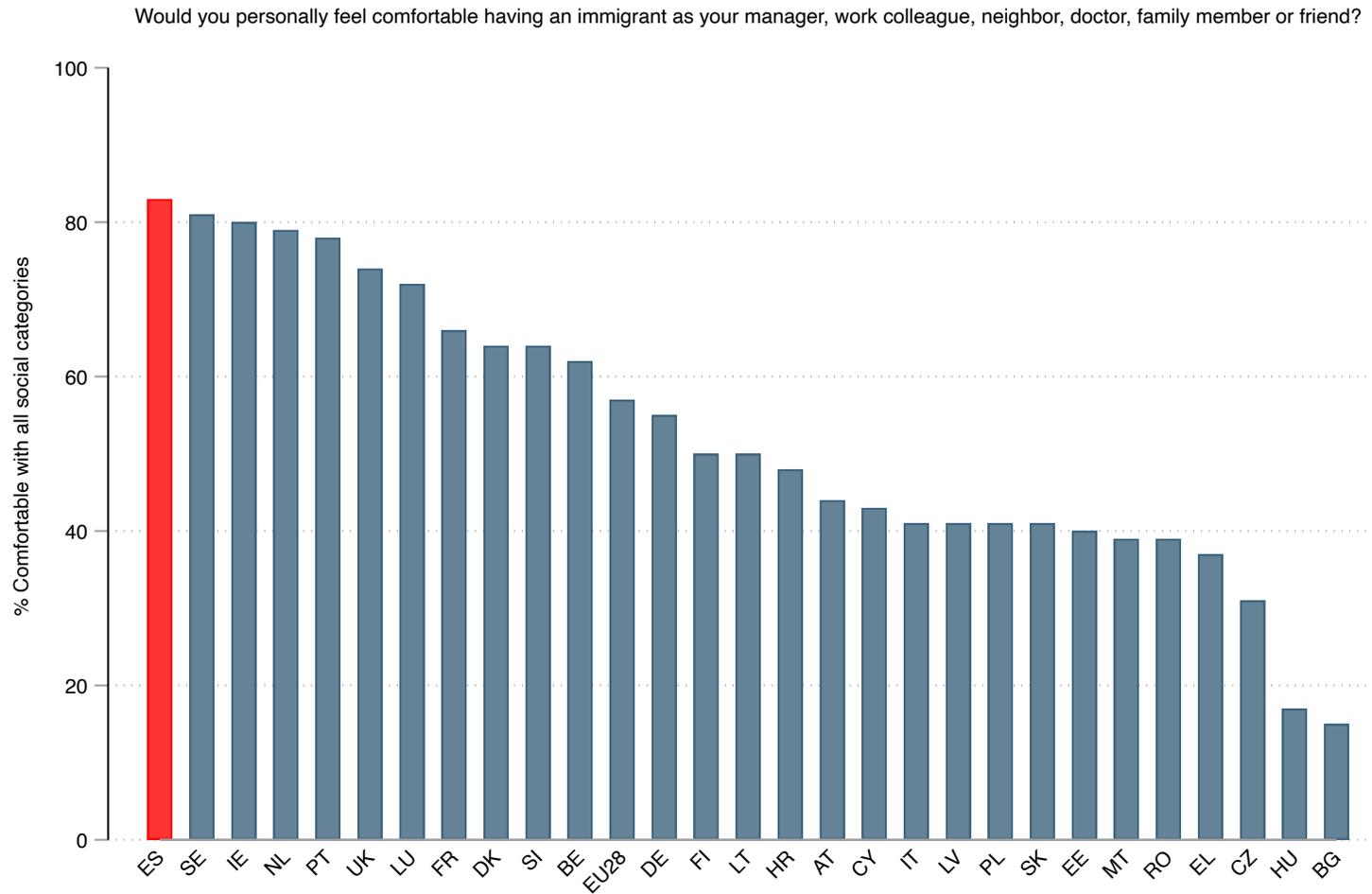
Notes: The graph plots the share of respondents that reports feeling comfortable or very comfortable with all forms of social interactions with immigrants, by country and for the EU average. Forms of social interactions include having an immigrant as manager, work colleague, neighbor, doctor, family member and friend. The red bar highlights Spain. Source: Eurobarometer (2018).

Figure A6: **Nature of the first reaction to the topic of immigration by year**
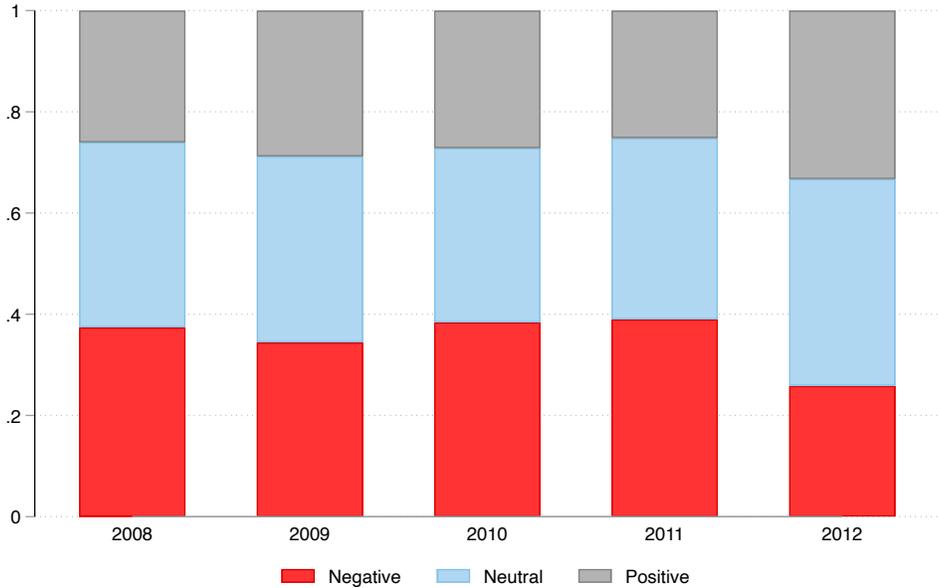
Notes: The graph shows the share of respondents who have positive (grey), neutral (blue) or negative (red) first reactions when asked about immigration, for each year from 2008 to 2012. Source: CIS questionnaires.

Figure A7: **Positive attitudes towards immigrants by background characteristics**
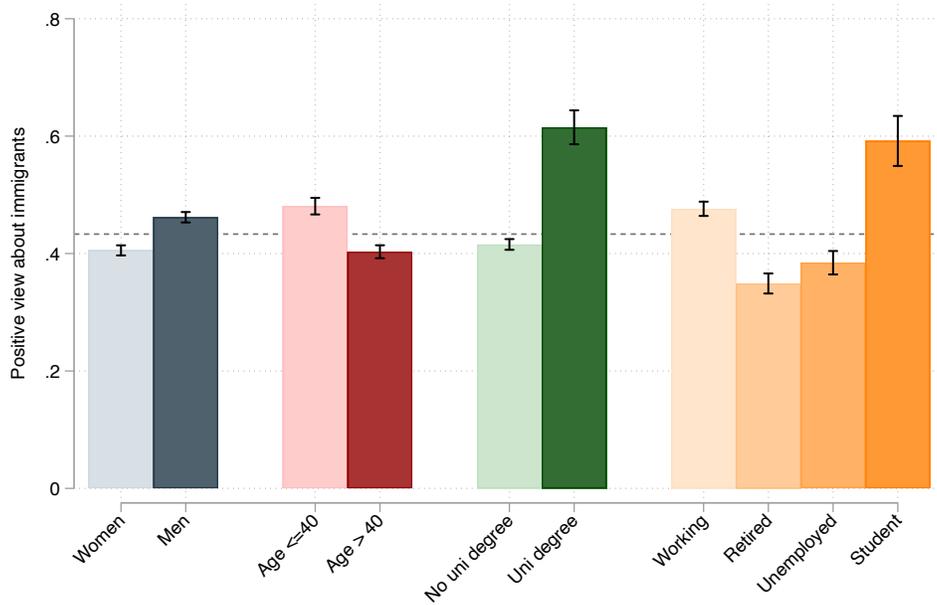
Notes: The graph shows the share of respondents who think immigration is good or very good for their country, separately by gender, broad age categories, educational attainment and occupational status. The sample is restricted to the post-Internet years (2008-2012). The dashed horizontal line represents the share of respondents agreeing that immigration is good or very good for their country for the whole sample. Source: CIS questionnaires.

B Supplementary analyses

Table B1: **Landlines penetration and municipality characteristics (OLS regressions)**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Population (in 1000s)	0.017*** (0.002)												0.014*** (0.002)
Area (km2)		-0.001 (0.002)											-0.000 (0.001)
Altitude			-0.002** (0.001)										-0.002** (0.001)
Share of immigrants				0.021* (0.011)									-0.027*** (0.010)
Share of African immigrants					-3.009** (1.377)								-6.026*** (1.570)
Share of EU immigrants						-0.559 (1.293)							-2.803* (1.502)
Share with primary education							3.372 (2.679)						1.124 (2.702)
Unemployment rate								-33.750*** (3.263)					40.860*** (12.842)
Female unemployment rate									-27.428*** (2.298)				-48.911*** (9.389)
Cars per capita										0.021*** (0.003)			0.010*** (0.003)
Banks per capita											3.942*** (0.586)		2.042*** (0.668)
Commercial activities per capita												0.397*** (0.040)	0.370*** (0.044)
Observations	885	885	885	757	716	716	885	881	881	881	881	881	712
R^2	0.05	0.00	0.01	0.00	0.01	0.00	0.00	0.11	0.14	0.07	0.05	0.10	0.33

Notes: OLS regressions. The dependent variable is the share of landlines per capital at the municipality level in 1996. Population, the share of immigrants, the share of EU immigrants and the share of African immigrants refer to figures for 1996 from Padrón Continuo. The other control variables are taken from the 2001 Census. Standard errors are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10.

Table B2: **Internet and attitudes towards migrants (OLS regressions)**

	(1)	(2)	(3)	(4)	(5)
Internet penetration	0.002**	0.015***	0.012***	0.011***	0.011***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)
Observations:	17054	17054	17054	17054	17026
R^2:	0.00	0.04	0.04	0.06	0.06
Fixed effects:	No	Yes	Yes	Yes	Yes
Landlines 1996:	No	No	Yes	Yes	Yes
Controls:	No	No	No	Yes	Yes
Census 2001:	No	No	No	No	Yes

Notes: OLS regressions. The dependent variable is a binary indicator equal to one if the respondent thinks immigration is good or very good for the country. Years 1995, 1996; 2008-2012. "Fixed effects" refers to year and province fixed effects. "Controls" includes personal and municipality level controls. Personal controls: gender, age, age squared, indicators for employment status and an indicator for having a university degree. Municipal controls: population, surface in Km^2, altitude, % immigrants over total population, % of EU15 migrants, and % of African migrants over immigrant population. "Census 2001" refers to municipality characteristics as per the 2001 Census. These include the unemployment rate for the full population and for the female population, the share of inhabitants with primary education, and number of cars, commercial activities and banks per capita. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level are reported in parentheses. Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Table B3: **Internet and attitudes towards migrants (IV) - Control variables**

	(1)	(2)	(3)	(4)
Landlines per capita 1996	0.004*	-0.003	-0.001	0.004**
	(0.002)	(0.002)	(0.003)	(0.002)
Population			-0.000	-0.000
			(0.000)	(0.000)
Surface (km2)			0.000	0.000
			(0.000)	(0.000)
Altitude			0.000	0.000**
			(0.000)	(0.000)
Share of immigrants over local population			0.130	0.542**
			(0.244)	(0.252)
Share of EU immigrants over total immigrants			-0.026	0.011
			(0.097)	(0.077)
Share of African immigrants over total immigrants			-0.037	-0.010
			(0.147)	(0.140)
Male			0.056***	0.056***
			(0.010)	(0.010)
Age (in years)			0.003**	0.003**
			(0.002)	(0.002)
Age squared			-0.000***	-0.000***
			(0.000)	(0.000)
University degree			0.111***	0.115***
			(0.014)	(0.013)
Retired			-0.037*	-0.039**
			(0.020)	(0.019)
Unemployed			-0.059***	-0.063***
			(0.013)	(0.013)
Student			-0.004	-0.001
			(0.030)	(0.030)
Other			0.087	0.076
			(0.058)	(0.059)
Unemployment rate				0.521
				(0.754)
Female unemployment rate				0.544
				(0.694)
Elementary education				0.029
				(0.154)
Cars per capita				-0.000*
				(0.000)
Commercial activities per capita				-0.002
				(0.003)
Banks per capita				-0.115
				(0.072)
Constant	0.252***	0.510***	0.381**	0.263*
	(0.086)	(0.092)	(0.170)	(0.160)
Observations:	17054	17054	17054	17026
Fixed effects:	No	Yes	Yes	Yes

Notes: 2SLS regressions. The dependent variable is a binary indicator equal to one if the respondent thinks immigration is good or very good for the country. Years 1995, 1996; 2008-2012. "Fixed effects" refers to year and province fixed effects. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10.

Table B4: **Internet and attitudes towards migrants (IV)**

Panel A: Negative View

	(1)	(2)	(3)	(4)
Internet penetration	-0.002	-0.032*	-0.027	-0.020
	(0.002)	(0.017)	(0.018)	(0.014)
First stage coefficient	0.539***	0.146***	0.140***	0.181***
Observations:	17054	17054	17054	17026
F-stat.:	713.66	32.23	17.42	31.28
Landlines 1996:	Yes	Yes	Yes	Yes
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes
Census 2001:	No	No	No	Yes

Panel B: Neutral View

	(1)	(2)	(3)	(4)
Internet penetration	-0.001**	-0.025***	-0.032***	-0.025***
	(0.000)	(0.009)	(0.009)	(0.007)
First stage coefficient	0.539***	0.146***	0.140***	0.181***
Observations:	17054	17054	17054	17026
F-stat.:	713.66	32.23	17.42	31.28
Landlines 1996:	Yes	Yes	Yes	Yes
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes
Census 2001:	No	No	No	Yes

Notes: 2SLS regressions. The dependent variable is a binary indicator equal to one if the respondent thinks immigration is negative or very negative for the country (Panel A) and if the respondent thinks immigration is neither (very) negative nor (very) positive for the country (Panel B). Years 1995, 1996; 2008-2012. All regressions control for landline penetration in 1996 at the municipality level. "Fixed effects" refers to year and province fixed effects. "Controls" includes personal and municipality level controls. Personal controls: gender, age, age squared, indicators for employment status and an indicator for having a university degree. Municipal controls: population, surface in Km^2, altitude, % immigrants over total population, % of EU15 migrants, and % of African migrants over immigrant population. "Census 2001" refers to municipality characteristics as per the 2001 Census. These include the unemployment rate for the full population and for the female population, the share of inhabitants with primary education, and number of cars, commercial activities and banks per capita. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10.

Table B5: **Reduced form (OLS regressions)**

	(1)	(2)	(3)	(4)
Instrument	0.002**	0.008***	0.008***	0.008***
	(0.001)	(0.002)	(0.003)	(0.003)
Observations:	17054	17054	17054	17026
R^2:	0.01	0.04	0.06	0.06
Landlines 1996:	Yes	Yes	Yes	Yes
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes
Census 2001:	No	No	No	Yes

Notes: OLS regressions. The dependent variable is a binary indicator equal to one if the respondent thinks immigration is good or very good for the country. Years 1995, 1996; 2008-2012. "Instrument" is the interaction between landline penetration in 1996 and a binary indicator for the post-Internet years. All regressions control for landline penetration in 1996 at the municipality level. "Fixed effects" refers to year and province fixed effects. "Controls" includes personal and municipality level controls. Personal controls: gender, age, age squared, indicators for employment status and an indicator for having a university degree. Municipal controls: population, surface in Km^2, altitude, % immigrants over total population, % of EU15 migrants, and % of African migrants over immigrant population. "Census 2001" refers to municipality characteristics as per the 2001 Census. These include the unemployment rate for the full population and for the female population, the share of inhabitants with primary education, and number of cars, commercial activities and banks per capita. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level are reported in parentheses. Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Table B6: **Placebo checks (OLS regressions)**

Panel A: Post-Internet period

	(1)	(2)	(3)	(4)
Landlines 1996	0.006**	0.006***	0.006***	0.005***
	(0.003)	(0.001)	(0.001)	(0.001)
Observations:	12345	12345	12345	12327
R^2:	0.01	0.06	0.09	0.09
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes
Census 2001:	No	No	No	Yes

Panel B: Pre-Internet period

	(1)	(2)	(3)	(4)
Landlines 1996	-0.001	-0.000	0.001	-0.002
	(0.002)	(0.002)	(0.003)	(0.005)
Observations:	4709	4709	4709	4699
R^2:	0.00	0.04	0.05	0.05
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes
Census 2001:	No	No	No	Yes

Notes: OLS regressions. The dependent variable is a binary indicator equal to one if the respondent thinks immigration is good or very good for the country. Years 1995, 1996; 2008-2012. Panel A shows results for regressions where the sample is restricted to the post-Internet years (2008-2012). Panel B shows regressions where the sample is restricted to the pre-Internet years (1995 and 1996). "Fixed effects" refers to year and province fixed effects. "Controls" includes personal and municipality level controls. Personal controls: gender, age, age squared, indicators for employment status and an indicator for having a university degree. Municipal controls: population, surface in Km^2, altitude, % immigrants over total population, % of EU15 migrants, and % of African migrants over immigrant population. "Census 2001" refers to municipality characteristics as per the 2001 Census. These include the unemployment rate for the full population and for the female population, the share of inhabitants with primary education, and number of cars, commercial activities and banks per capita. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level are reported in parentheses. Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Table B7: **Attitudes towards migrants and channels (OLS regressions)**

Immigrants:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Steal jobs	-0.385*** (0.013)						-0.278*** (0.017)
Reduce salary		-0.252*** (0.016)					-0.054*** (0.018)
Should not get unemployment benefit			-0.321*** (0.013)				-0.087*** (0.019)
Should not be allowed to vote				-0.265*** (0.013)			-0.096*** (0.015)
Should not get nationality					-0.331*** (0.019)		-0.125*** (0.014)
Should face stricter immigration laws						-0.328*** (0.018)	-0.172*** (0.018)
Observations:	16223	16073	16255	15362	15322	14949	11920
R^2:	0.20	0.11	0.09	0.12	0.12	0.14	0.27
Fixed-effects:	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls:	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: OLS regressions. The dependent variable is a binary indicator equal to one if the respondent thinks immigration is good or very good for the country. Years 1995, 1996; 2008-2012. Explanatory variables: binary indicators equal to one if the respondent agrees with the following statements: "Immigrants steal jobs from natives"; "Immigrants reduce natives' salaries"; "Immigrants should not get unemployment benefits"; "Immigrants should not be allowed to vote"; "Immigrants should not be able to obtain Spanish nationality"; "Immigrants should face stricter immigration laws". All regressions include year and province fixed effects. "Controls" includes personal and municipality level controls. Personal controls: gender, age, age squared, indicators for employment status and an indicator for having a university degree. Municipal controls: population, surface in Km^2, altitude, % immigrants over total population, % of EU15 migrants, and % of African migrants over immigrant population. "Census 2001" refers to municipality characteristics as per the 2001 Census. These are the unemployment rate for the full population and for the female population, the share of inhabitants with primary education, and number of cars, commercial activities and banks per capita. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10.

Table B8: **Internet and information about national share of migrants (OLS regressions) - Excluding "Do not know"**

Panel A: Correct guess about share of migrants

	(1)	(2)	(3)	(4)
Internet penetration	0.003***	0.004**	0.004***	0.003**
	(0.001)	(0.002)	(0.001)	(0.001)
Observations:	8803	8803	8803	8793
R^2:	0.00	0.02	0.02	0.02
Landlines 1996:	Yes	Yes	Yes	Yes
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes

Panel B: Overestimation of share of migrants

	(1)	(2)	(3)	(4)
Internet penetration	-0.001	-0.005*	-0.005**	-0.003
	(0.002)	(0.002)	(0.002)	(0.003)
Observations:	8803	8803	8803	8793
R^2:	0.00	0.03	0.05	0.06
Landlines 1996:	Yes	Yes	Yes	Yes
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes

Notes: OLS regressions. Dependent variable, Panel A: Dummy equal to one if the respondent reports a correct estimated range for the share of immigrants in Spain (between 11 and 15%). Dependent variable, Panel B: dummy equal to one if the respondent overestimates the share of immigrants at the national level (>15%). Real share of immigrants: between 12.8% (2012) 13.9% (2009). Years: 2008-2012. Sample restricted to individuals who did not answer "Don't know" or "Refused to answer". All regressions control for landline penetration in 1996 at the municipality level. "Fixed effects" refers to year and province fixed effects. "Controls" includes personal and municipality level controls. Personal controls: gender, age, age squared, indicators for employment status and an indicator for having a university degree. Municipal controls: population, surface in Km^2, altitude, % immigrants over total population, % of EU15 migrants, and % of African migrants over immigrant population. "Census 2001" refers to municipality characteristics as per the 2001 Census. These include the unemployment rate for the full population and for the female population, the share of inhabitants with primary education, and number of cars, commercial activities and banks per capita. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10.

Table B9: **Internet and information about national share of migrants (OLS regressions) - Prediction error**

Panel A: Prediction error - Absolute value

	(1)	(2)	(3)	(4)
Internet penetration	-0.015	-0.224***	-0.201***	-0.194***
	(0.087)	(0.066)	(0.055)	(0.056)
Observations:	9272	9272	9272	9260
R^2:	0.00	0.06	0.13	0.13
Landlines 1996:	Yes	Yes	Yes	Yes
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes
Census 2001:	No	No	No	Yes

Panel B: Positive prediction error

	(1)	(2)	(3)	(4)
Internet penetration	-0.038	-0.262***	-0.230***	-0.257***
	(0.113)	(0.083)	(0.069)	(0.070)
Observations:	6222	6222	6222	6211
R^2:	0.01	0.08	0.14	0.14
Landlines 1996:	Yes	Yes	Yes	Yes
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes

Notes: OLS regressions. Dependent variable in Panel A is the absolute value of the difference between the estimated share of migrants in Spain minus the actual share of migrants. In Panel B we use the same dependent variable but restrict the sample to respondents who overestimate the share of migrants in Spain. Real share of immigrants: between 12.8% (2012) 13.9% (2009). Years: 2008-2012. Sample restricted to individuals who provided continuous answers to the question on the share of immigrants over the total population in Spain. All regressions control for landline penetration in 1996 at the municipality level. "Fixed effects" refers to year and province fixed effects. "Controls" includes personal and municipality level controls. Personal controls: gender, age, age squared, indicators for employment status and an indicator for having a university degree. Municipal controls: population, surface in Km^2, altitude, % immigrants over total population, % of EU15 migrants, and % of African migrants over immigrant population. "Census 2001" refers to municipality characteristics as per the 2001 Census. These include the unemployment rate for the full population and for the female population, the share of inhabitants with primary education, and number of cars, commercial activities and banks per capita. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10.

Table B10: **Internet and information about local share of migrants (OLS regressions)**

Panel A: Correct guess about share of migrants

	(1)	(2)	(3)	(4)
Internet penetration	-0.000	-0.002	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Observations:	10997	10997	10997	10983
R^2:	0.00	0.04	0.05	0.05
Landlines 1996:	Yes	Yes	Yes	Yes
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes

Panel B: Overestimation of share of migrants

	(1)	(2)	(3)	(4)
Internet penetration	-0.003	-0.006**	-0.005**	-0.000
	(0.003)	(0.003)	(0.002)	(0.002)
Observations:	10997	10997	10997	10983
R^2:	0.00	0.04	0.10	0.10
Landlines 1996:	Yes	Yes	Yes	Yes
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes

Notes: OLS regressions. Dependent variable, Panel A: Dummy equal to one if the respondent reports a correct estimated range for the share of immigrants in their municipality. Dependent variable, Panel B: dummy equal to one if the respondent overestimates the share of immigrants at the municipality level. Years: 2008-2012. All regressions control for landline penetration in 1996 at the municipality level. "Fixed effects" refers to year and province fixed effects. "Controls" includes personal and municipality level controls. Personal controls: gender, age, age squared, indicators for employment status and an indicator for having a university degree. Municipal controls: population, surface in Km^2, altitude, % immigrants over total population, % of EU15 migrants, and % of African migrants over immigrant population. "Census 2001" refers to municipality characteristics as per the 2001 Census. These include the unemployment rate for the full population and for the female population, the share of inhabitants with primary education, and number of cars, commercial activities and banks per capita. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level are reported in parentheses. Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Table B11: **Internet and general concerns (IV)**

Panel A: Concerns about Spain

	(1)	(2)	(3)	(4)
Internet penetration	0.002***	-0.012*	-0.012**	-0.011**
	(0.001)	(0.006)	(0.006)	(0.004)
First stage coefficient	0.522***	0.141***	0.138***	0.181***
Observations:	14602	14602	14602	14581
F-stat.:	770.74	29.29	17.09	33.51
Landlines 1996:	Yes	Yes	Yes	Yes
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes
Census 2001:	No	No	No	Yes

Panel B: Personal concerns

|	(1)	(2)	(3)	(4)
Internet penetration	0.000	-0.003	-0.005*	-0.005**
	(0.000)	(0.002)	(0.003)	(0.002)
First stage coefficient	0.522***	0.143***	0.141***	0.187***
Observations:	13814	13814	13814	13793
F-stat.:	741.52	30.54	18.23	36.15
Landlines 1996:	Yes	Yes	Yes	Yes
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes
Census 2001:	No	No	No	Yes

Notes: 2SLS regressions. The dependent variable in Panel A is a binary indicator equal to one if the respondent mentions immigration as one of the two main problems for Spain. The dependent variable in Panel B is a binary indicator equal to one if the respondent mentions immigration as one of the two main problems for him/herself. Years 1995, 1996; 2008-2012. All regressions control for landline penetration in 1996 at the municipality level. "Fixed effects" refers to year and province fixed effects. "Controls" includes personal and municipality level controls. Personal controls: gender, age, age squared, indicators for employment status and an indicator for having a university degree. Municipal controls: population, surface in Km^2, altitude, % immigrants over total population, % of EU15 migrants, and % of African migrants over immigrant population. "Census 2001" refers to municipality characteristics as per the 2001 Census. These include the unemployment rate for the full population and for the female population, the share of inhabitants with primary education, and number of cars, commercial activities and banks per capita. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10.

Table B12: **Internet and support for PP (IV) - CIS surveys**

|	(1)	(2)	(3)	(4)
Internet penetration	0.001	-0.022	-0.031**	-0.024**
	(0.001)	(0.014)	(0.015)	(0.011)
First stage coefficient	0.540***	0.144***	0.138***	0.180***
Observations:	14514	14514	14514	14491
F-stat.:	692.95	32.81	18.05	32.63
Landlines 1996:	Yes	Yes	Yes	Yes
Fixed effects:	No	Yes	Yes	Yes
Controls:	No	No	Yes	Yes
Census 2001:	No	No	No	Yes

Notes: 2SLS regressions. The dependent variable is a binary indicator equal to one if the respondent states that (s)he voted for PP in the last election. Years 1995, 1996; 2008-2012. All regressions control for landline penetration in 1996 at the municipality level. "Fixed effects" refers to year and province fixed effects. "Controls" includes personal and municipality level controls. Personal controls: gender, age, age squared, indicators for employment status and an indicator for having a university degree. Municipal controls: population, surface in Km^2, altitude, % immigrants over total population, % of EU15 migrants, and % of African migrants over immigrant population. "Census 2001" refers to municipality characteristics as per the 2001 Census. These include the unemployment rate for the full population and for the female population, the share of inhabitants with primary education, and number of cars, commercial activities and banks per capita. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10.

Figure B1: **Internet and attitudes towards migrants - Heterogeneity by individual characteristics**
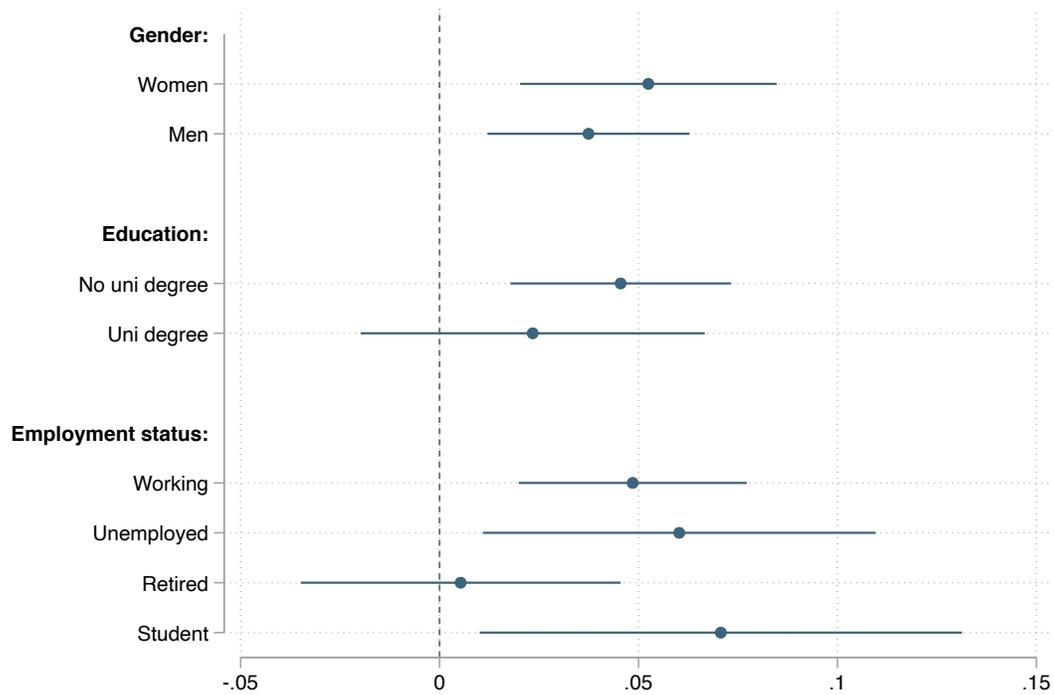
Notes: The graph shows coefficients for broadband Internet penetration and 95% confidence intervals from 2SLS regressions run on sub-samples restricted to respondents in different groups, as indicated on the y-axis (blue). The dependent variable is a binary indicator equal to one if the respondent thinks immigration is good or very good for the country. Years 1995, 1996; 2008-2012. All regressions control for landline penetration in 1996 at the municipality level and include controls and fixed effects as per column (4) of Table 2. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level.

Figure B2: **Internet and attitudes towards migrants - Heterogeneity by municipal characteristics**
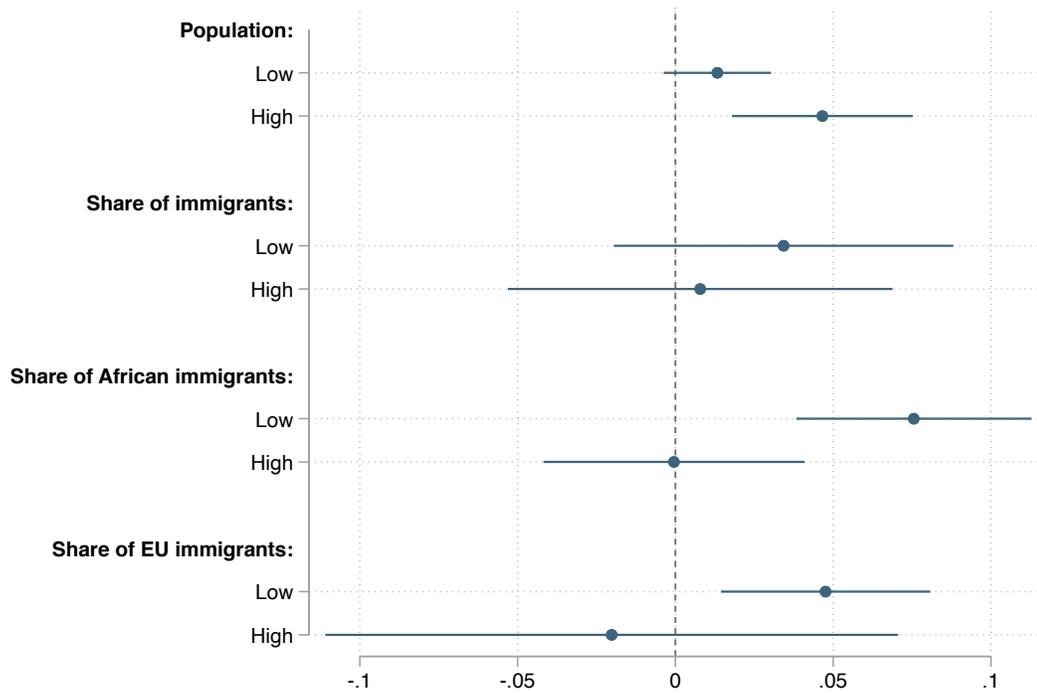

Notes: The graph shows coefficients for broadband Internet penetration and 95% confidence intervals from 2SLS regressions run on sub-samples restricted to respondents living in municipalities with different characteristics, as indicated on the y-axis (blue). "Low" and "High" correspond to municipalities with below-median and above-median values of the variable of interest, where median values are calculated separately for each survey year. The dependent variable is a binary indicator equal to one if the respondent thinks immigration is good or very good for the country. Years 1995, 1996; 2008-2012. All regressions control for landline penetration in 1996 at the municipality level and include controls and fixed effects as per column (4) of Table 2. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level.

Figure B3: **Perceived vs real share of immigrants by year**
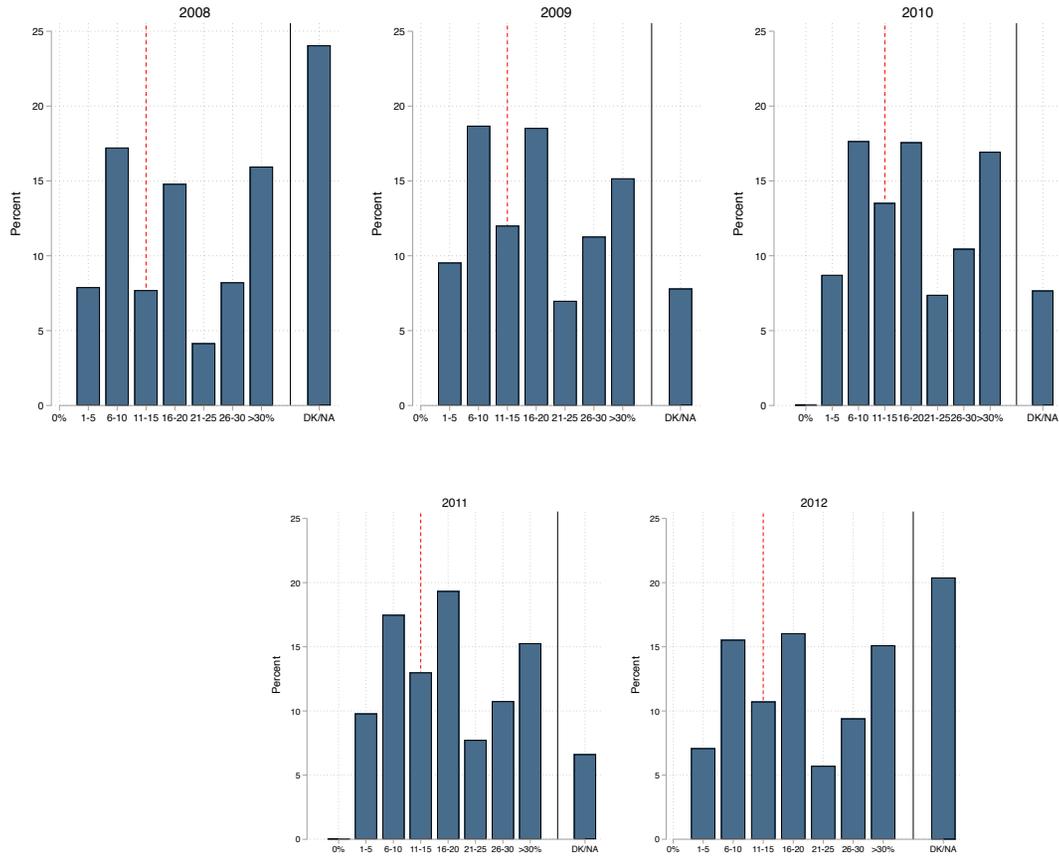
Notes: The graphs show the distribution of respondents' guesses about the share of migrants in Spain, for the years 2008-2012. Answers in 2008 and 2012 were elicited on a continuous scale only, and have been discretized for comparison with the years 2009, 2010 and 2011. In 2009, 2010 and 2011, respondents were first asked to estimate the share of migrants in continuous form (0-100) and, if they answered "Do not know", they were asked for their guess in 5 percentage point bins. In all graphs, the red dashed line represents the actual share of migrants in Spain in the relevant year.

Figure B4: **Internet and information about share of migrants - Heterogeneity by age**
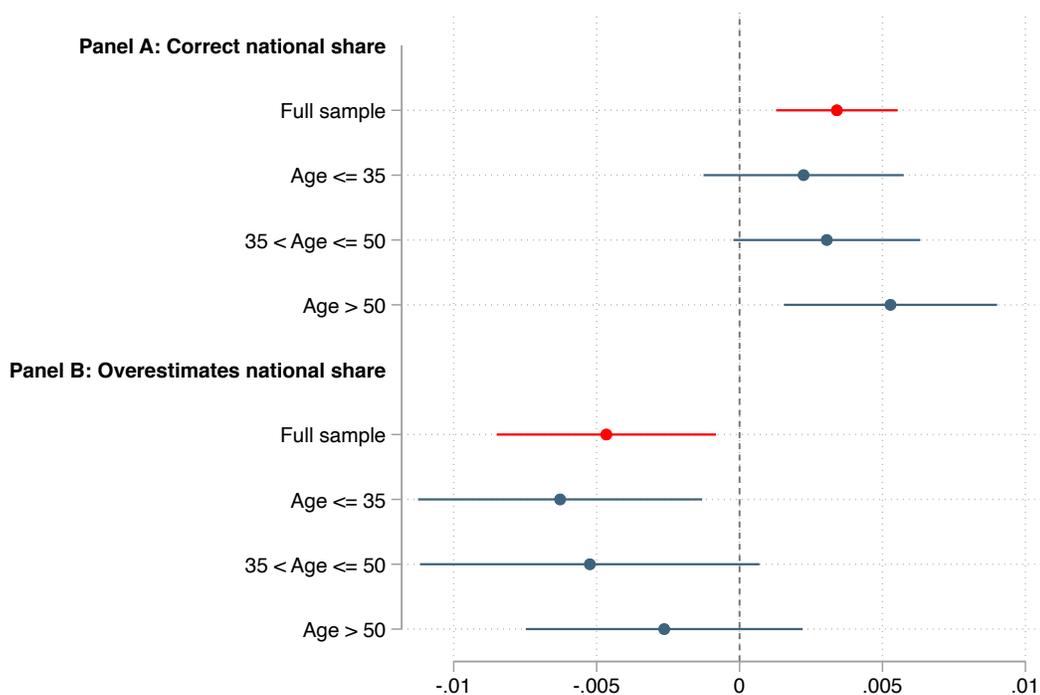
Notes: The graph shows coefficients and 90% confidence intervals from OLS regressions run on the full sample (red), or on samples restricted to respondents in different age groups, as indicated on the y-axis (blue). In Panel A the dependent variable is a dummy equal to one if the respondent reports a correct estimated range for the share of immigrants living in Spain (between 11 and 15%). In Panel B the dependent variable is a dummy equal to one if the respondent overestimates the share of immigrants at the national level (>15%). Real share of immigrants: between 12.8% (2012) and 13.9% (2009). Years: 2008-2012. All regressions control for landline penetration in 1996 at the municipality level and include controls and fixed effects as per column (4) of Table 2. Observations are weighted to match the national distribution of the population across municipalities, separately for each survey year. Standard errors clustered at the municipality level.

C Weighting procedure

Throughout the analysis, we use probability weights and re-weight observations to achieve geographical representativeness across the municipalities that are represented in each survey year. We do this because our unit of treatment is the municipality (i.e., we are exploiting variation in broadband penetration across municipalities, and within municipalities over time). In such a setting, weights should reflect the population size of a given municipality. In our setting, with observations that correspond to individuals within a municipality, the weighting guarantees that observations that belong to municipalities that are underrepresented in our survey relative to the municipality's population size receive a higher weight.

We construct the weights in the following way. First, for each survey year, we compute the share of respondents that live in a given municipality as the number of respondents from a given municipality divided by the total number of respondents in that wave. This quantity is expressed on a 0-1 scale. Call this quantity 'survey share'. Second, we compute the total population of municipalities that are represented in that wave using year-specific population data from INE. We then compute the municipality-specific population share by dividing the population of a given municipality by the total population computed as described above. This second quantity also ranges between 0 and 1. Call this second quantity 'national share'. We then construct our survey weights as the ratio between the 'national share' and the 'survey share'. We provide a concrete example for ease of understanding. Suppose that in 1996, 5% of respondents to the 1996 survey wave are from municipality j. The 'survey share' for municipality j in 1996 is therefore 5%. Suppose also that, amongst all municipalities that are represented in the 1996 survey wave, the actual population of municipality j represents 10% of the total population. The 'national share' for municipality j for 1996 is therefore 10%. This means that, in our 1996 survey, municipality j is underrepresented compared to its true weight in the population. We therefore assign a higher weight (precisely, a weight equal to 2) to respondents from municipality j, to restore geographical representativeness.