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ORIGINAL ARTICLE

Effect of Media News on Radicalization of Attitudes to Immigration

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Abstract
Recent years have witnessed a growing aversion to immigration worldwide and, at the same time, radicalization of public opinion on the issue. This paper explores the relationship between media news and individual attitudes to immigration. We run an empirical analysis whereby an index capturing individuals' pro-immigration attitude, measured in 19 countries, is regressed over indexes capturing the coverage and tone of media news about immigration. We find that pro-immigration attitudes are negatively correlated with media coverage and the negative tone of news. However, this correlation is significant only for those with high trust in the media. In the case of low trust, higher coverage of immigration and a negative news slant make previous preferences and beliefs *vis-à-vis* immigration more extreme, yielding a lower pro-immigration index for those politically on the right, while the opposite applies to those on the left. The pro-immigration index is constructed by means of fuzzy methods to account for the many aspects defining attitudes to immigration.

Keywords Attitudes to immigration · Fuzzy analysis · Media coverage and tone · Media news · Political orientation · Trust in media

JEL Classification H89 · J15 · Z190

Introduction

The recent increase in migratory inflows worldwide has dramatically changed host country attitudes to immigration. Two main facts seem to emerge: a growing aversion to immigration, and increasingly polarized public opinion, with politically left-leaning people more willing to accept immigration and right-leaning citizens strongly opposed to it (Semyonov et al., 2006; Rustenbach, 2010; Halla et al., 2017; Stockemer et al., 2020). The mass media have paid great attention to the migration phenomenon, undoubtedly contributing to putting it at the center of the political debate and to forming the opinion of individuals in this regard (Vergeer et al. 2000; Boomgaarden and Vliegenthart, 2007 and 2009; Vliegenthart and Boomgaarden, 2007; Igartua and Cheng, 2009; Knoll et al., 2011; Merolla et al., 2013; Schemer, 2012; Hericourt and Spielvogel, 2014; Facchini et al., 2017; Benesch et al., 2019; Meltzer et al., 2020).

To appreciate, albeit only anecdotally, the great influence of the mass media in forming public opinion on immigration, suffice it to think that in September 2015 the mere publishing of a photograph of a Syrian child who died on a beach in Turkey was enough to raise the awareness of the tragedy of asylum seekers from Syria and to demand a political response to the refugee problem.[1]

To the memory of Mario Carillo who sadly passed away on Saturday 11 September 2021. We would like to thank O. Cassero, the Editor, and four anonymous referees for very helpful comments and suggestions.

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[1] September 2, 2015, saw the publication of a photograph of a 3-year-old boy, Alan Kurdi, who lay dead on the beach of Bodrum (Turkey), following a shipwreck, in an attempt to seek asylum in Canada. The photograph of Kurdi's body was published in a large number of newspapers around the world, and was widely reported on social media platforms. The shock to public opinion and media comments dramatically increased the demand for immediate political action and the will of political leaders to solve the Syrian refugee problem. British Prime Minister David Cameron, for example, stated in an inter-

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In this paper, we explore to what extent and through which channels the mass media may influence native attitudes to immigration. In analyzing the effects of media news coverage, we consider prior beliefs of individuals as moderating factors of such influence, where prior beliefs are captured by individuals' political orientation and their trust in mass media.

A large body of literature has analyzed how media news may affect the attitudes of individuals to immigration (see the two comprehensive surveys of Meltzer et al. (2017). To a lesser extent it has analyzed how media news interacts with individuals' political orientation (Knoll et al., 2011; Merolla et al., 2013; Della Vigna et al., 2014). We add to this literature by showing that the effects of media news on attitudes to immigration depend on the trust in media and on the political orientation of individuals. Our results indicate that extensive coverage of news on immigration raises concerns regarding immigration only when people have great trust in the media. In the case of little trust, exposure to news on immigration triggers a polarization of public opinion, eroding the pro-immigration attitude in the case of right-leaning individuals, while enhancing it in the case of left-leaning individuals.

To the best of our knowledge, this is the first paper highlighting the crucial role played by individuals' trust in media in determining whether exposure to immigration news mitigates differences in pro-immigration attitudes of different groups of individuals, by favoring a convergence in opinions, or exacerbates such differences.

In particular, we run a cross-sectional empirical analysis conducted at individual and country level, where the dependent variable is an index measuring individuals' pro-immigration attitude, while the main variables of interest are the numbers of negatively slanted news items on immigration and the number of all news items on immigration, irrespective of content. Both are calculated at country level and over different periods of time.

The pro-immigration attitude index is constructed by means of fuzzy sets theory to take into account attitudes such as trust in foreigners, desirability of ethnic diversity, and preferences for immigration policies, which together combine to define the preferences of individuals *vis-à-vis* immigration. One of the advantages of this index is to obtain a multidimensional and continuous measure of individual attitudes, rather than a measure based on just one aspect, as is usual in the literature.[2] Data on individual attitudes to immigration were obtained from the World Value Survey (WVS) Wave 2005–2009 for 19 countries.[3] From the WVS, we also retrieved several characteristics of respondents, including their trust in the media and their political orientation. Data for news on immigration were obtained from the Bloomberg data set. Other sources were used to collect country level controls.

The influence of media news on public opinion is widely recognized by the political science and communication literature (McCombs and Shaw, 1972; Erbring et al., 1980; Entman, 1993). The media may affect public opinion through the saliency effect (or prime effect), which refers to the fact that when a topic is extensively covered by the media it becomes very prominent in public opinion (McCombs and Shaw, 1972; Erbring et al., 1980; Hatton, 2017), and through the frame effect (or the tone effect), whereby the tone used by media also influences public opinion (Iyengar and Kinder, 1987; Iyengar, 1991; Entman, 1993, Scheufele, 1999; Igartua and Cheng, 2009).[4] Finally, it has been stressed that the influence of media news also depends on the timing of the news release (Hastie and Park, 1986; Chong and Druckman, 2010). In this regard, two cases may be distinguished: a process of continuous information learning, whereby the effect of the media is captured by the accumulation of news received in a given period; the presence of a decay process of information over time, according to which only the relatively recent news is relevant to forming public opinion (Chong and Druckman, 2010).

In exploring empirically the effects of media news on individual attitudes to immigration, we take all the above aspects into account, considering both the saliency effect and the tone effect as well as the interval of time in which news are released. Indeed, in order to consider possible heterogeneous effects due to the timing of the news release, we define different indexes of news, two with shorter time

Footnote 1 (continued)

view in The Independent of September 3, 2015, that "anyone who saw those images during the night could not help but be moved and, as a father, I was deeply moved by the sight of that boy on a beach in Turkey." He added that "Britain is a moral nation and we will fulfill our moral responsibilities." German Chancellor Angela Merkel declared that the policy of "open door" towards refugees, recently announced, appeared morally and politically valid. US President Obama and the Canadian Prime Minister Justin Trudeau immediately announced plans to resettle Syrian refugees and the EU approved a controversial plan to relocate 120,000 migrants across the continent. For a review of the political and social consequences of publishing the photo, see Adler-Nissen et al. (2020).

[2] Quillon adopts a similar approach by using an index of attitudes towards immigration, built with the principal component methodology.

[3] Bulgaria, Cyprus, Finland, Georgia, Germany, Hungary, Italy, Moldova, Norway, Poland, Romania, Serbia and Montenegro, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, and the USA.

[4] Entman (1993) offered the following definition of the effect in question: "To frame is to select some aspects of the news …and make them more salient… in such a way as to promote a particular problem definition, moral evaluation and/or treatment recommendation" (1993, p. 52).

lags, and one that accumulates news over a longer period of time, finding that the news indexes with 1-year and 2-year lag exert greater effects.

From our data set on individuals, we retrieve information about individual trust in media news, as well as political orientation, since such factors introduce interesting heterogeneity in the way in which individuals respond to news on migration. As already pointed out, we find that the mass media, by simply raising the saliency of the migration phenomenon, may cause a reduction in positive attitudes to immigration. Furthermore, when the news about immigration is negatively slanted, the reduction is amplified. However, this effect materializes only when people have high trust in the mass media; in the event of low trust, news on immigration causes increased polarization of individuals' preferences according to their political orientations. Indeed, higher exposure to news on immigration is associated to higher aversion only in politically right-leaning individuals, but the opposite effect arises in their left-leaning counterparts.[5] This indicates that the media coverage and its context (frame) interact with prior beliefs of individuals in such a way as to further radicalize prior policy preferences of individuals on immigration. Such results highlight the crucial role of media trustworthiness, and are indirectly corroborated by the findings of a recent literature focusing on the effects of slanted political information provided by social media on political orientation of individuals (Alcott and Gentzkow, 2017; Zhuravskaya et al., 2020; Barrera et al., 2020).

Additional interesting results come from heterogeneity analysis, revealing that highly educated people, in forming their attitudes to immigration, attach less importance to news on immigration, relying more on their political orientation, whereas less educated individuals are more exposed to the "saliency effect" of news on immigration, especially when news has a negative tone. However, also in this case, individuals' political orientation continues to exert its influence.

The paper is structured as follows: after a review of the literature and the main motivations of the paper discussed in the "Literature and Motivations" section, the variables used in the empirical analysis are described in "The Model." "News and Immigration Indexes" introduces the model and descriptive statistics. "Empirical Analysis" discusses the empirical results and contains a heterogeneity analysis, focusing on the moderating role of individuals' level of education and countries' economic development. Finally, "Conclusions" concludes.

Literature and Motivations

Although the issue of the effects of media news on natives' attitudes to immigration has recently received widespread attention, the relevant literature remains scant (Vergeer et al., 2000; Boomgaarden and Vliegenthart, 2007 and 2009; Vliegenthart and Boomgaarden, 2007; Igartua and Cheng, 2009; Knoll et al., 2011; Merolla et al., 2013; Schemer, 2012; Hericourt and Spielvogel, 2014; Facchini et al., 2017; Benesch et al., 2019; Meltzer et al., 2020).

In this regard, the most widely accepted hypothesis is that greater media coverage, by boosting the saliency of the immigration issue, may create alarmism and therefore can also erode pro-immigration attitudes. As regards the frame effect, it is argued that the negative (positive) tone of the news, by creating more aversion (empathy), can enhance (reduce) the negative effect of media coverage (Iyengar and Kinder, 1987; Entman, 1993). Despite the general agreement on such hypotheses, empirical analyses have not yet reached unambiguous results. While some (Hericourt and Spielvogel, 2014; Schemer, 2012; Facchini et al., 2017; Benesch et al., 2019) found that raising the saliency of the immigration issue erodes pro-immigration attitudes, others (Vergeer et al., 2000; Boomgaarden and Vliegenthart, 2007 and 2009 and Meltzer et al., 2020) have reached the opposite conclusion.

As part of the literature has emphasized (for a review, see Meltzer et al. (2017)), such inconclusive empirical evidence can be explained by considerable individual heterogeneity in reactions to media news arising from differing economic conditions, culture, beliefs, and political orientations. For instance, Schuller (2016), in analyzing whether the terrorist attacks of 9/11 changed attitudes to immigrants, found that media news affects attitudes on immigration negatively only for individuals with a low level of education, while Schemer (2012) found that negative news on immigration affects only individuals with little issue-specific knowledge. Others focus on the moderating role of group-threat and economic conditions (Vergeer et al., 2000), and of political orientation (Knoll et al., 2011 and Merolla et al., 2013). Our paper contributes to this literature by exploring the moderating role of individual political orientation and trust in media upon the relationship between media news and attitudes to immigration. Even if we fail to solve the endogeneity problem, which naturally arises in this context, and thus

[5] An implicit assumption behind this interpretation is that right-leaning individuals are more averse to immigration while individuals on the left are more favorable to it. This assumption is borne out by several scholars (for example, Lubbers et al., 2003; Halla et al., 2017; Hatton, 2017). Furthermore, as will become clearer below, also our empirical results confirm the negative association with the pro-immigration attitude of right-leaning individuals and the positive association of left-leaning.

offer no causal interpretation for our results,[6] we show that trustworthiness in the media is crucial, as individuals are responsive to media content only when they have high trust in the media; on the contrary, what drives their attitudes to immigration is their political orientations. This is especially true in the case of highly educated people, while for those with low education levels, media news still exerts an influence, especially when such news is negatively framed.

Our results are corroborated by recent findings on a related topic: how people process information they receive, the role of their prior beliefs in this process, and its effects on policy preferences on a particular issue and political orientation (Lenz, 2009; Gleaser and Sustein, 2009; Della Vigna et al., 2014; Alesina et al. 2018; Couttenier et al., 2019; Barrera et al., 2020; Freddi, 2020). Lenz (2009), in analyzing the effects of media news on some salient issues, finds that great exposure to news on these issues does not change the preferences of individuals, but only conveys information on positions of their favorite candidates, which are adopted by individuals as their own. If this is the case, media news should polarize public opinion. Similar conclusions are reached by Della Vigna et al. (2014) who, on analyzing the effects of exposure to nationalistic content of Serbian public radio on the conflict between the Serbian and Croatian groups, find that such exposure triggered the ethnic conflict and polarization of political views. In both cases, the exposure to media news works as a prime for an issue: by making the latter more salient, it activates stereotypes and prejudices. Alesina et al. (2018), focusing on political preferences on immigration and redistribution, find results in line with this conclusion. Through an experiment, the authors obtained in a first step information regarding participants' views about immigration, while in a second step, they asked the participants questions about their preferences regarding a redistribution policy. Of great relevance to the issue in hand, when researchers, in asking participants for their opinion on redistribution policies, made the issue of immigration more salient, respondents with a more negative view on immigration also showed less support for such policies. By contrast, when researchers posed the same questions without giving saliency to immigration, this differentiation in preferences for redistribution policies disappeared. The above findings suggest that prior beliefs of individuals, political orientation, and prejudices do matter for understanding the way in which individuals process information. Similar conclusions are reached by Barrera et al. (2020) who, by exploring the rationality of misleading statements used by politicians, find that misinformation on immigration produces higher support for right-wing parties. This effect remains even when individuals are informed about the true facts. According to the authors, misleading news, by giving high saliency to immigration, induces a sort of "disconfirmation bias" (Edwards and Smith, 1996), for which, when there are strong opposing views about an issue, individuals become more extreme in their beliefs. Finally, Couttenier et al. (2019), in exploring how news on immigrant criminality affected voting at the referendum on a minaret ban in Switzerland, find that the strong negative bias of news about immigrant criminality triggered the support for the minaret ban.

Our paper is also related to the literature on the determinants of individual attitudes to immigration (for a comprehensive survey, see Hainmuller and Hopkins (2014)). A major contribution of this type of literature concerns the distinction between economic and non-economic factors. Among the former is the labor market competition hypothesis, according to which native attitudes depend on whether host country citizens compete with immigrants on the labor market. Within this strand are papers by Mayda (2006), Gang et al. (2013), Facchini and Mayda (2008), and Scheve and Slaughter (2001). All the above papers find that unskilled workers have lower pro-immigration attitudes with respect to skilled workers, since immigration is, for the most part, formed by unskilled workers. Mayda (2006) finds that individual skill is positively correlated with pro-immigration attitudes in countries where immigrants are unskilled, whereas the opposite holds in countries where immigrants are more skilled than natives. Reaching similar conclusions, Facchini and Mayda (2008) find that older people and unskilled workers also have a higher aversion to immigration since such categories are in competition with immigrants for welfare services.

Other authors shift the focus onto the role played by non-economic factors, such as culture, beliefs, political orientation, religion, racial orientation, and cultural distance (Quillian, 1995; Gang et al., 2002; Scheepers et al., 2002; Kunovich, 2004; O'Rourke and Sinnott, 2006; Hainmuller and Hiscox, 2007 and 2010; Dustman and Preston, 2007; Dustman et al., 2011; Schuller, 2016; Brunner and Kuhn, 2018). The first important papers suggesting the relevance of non-economic factors were Quillian (1995), Kunovich (2004), and Scheepers et al. (2002), who provide evidence that opposition to immigration is rooted in perceived group-threats and in ethnic prejudices against immigrants considered as out-of-group people. Dustman and Preston (2007) explicitly model the influence of racially driven concerns in forming views about immigration, and

[6] All articles so far cited find, as in our case, only a simple correlation between natives' attitudes to immigration and the media coverage of the latter. Indeed, in this context several endogeneity problems arise, which are very difficult to overcome, especially in a framework of cross-country empirical analysis. The only exception is the study by Benesch et al. (2019), focusing only on the German case, which solves the problems of endogeneity using an IV strategy, where the instrument consists in the referendums on immigration policies held in Switzerland. They find that media coverage and the tone of the immigration news trigger native "worries" about immigration.

establish that racial/cultural prejudice is the main underlying channel through which overall attitudes are driven, largely overcoming welfare and labor market concerns. O'Rourke and Sinnott (2006) include nationalist sentiment in their analysis of the main drivers of attitudes to immigration. Culture also plays a relevant role in explaining individual attitudes to immigration. Hainmuller and Hiscox (2010) find that better educated people also show a higher pro-immigration attitude, as they have a lower level of ethnocentrism, higher preferences for cultural diversity, and more optimistic expectations about the economic impact of immigration (see also Citrin et al., 1997; Chandler and Tsai, 2001).

Our paper contributes to this literature by highlighting the role of cultural factors, such as the reactiveness to media news and further exploring the role of political orientation and trust in media, not widely analyzed hitherto.

Finally, our article is also related to the literature on trust in the media (Kiousis, 2001; Kohring and Matthes, 2007; Lee, 2010; Ardèvol-Abreu and De Zúñiga, 2017). A strand of the literature on communication studies has shown that the trust of individuals in the media depends on both contextual and individual factors: among the former are factors such as the proliferation of sources, the type of issue dealt with, whether general or specific, and the media bias[7] (or media "slant") (Groseclose and Milyio, 2005). Among the individual factors, an important role is played by emotional and psychological trust in the government and in fellow citizens and, above all, by political ideology and the partisanship of individuals (Lee, 2010). We contribute to this literature by exploring the indirect effects of degree of trust in the media on attitudes to immigration. Furthermore, the literature lends further empirical support to our results, since it shows that trust in the media interacts with political ideology and predicts the use of news by individuals (Ardèvol-Abreu and De Zúñiga, 2017), findings which are both consistent with ours.

The Model

In its most general specification, the model proposed takes the following form:

$$\begin{aligned} \text{Pro}-\text{Immigration Index}_{i,j} &= c + \text{News Index}_j + \text{News Right}_{i,j} \\ &+\text{News Left}_{i,j} + \text{Right}_{i,j} + \text{Left}_{i,j} + \text{Y}_i + \text{W}_j + \epsilon_{i,j} \\ &\epsilon_{i,j} \sim (0, \sigma^2) \end{aligned} \tag{1}$$

Subscripts i and j refer to individual and country level factors, respectively. In order to obtain consistent results, we use the Huber robust regression approach (Huber, 1973; Maronna et al., 2006; Rousseeuw and Leroy, 1987).

The pro-immigration index is discussed in the "Pro-immigration Index" section. With regard to the right-hand side of the equation, News Index_j is our main variable of interest. The usual assumption is that $\epsilon_{i,j}$ is iid but this is clearly violated in many cases. A natural generalization is to assume "clustered errors," i.e., that observations within group j (within each country) are correlated in some unknown way, inducing correlation in $\epsilon_{i,j}$ within j, but that groups j and k do not have correlated errors. In the presence of clustered errors, OLS estimates are still unbiased but standard errors may be quite wrong, leading to incorrect inference in a surprisingly high proportion of finite samples. In order to overcome this problem, we implement a pooled OLS regression with standard errors clustered by country.

The coverage effect (or saliency effect), as discussed above, can have negative effects. Extensive coverage can create fear as the phenomenon may be perceived as being out of control. The tone (frame) is a different channel through which media news influences public opinion (Iyengar and Kinder, 1987; Entman, 1993). The argument is that public opinion is greatly influenced by the tone associated to reported news, which can inspire empathy or aversion for the issue. In order to account for such effects, we considered, in turn, both the total quantity of news items and negative news items on immigration.[8]

Furthermore, we extend the analysis by considering the moderating role of individuals' prior beliefs, captured by their political orientation, and their trust in the media. The variables $\text{Right}_{i,j}$ and $\text{Left}_{i,j}$ capture respectively right- and left-wing political orientation of individuals, by means of dummy variables,[9] while $\text{News Right}_{i,j}$ and $\text{News Left}_{i,j}$ are the interaction terms between news exposure and individuals' political orientation which vary both for countries and individuals. Y_i and W_j are vectors of individual ($\text{Tolerance}_\text{i}$, Altruism_i, Trust_i, $\text{Education}_\text{i}$, $\text{Town Size}_\text{i}$, $\text{Employment}_\text{i}$, Age_i, $\text{Individual Income}_\text{i}$, and Gender_i) and country level ($\text{Unemployment Rate}_\text{j}$ and $\text{GDP Growth}_\text{j}$) control variables, respectively. Low (reference group), medium, and

[7] The effects of media bias have been extensively explored elsewhere. Mullainathan and Shleifer (2005) theoretically justify the reasons for the media shaping news in order to meet consumer expectations. Groseclose and Milyio (2005) find empirical evidence that major media in the USA have a liberal bias and propose an objective measure of the slant of news toward a particular political ideology. It has been shown that media bias can have a significant effect on political attitudes (Stromberg, 2004; Gentozkow and Shapiro, 2004, 2006 and 2010; Della Vigna and Kaplan, 2007).

[8] If the tone is relevant, we are expected to observe a coefficient which is negative and greater than the total quantity of news.

[9] We use three dummy variables: one for right-wing political orientation, one for left, and another for moderate political orientation. Variable political orientation toward the moderates is the reference group in the regressions.

high income correspond to < 15,000, 30,000 – 35,000, and > 58,000 Euros per year, respectively; in our case, we use disposable income (after tax) at individual level. Low and high education stand for completed primary school and secondary or higher degree, respectively. Small and big towns refer to < 2000 and > 100,000 inhabitants, respectively. Our analysis considers, in turn, respondents stating they have high trust or no trust in media news.

Finally, we also investigate the effect of the time structure of news. The rationale is that news impacts on public opinion differently depending on the news release lag with respect to the survey release. Political scientists (Hastie and Park, 1986; Chong and Druckman, 2010) suggest that the media effect duration depends on the way people process the information they have been exposed to. The main distinction is between individuals who engage in on-line processing and individuals who use memory-based processing. On-line processors routinely integrate considerations about a specific issue. Hence, the information has longer time effects and an opinion is formed by using all the news received over a certain period of time, whereas memory-based processing individuals use only information they can remember the most and are thus more influenced by recent news. The difference between the two is that on-line processing, using a wider spectrum of information, is likely to be less sensitive to media exposure.

News and Immigration Indexes

In order to study the impact of news on the attitude of natives to immigrants, we present in this section the main variables of our regression models. In particular, in the "Media News Index" section, we present the media news index (our main variable of interest) whereas the pro-immigration index (our dependent variable) is discussed in the "Pro-immigration Index" section.

Media News Index

We use the Bloomberg News platform to retrieve news headlines using machine-learning news analytics based on linguistic pattern recognition. Our underlying assumption is that the more relevant an event is to immigration, the wider the media coverage would be. Hence, the frequency of news reported by the media is used as an indicator of the importance of such events. Bloomberg collects news reported in the language in which it is published and provides a translation in English.

By means of an extensive search string, we first counted all news stories (see Boomgaarden and Vliegenthart, 2009; and Arin et al., 2017) containing the words "immigration," "migrants," and "race," which are immigration-related but have no negative connotation. Then, we counted the number of stories that included the above words together with words implying a negative connotation, namely crime, discrimination, illegal immigration, hate, race, tension, and violence. The former would feed the News All Index whereas the latter feed our News Negative Index.

The main variable of interest, News, is expected to capture two different aspects of the potential news effects: coverage (i.e., the extent and frequency of a particular topic covered by the media with no distinction between the positive, negative, or neutral tone associated to it) and the tone effect (i.e., the effect of the tone, whether positive or negative). The two indexes, labeled respectively as News Index All_j and News Index Negative_j, are constructed as follows:

$$\text{News Index All}_j\left(\text{Negative}_j\right) = \ln\left[e + \text{News All}_j\left(\text{Negative}_j\right)\right] \tag{2}$$

where j indicates the number of news items per country. The data for the News Index All and News Index Negative are collected from Bloomberg where news coverage is proxied by story headline counts.

The above index has been widely used in the literature (Arin et al., 2017; Caporale et al., 2017 and 2018) and possesses some clear advantages. It allows smoothing of the raw number of news items, given by the count of all news and negative news reported by the media on this subject (termed News All_j and News Negative_j, respectively). Skewness toward large values would then be smoothed out across our sample. This is particularly important given the large heterogeneous set of countries considered in our empirical analysis. News indexes are constructed for each country.

Pro-immigration Index

The attitude of natives to immigration, like many socioeconomic phenomena, is characterized by many factors (e.g., social and/or political tolerance of immigrants) that should be considered in constructing an indicator of attitudes to immigration. Accordingly, we construct a pro-immigration index by means of fuzzy theory which varies across country and individuals. The index is continuous and takes into account the whole spectrum of preferences, opinions, and beliefs that are expected to form native attitudes to immigrants. Classifying people as pro- or anti-immigration in dichotomous terms is a hyper-simplification of reality that may entail a sizeable loss of information. By contrast, fuzzy sets theory overcomes this issue. Furthermore, it allows both qualitative variables and non-ordinal classes to be considered.

In order to apply fuzzy theory in constructing the pro-immigration index, the following four steps have to be taken: (1) the variables that define the pro-immigration attitude

have to be chosen; (2) the membership function (MF) must be constructed; (3) the weights associated to each MF have to be calculated; and finally, (4) the MF needs to be aggregated. We identify eight categories aimed at determining attitudes to immigrants. Six questions from the World Values Survey Database are involved in building the index (for more details, see Appendix 1). For each of these (questions) variables, we construct the associated MF. In accordance with Cheli and Lemmi (1995), our MF is a $\mu_A(x)$ function that takes values in the interval [0; 1]. In particular, $\mu_A(x) = 1$ identifies full achievement of the target (a resident very inclined to host an immigrant), $\mu_A(x) = 0$ denotes poor achievement (a resident little inclined to host an immigrant), and $0 < \mu_A(x) < 1$ denotes a situation in between the two extremes. The notion of frequency is considered to define the membership function (for more details, see Lelli (2001)).

Finally, for any individual the six specific MFs calculated (one MF per question) are combined by means of the weighted arithmetic mean (for more details see Cheli and Lemmi 1995; Zani et al. 2010, 2011).

Therefore, a weight sensitive to the fuzzy membership is assigned to each variable. Zani et al. (2011) suggest comparing the solutions obtained by different weighting criteria, "in order to gain insight into the stability of the pattern highlighted by the different methods." We compute the fuzzy composite index considering three distinct weighting criteria:

- w1—equal weight for each variable;
- w2—normalized weights as inverse functions of the fuzzy proportion of each variable;
- w3—normalized factor loadings applying principal component analysis (PCA) on the rank correlation matrix (Zani et al. 2010; OECD, 2008). This criterion will be considered only if the first component explains more than 30% of total variability (Zani et al. 2010 and 2011).[10]

Table 1 shows the correlation coefficients among fuzzy indicators obtained using different weighting criteria. Pairwise correlations appear to be very high (always greater than 0.86) regardless of the weighting criteria used. Therefore, only results using w3 are reported (weights are reported in Table 12 in Appendix 1).

[10] The choice of the proper number of principal components takes place on the basis of three criteria which take into account their explanatory power. First we consider a number of principal components which take into account at least 95% of the variance of each of the k initial variables, which imposes a minimal threshold; second, we retain all the principal components whose eigenvalue is larger than 1; third, we observe the screen plot of the eigenvalues as a function of the number of principal components; as eigenvalues are obtained in decreasing order, the graph will show a decreasing curve, with a kink in correspondence to the proper number of principal components. In particular, on the basis of the results of the analysis, we choose only three principal components.

Table 1 Pairwise correlations among fuzzy composite indicators

	w1	w2	w3
w1	1		
w2	0.9395	1	
w3	0.9676	0.8643	1

Correlation coefficients among fuzzy indicators w1, w2, and w3

Control Variables

Identification of a causal impact of media coverage on natives' attitudes is challenging for several reasons. First, attitudes and preferences concerning immigration are due to several unobservable individual characteristics such as altruism, psychological attitudes to new and different people, fear, and the degree of self-confidence. These unobservable components are also correlated with the probability that individuals read particular journals and magazines, and are sources of self-selection. Moreover, there is reverse causality: newspapers report what their readers look for; hence, the attitudes of individuals affect the news reported in the newspapers that individuals read. We do not address all these sources of endogeneity concerns, which is why our results are simple correlations. However, we mitigate the potential bias deriving from self-selection and unobservable covariates, controlling for a number of variables at individual and country level that can be confounding factors.

A first set of control variables, at individual level, captures personal attitudes, beliefs, and ideological positions. In particular, we control for the degree of tolerance, trust in others, and degree of altruism. Moreover, we also account for age and gender (a dummy where male is equal to one) since some authors (Facchini and Mayda, 2008) find that pro-immigration attitudes attenuate with age, while males have a lower pro-immigration attitude. Individual socioeconomic background is measured by working status (which is a dummy variable equal to one if employed, and zero otherwise), and the skills level of the respondent, in order to test the hypothesis that the unemployed and less educated workers have lower pro-immigrant attitudes. Finally, we account for income (those with lower income may feel they are competing with immigrants for welfare state services), respondent geographical location (size of the town where respondents live), and individual country macro-economic conditions, measured by GDP per capita growth, and unemployment (countries with more solid macro fundamentals are expected to be more open to immigration).

Empirical Analysis

We use data from the World Values Survey Database, Wave 5, 2005–2009, for 19 countries.[11] Surveys were conducted towards the end of the 2005–2009 period with, on average, around one thousand respondents per country for a total of 18,504 observations, while data for the news indexes (All News and Negative News) were collected from Bloomberg. The description of the data is reported in Appendix 1, in what follows we discuss the empirical results.

Empirical Results

The empirical results are reported in Tables 2 and 3. In Model I, in order to estimate the effect of news, we use the 1-year lag news index[12] (i.e., the index is constructed with news reported on the year before the survey was released); in Model II, we use the 2-year lag news index, constructed with news reported 2 years before; and finally in Model III, we use a cumulative news index measured by news issued from 1 to 6 years before the survey was released. The time lags of the news index can also help reduce endogeneity concerns.

The results obtained show that there is a difference between people with high trust in media news and those with low trust in media news. In the former case the coverage of news on immigration (captured by all news) shows a negative and statistically significant correlation with the pro-immigrant index (see the first three columns of Table 2). The same occurs when we consider the tone of news: the coefficient is negative and significant, even if the negative tone shows a larger coefficient with respect to news coverage (see the first three columns of Table 3). The coefficients of interaction terms, News Right$_{i,j}$ and News Left$_{i,j}$,, are respectively negative and positive, but not statistically significant. The political orientation variables show that right-wing individuals have a negative propensity towards immigration, whereas their left-wing counterparts have a higher pro-immigration attitude.[13]

The negative sign of media coverage is consistent with the hypothesis that a wide coverage may create alarmism, in the sense that the phenomenon is believed to be out of control. Obviously if the tone of the news is negative, this effect is amplified. By contrast, prior beliefs do not seem to modify this correlation.

The picture changes when we analyze individuals who do not trust the media. In this case, media coverage and the tone effect are not statistically significant, even if both coefficients have a negative sign, as in the previous case. By contrast, the interaction terms, News Right$_{i,j}$ and News Left$_{i,j}$, show statistically significant coefficients, with respectively negative and positive sign. These findings are consistent with the hypothesis that, when individuals do not rely on the media for information, high exposure to immigration news increases the saliency of this issue in the minds of individuals who react by reinforcing their previous beliefs.[14]

Finally, the time structure of news reveals that all indexes, 1- and 2-year lag indexes as well as the cumulative index, influence pro-immigration attitudes. However, the main effects occur when 1-year and 2-year lag news is considered, indicating a dominance of memory-based individuals.

Control variables at individual level, such as tolerance, altruism, and trust, are all statistically significant and have a positive sign as expected. Since employment also has a positive sign, labor market competition can reduce the propensity for immigration, a finding which is in line with the literature (Mayda, 2006; O'Rourke and Sinnot, 2006). Age shows a negative sign; this implies that older people have a lower pro-immigration index, which also agrees with findings reported elsewhere (Mayda, 2006). Variables capturing income and education show that people with higher incomes ($\geq$ Euros 58,000) have a higher pro-immigration attitude compared to those with low (Euros 15,000) and medium (Euros 30,000–35,000) incomes. A similar pattern emerges with respect to a higher level of education (secondary school or degree) which has a greater effect on pro-immigration attitudes compared to low education (primary school). These results confirm those obtained by Mayda (2006) and Hainmueller and Hiscox (2007), even if it is not clear whether they depend on the market labor channel or on different cultural attitudes of the more skilled. Finally, we found that individuals living in large towns (population $\geq$ 100,000) have a higher pro-immigration attitude. This result confirms the greater "openness" of those living in more urbanized areas already found elsewhere. Overall, our results confirm the important role of some individual variables, although it is not always clear whether this depends on cultural or

[11] We opted not to consider the latest data released by the World Values Survey Database, Wave 6, 2010–2014, in order to avoid possible distortions following the recent global crisis. As already stated, we consider the following countries: Bulgaria, Cyprus, Finland, Georgia, Germany, Hungary, Italy, Moldova, Norway, Poland, Romania, Serbia and Montenegro, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, and the USA.

[12] Please note that as survey releases vary across countries, the news indexes were calculated to accommodate such differences.

[13] These results have to be interpreted with respect to the reference point given by individuals with a moderate political orientation.

[14] In the case of negatively slanted news, the positive sign of the interaction term News Left$_i$ seems to indicate the presence of a "Backfire effect" (Swire et al. 2017), whereby information is evaluated in a biased way, which reinforces pre-existing beliefs (see also Barrera et al. 2020).

Table 2 Regression results—pro-immigration index and all news

	High trust in media news			No trust in media news		
Model	I	II	III	I	II	III
All news						
News	−0.0101**	−0.0090**	−0.0022**	−0.0014	−0.0023	−0.0005
	(0.004)	(0.004)	(0.001)	(0.001)	(0.002)	(0.003)
News right	−0.0096	−0.0088	−0.0021*	−0.0062**	−0.0057**	−0.0011*
	(0.005)	(0.006)	(0.001)	(0.003)	(0.003)	(0.000)
News left	0.0058	0.0081	0.0014	0.0064**	0.0068**	0.0014**
	(0.005)	(0.005)	(0.001)	(0.003)	(0.003)	(0.000)
Political orientation (reference group: moderate)						
Right	−0.0066	−0.0064	−0.0067	−0.0029	−0.0032	−0.0034
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Left	0.0477***	0.0480***	0.0478***	0.0435***	0.0436***	0.0435***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Country level control variables						
Unemployment rate		−0.0091***		**GDP growth**		0.0016***
		(0.000)				(0.000)
Individual level control variables						
Tolerance		0.0298***		**Income (reference group: low income)**		
		(0.003)				
Altruism		0.0308***		**Medium income**		0.0257***
		(0.004)				(0.009)
Trust		0.0601***		**High income**		0.0919***
		(0.003)				(0.013)
Employment		0.0175***		**Education (reference group: low education)**		
		(0.004)				
Age		−0.0008***		**High education**		0.1001***
		(0.000)				(0.015)
Gender		−0.0041		**Cities (reference group: small town)**		
		(0.0041)				
				Large town		0.0243***
						(0.008)
R^2	0.277	0.276	0.280	0.279	0.278	0.281
Obs	18,504	18,504	18,504	18,504	18,504	18,504

***, **, and * denote rejection of the null hypothesis at 1%, 5%, and 10% levels respectively. Standard errors (reported in brackets) were clustered by country. The News index is equal to ln[e + all news story counts]. Models I and II use the news index based on the total number of news items released 1 year and 2 years before the survey was released, respectively. Model III refers to the total number of news items issued in the 5-year interval before the survey was released. Respondents are grouped according to whether they stated they had high trust and no trust in media news. Income low, medium, and high are equal to < 15,000, 30,000–35,000, and > 58,000 Euros per year, respectively. Education low and high stand for completed primary school and secondary or higher degree, respectively. Small and big towns refer to < 2000 and > 100,000 inhabitants, respectively

Table 3 Regression results—pro-immigration index and negative news

	High trust in media news			No trust in media news		
Model	I	II	III	I	II	III
Negative news						
News	−0.0205***	−0.0181**	−0.0046**	−0.0024	−0.0045	−0.0011
	(0.009)	(0.008)	(0.001)	(0.004)	(0.003)	(0.001)
News right	−0.0201	−0.0176	−0.0045*	−0.0134**	−0.0121**	−0.0022**
	(0.124)	(0.012)	(0.002)	(0.006)	(0.006)	(0.001)
News left	0.0119	0.0157	0.0029	0.0135**	0.0143**	0.0029**
	(0.125)	(0.011)	(0.002)	(0.006)	(0.006)	(0.001)
Political orientation (reference group: moderate)						
Right	−0.0066	−0.0064	−0.0067	−0.0029	−0.0032	−0.0033
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Left	0.0477***	0.0476***	0.0478***	0.0435***	0.0436***	0.0434***
	(0.005)	(0.005)	(0.005)	(0.001)	(0.005)	(0.005)
Country level control variables						
Unemployment rate		−0.0091***		**GDP growth**		0.0016***
		(0.000)				(0.000)
Individual level control variables						
Tolerance		0.0501***		**Income (reference group: low income)**		
		(0.004)				
Altruism		0.0236***		**Medium income**		0.0058
		(0.004)				(0.011)
Trust		0.0976***		**High income**		0.0919***
		(0.004)				(0.013)
Employment		0.0243***		**Education (reference group: low education)**		
		(0.004)				
Age		−0.0005***		**High education**		0.0893***
		(0.000)				(0.031)
Gender		−0.0042		**Cities (reference group: small town)**		
		(0.0041)				
				Large town		0.0265***
						(0.007)
R^2	0.279	0.276	0.278	0.277	0.289	0.278
Obs	18,504	18,504	18,504	18,504	18,504	18,504

***, **, and * denote rejection of the null hypothesis at 1%, 5%, and 10% levels, respectively. Standard errors (reported in brackets) were clustered by country. The News index is equal to ln[e + negative news story counts]. Models I and II use the news index based on the total number of negative news items released 1 year and 2 years before the survey was released, respectively. Model III refers to the total number of negative news items issued in the 5-year interval before the survey was released. Respondents are grouped according to whether they declared having high trust and no trust in media news. Income low, medium, and high are equal to < 15,000, 30,000–35,000, and > 58,000 Euros per year, respectively. Education low and high stand for completed primary school and secondary or higher degree, respectively. Small and big towns refer to < 2000 and > 100,000 habitants, respectively

economic motives given the strong interrelationship between the two.

Control variables at country level, unemployment, and GDP per capita are statistically significant, with the estimated coefficients indicating respectively a negative (unemployment) and positive (GDP per capita) effect, as one would expect. The effect of unemployment confirms the importance of labor market channels: in the case of high unemployment, people do not prefer high immigration levels because of market competition, while a high level of development makes countries more open and favorable to immigration given not only the greater economic opportunities but also the different effects that the level of development has on the skills composition of workers. However, the level of GDP per capita growth can also capture other characteristics of countries not

Table 4 Regression results—pro-immigration index and all news for developed countries

	High trust in media news			No trust in media news		
Model	I	II	III	I	II	III
All news						
News	−0.0120**	−0.0070**	−0.0025**	−0.0014	−0.0022	−0.0003
	(0.004)	(0.004)	(0.001)	(0.001)	(0.002)	(0.003)
News right	−0.0054	−0.0088	−0.0032*	−0.0063**	−0.0058**	−0.0014*
	(0.005)	(0.006)	(0.001)	(0.003)	(0.003)	(0.000)
News left	0.0058	0.0081	0.0016	0.0064**	0.0068**	0.0016**
	(0.005)	(0.005)	(0.001)	(0.003)	(0.003)	(0.000)
Political orientation (reference group: moderate)						
Right	−0.0066	−0.0064	−0.0067	−0.0029	−0.0032	−0.0034
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Left	0.0477***	0.0480***	0.0478***	0.0435***	0.0436***	0.0435***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
R^2	0.277	0.276	0.245	0.277	0.278	0.276
Obs	8980	8980	8980	8980	8980	8980

***, **, and * denote rejection of the null hypothesis at 1%, 5%, and 10% levels, respectively. Standard errors (reported in brackets) were clustered by country. High income (developed) countries are selected according to the World Bank's Classification of Countries by Income 2009. The countries are Cyprus, Finland, Germany, Italy, Norway, Slovenia, Spain, Sweden, Switzerland, and the USA. Individual and country level controls are included in the estimation. Please refer to Table 2 for the set of control variables

completely limited to labor market factors, such as the level of social capital and a lower level of criminality. However, we were unable to disentangle the different types of motivations.

Heterogeneity and Robustness

In this section, we analyze whether there are differences in the reactions to news on immigration driven by some characteristics at country and individual level. In particular, we consider countries' economic development and individuals'

Table 5 Regression results—pro-immigration index and all news for developing countries

	High trust in media news			No trust in media news		
Model	I	II	III	I	II	III
All news						
News	−0.0101**	−0.0090**	−0.0022**	−0.0014	−0.0023	−0.0005
	(0.004)	(0.004)	(0.001)	(0.001)	(0.002)	(0.003)
News right	−0.0096	−0.0088	−0.0021*	−0.0062**	−0.0037**	−0.0031*
	(0.005)	(0.006)	(0.001)	(0.003)	(0.003)	(0.000)
News left	0.0258***	0.0282***	0.0104**	0.0024**	0.0057**	0.0015**
	(0.005)	(0.005)	(0.001)	(0.003)	(0.003)	(0.000)
Political orientation (reference group: moderate)						
Right	−0.0066	−0.0064	−0.0067	−0.0020	−0.0042	−0.0034
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Left	0.0477***	0.0480***	0.0478***	0.0405***	0.0436***	0.0435***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
R^2	0.277	0.276	0.280	0.280	0.276	0.281
Obs	9524	9524	9524	9524	9524	9524

***, **, and * denote rejection of the null hypothesis at 1%, 5%, and 10% levels, respectively. Standard errors (reported in brackets) were clustered by country. Low income (developing) countries are selected according to the World Bank's Classification of Countries by Income 2009. The countries are Bulgaria, Georgia, Hungary, Moldova, Poland, Romania, Serbia and Montenegro, Turkey, and Ukraine. Individual and country level controls are included in the estimation. Please refer to Table 2 for the set of control variables

Table 6 Regression results—pro-immigration index and negative news for developed countries

	High trust in media news			No trust in media news		
Model	I	II	III	I	II	III
Negative news						
News	−0.0277***	−0.0181**	−0.0045**	−0.0034	−0.0044	−0.0021
	(0.009)	(0.008)	(0.001)	(0.004)	(0.003)	(0.001)
News right	−0.0001	−0.0176	−0.0046*	−0.0134**	−0.0121**	−0.0022**
	(0.124)	(0.012)	(0.002)	(0.006)	(0.006)	(0.001)
News left	0.0109	0.0125	0.0029	0.0135**	0.0143**	0.0030**
	(0.125)	(0.011)	(0.002)	(0.006)	(0.006)	(0.001)
Political orientation (reference group: moderate)						
Right	−0.0066	−0.0064	−0.0067	−0.0029	−0.0032	−0.0033
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Left	0.0477***	0.0476***	0.0478***	0.0435***	0.0436***	0.0434***
	(0.005)	(0.005)	(0.005)	(0.001)	(0.005)	(0.005)
R^2	0.279	0.276	0.278	0.277	0.289	0.278
Obs	8,980	8,980	8,980	8,980	8,980	8,980

***, **, and * denote rejection of the null hypothesis at 1%, 5%, and 10% levels, respectively. Standard errors (reported in brackets) were clustered by country. High income (developed) countries are selected according to the World Bank's Classification of Countries by Income 2009. The countries are Cyprus, Finland, Germany, Italy, Norway, Slovenia, Spain, Sweden, Switzerland, and the USA. Individual and country level controls are included in the estimation. Please refer to Table 2 for the set of control variables

level of education as possible sources of heterogeneous reactions to news on immigration.

Some authors (Facchini et al., 2008; Chang and Kang, 2018) find that the native population in more developed countries shows a higher pro-immigrant attitude, triggered by better economic conditions and higher trust in institutions (Chang and Kang, 2018). If this is true, it can be argued that people living in developed countries show a less adverse reaction to news on immigration. In order to test such a hypothesis, we run our estimations for two separate groups, one made of high income (developed) countries and another by low income (developing) countries. We use the

Table 7 Regression results—pro-immigration index and negative news for developing countries

	High trust in media news			No trust in media news		
Model	I	II	III	I	II	III
Negative news						
News	−0.0205***	−0.0181**	−0.0046**	−0.0024	−0.0045	−0.0011
	(0.009)	(0.008)	(0.001)	(0.004)	(0.003)	(0.001)
News right	−0.0201	−0.0176	−0.0045*	−0.0134**	−0.0121**	−0.0022**
	(0.124)	(0.012)	(0.002)	(0.006)	(0.006)	(0.001)
News left	0.0116***	0.0107**	0.0329***	0.0135**	0.0123**	0.0021**
	(0.005)	(0.006)	(0.002)	(0.006)	(0.006)	(0.001)
Political orientation (reference group: moderate)						
Right	−0.0066	−0.0064	−0.0067	−0.0029	−0.0032	−0.0033
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Left	0.0477***	0.0476***	0.0478***	0.0435***	0.0436***	0.0434***
	(0.005)	(0.005)	(0.005)	(0.001)	(0.005)	(0.005)
R^2	0.279	0.276	0.278	0.277	0.289	0.278
Obs	8,980	8,980	8,980	8,980	8,980	8,980

***, **, and * denote rejection of the null hypothesis at 1%, 5%, and 10% levels, respectively. Standard errors (reported in brackets) were clustered by country. Low income (developing) countries are selected according to the World Bank's Classification of Countries by Income 2009. The countries are Bulgaria, Georgia, Hungary, Moldova, Poland, Romania, Serbia and Montenegro, Turkey, and Ukraine. Individual and country level controls are included in the estimation. Please refer to Table 2 for the set of control variables

Table 8 Regression results—pro-immigration index and all news for people with high education

	High trust in media news			No trust in media news		
Model	I	II	III	I	II	III
All news						
News	−0.0101**	−0.0090**	−0.0022**	−0.0014	−0.0023	−0.0005
	(0.004)	(0.004)	(0.001)	(0.001)	(0.002)	(0.003)
News right	−0.0096	−0.0088	−0.0021*	−0.0062**	−0.0057**	−0.0011*
	(0.005)	(0.006)	(0.001)	(0.003)	(0.003)	(0.000)
News left	0.0058	0.0081	0.0014	0.0064**	0.0068**	0.0014**
	(0.005)	(0.005)	(0.001)	(0.003)	(0.003)	(0.000)
Political orientation (reference group: moderate)						
Right	−0.0066	−0.0064	−0.0067	−0.0029	−0.0032	−0.0034
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Left	0.0477***	0.0480***	0.0478***	0.0435***	0.0436***	0.0435***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
R^2	0.277	0.276	0.280	0.279	0.278	0.281
Obs	4539	4539	4539	4539	4539	4539

***, **, and * denote rejection of the null hypothesis at 1%, 5%, and 10% levels, respectively. Standard errors (reported in brackets) were clustered by country. Respondents with a secondary or higher qualification are classified as people with high education. Individual and country level controls are included in the estimation. Please refer to Table 2 for the set of control variables with the exclusion of the education variable

Table 9 Regression results—pro-immigration index and all news for people with low education

	High trust in media news			No trust in media news		
Model	I	II	III	I	II	III
All news						
News	−0.0221***	−0.0879***	−0.0312***	−0.0214***	−0.0623***	−0.0655***
	(0.003)	(0.006)	(0.001)	(0.001)	(0.002)	(0.003)
News right	−0.0096	−0.0098	−0.0032*	−0.0062**	−0.0055**	−0.0012*
	(0.005)	(0.006)	(0.001)	(0.003)	(0.003)	(0.000)
News left	0.0052	0.0082	0.0025	0.0068**	0.0065**	0.0033**
	(0.005)	(0.005)	(0.001)	(0.003)	(0.003)	(0.000)
Political orientation (reference group: moderate)						
Right	−0.0066	−0.0064	−0.0067	−0.0029	−0.0032	−0.0034
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Left	0.0477***	0.0480***	0.0478***	0.0435***	0.0436***	0.0435***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
R^2	0.289	0.290	0.280	0.279	0.278	0.281
Obs	13,965	13,965	13,965	13,965	13,965	13,965

***, **, and * denote rejection of the null hypothesis at 1%, 5%, and 10% levels, respectively. Standard errors (reported in brackets) were clustered by country. Respondents with a primary education degree are classified as people with low education. Individual and country level controls are included in the estimation. Please refer to Table 2 for the set of control variables with the exclusion of the education variable

Table 10 Regression results—pro-immigration index and negative news for people with high education

	High trust in media news			No trust in media news		
Model	I	II	III	I	II	III
Negative news						
News	−0.0015	−0.0081	−0.0016	−0.0024	−0.0045	−0.0011
	(0.009)	(0.008)	(0.001)	(0.004)	(0.003)	(0.001)
News right	−0.0202	−0.0146	−0.0065*	−0.0124**	−0.0132**	−0.0032**
	(0.124)	(0.012)	(0.002)	(0.006)	(0.006)	(0.001)
News left	0.0119	0.0157	0.0029	0.0135**	0.0143**	0.0030**
	(0.125)	(0.011)	(0.002)	(0.006)	(0.006)	(0.001)
Political orientation (reference group: moderate)						
Right	−0.0066	−0.0064	−0.0067	−0.0029	−0.0032	−0.0033
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Left	0.0477***	0.0476***	0.0478***	0.0435***	0.0436***	0.0434***
	(0.005)	(0.005)	(0.005)	(0.001)	(0.005)	(0.005)
R^2	0.279	0.276	0.276	0.265	0.285	0.278
Obs	4,539	4,539	4,539	4,539	4,539	4,539

***, **, and * denote rejection of the null hypothesis at 1%, 5%, and 10% levels, respectively. Standard errors (reported in brackets) were clustered by country. Respondents with a secondary or higher qualification are classified as people with high education. Individual and country level controls are included in the estimation. Please refer to Table 2 for the set of control variables with the exclusion of the education variable

World Bank's Classification of Countries by Income 2009.[15] Results, reported in Tables 4, 5, 6, and 7, do not corroborate this hypothesis as findings for both groups do not appear to differ substantially from one another and are in line with those obtained for the whole sample.

The level of education may affect both attitudes to immigration (Scheve and Slaughter, 2001; Mayda, 2006; Hainmueller and Hiscox, 2007 and 2010; Schuller, 2016) and the way in which individuals process information from the media. Therefore, we also investigate whether the level

[15] Bulgaria, Georgia, Hungary, Moldova, Poland, Romania, Serbia and Montenegro, Turkey, and Ukraine are grouped as low income countries, whereas Cyprus, Finland, Germany, Italy, Norway, Slovenia, Spain, Sweden, Switzerland, and the USA belong to the high income group. Note that the two groups would also be consistent with Eastern vs. Western European countries with the only noticeable exception for the USA added to the Western European group.

Table 11 Regression results—pro-immigration index and negative news for people with low education

	High trust in media news			No trust in media news		
Model	I	II	III	I	II	III
Negative news						
News	−0.0465***	−0.0133***	−0.0226***	−0.0324***	−0.0245***	−0.0211***
	(0.006)	(0.007)	(0.001)	(0.002)	(0.005)	(0.000)
News right	−0.0201	−0.0176	−0.0045*	−0.0134**	−0.0121**	−0.0032**
	(0.124)	(0.012)	(0.002)	(0.006)	(0.006)	(0.001)
News left	0.0119	0.0157	0.0029	0.0135***	0.0123***	0.0043**
	(0.125)	(0.011)	(0.002)	(0.006)	(0.006)	(0.001)
Political orientation (reference group: moderate)						
Right	−0.0056	−0.0044	−0.0069	−0.0030	−0.0031	−0.0033
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Left	0.0477***	0.0476***	0.0478***	0.0435***	0.0436***	0.0434***
	(0.005)	(0.005)	(0.005)	(0.001)	(0.005)	(0.005)
R^2	0.279	0.276	0.278	0.277	0.233	0.230
Obs	13,965	13,965	13,965	13,965	13,965	13,965

***, **, and * denote rejection of the null hypothesis at 1%, 5%, and 10% levels, respectively. Standard errors (reported in brackets) were clustered by country. Respondents with a primary degree are classified as people with low education. Individual and country level controls are included in the estimation. Please refer to Table 2 for the set of control variables with the exclusion of the education variable

of education moderates the reaction to news on immigration. To this end, we split the sample into two sub-samples according to individuals' level of education (low or high).[16]

The results, reported in Tables 8, 9, 10, and 11, are consistent with our previous findings. However, it appears that in the case of people educated to a low level, even for those with no trust in the media, the coefficients associated to All News, as well as Negative News, variables are always negative and statistically significant even for those with no trust in the media, while in the case of the highly educated, those coefficients are still negative (with a smaller magnitude in absolute value) and not statistically significant. We interpret these results as evidence that education does affect reactions to news on immigration, as the highly educated, in forming their attitudes to immigration, rely more on their prior beliefs. In this respect, our results are consistent with findings of Schuller (2016) who, in analyzing the effects on pro-immigration attitude of news related to the September 11, 2001, terrorist attacks, shows that educated people are less influenced by negative news.

Finally, to check the robustness of our whole sample results, we also estimate the model with countries' fixed effects (see Tables 15, 16, 17, 18 in Appendix 2). The fixed effect specification does not allow us to include unemployment, GDP per capita growth, or the News indicator as the above variables are country-specific. The results, however, as far as the interaction terms are concerned, are in line with

[16] Respondents with a primary degree are classified as people with low education, whereas those with a secondary degree or higher are classified as highly educated.

Table 12 Member function weights

Variables	w2	w3
Social tolerance	0.03365	0.12367
Economic tolerance	0.25075	0.04889
Political tolerance	0.08775	0.07582
Trust	0.09522	0.11409
A. Requisites for citizenship	0.10612	0.17077
B. Requisites for citizenship	0.11637	0.16691
C. Requisites for citizenship	0.18220	0.12244
Ethnic diversity	0.12793	0.17740
Total	1	1

w2 are normalized weights calculated as inverse functions of the fuzzy proportion of each variable, according to Eq. (5). W3 are normalized factor loadings by means of PCA (principal component analysis)

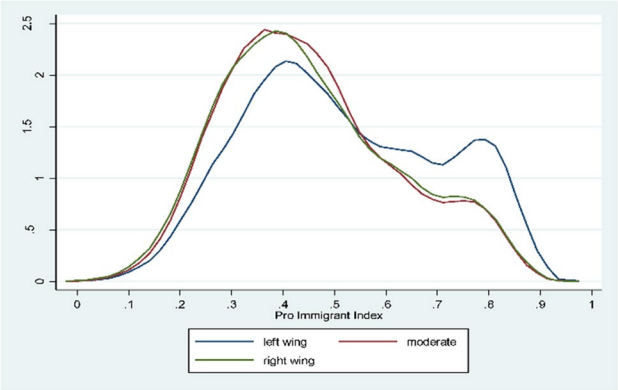

Fig. 1 Pro-immigrant index distributions for political orientation

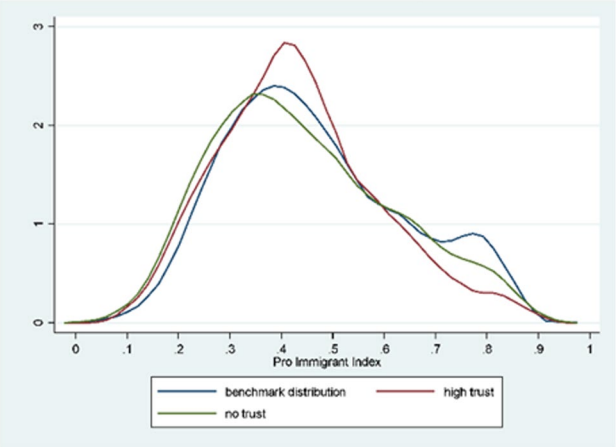

Fig. 2 Pro-immigration index distributions conditional upon the degree of trust in news (high trust and no trust)

our previous results, confirming the difference between people with high trust in media news and those with low trust in media news. The interaction terms, News Right$_{i,j}$ and News Left$_{i,j}$, confirm our previous findings showing statistically significant coefficients, with respectively negative and positive signs. A negative and statistically significant effect of individuals with right-wing political orientation is now found.

Conclusions

This paper analyzed the effects of media coverage on individuals' pro-immigration attitudes. The novel pro-immigration attitude index proposed was calculated by means of a fuzzy approach. The results can be summarized as follows: both the coverage and negative tone of news attenuate pro-immigration attitudes, albeit only for those with high trust in the media. By contrast, for individuals with no trust in the media, news on immigration strengthens the effects of political orientations, further eroding the pro-immigration attitude in the case of individuals with negative prior preferences (right-leaning), while increasing the pro-immigration attitude in the case of individuals with positive prior preferences (left-leaning). Therefore, in the latter case, media news radicalizes individuals' prior preferences on immigration, captured by their political orientation.

Table 13 Descriptive statistics

	Pro-immigration index					Right			Left		
Countries	Obs	Mean	C.V	Min	Max	Obs	Mean	C.V	Obs	Mean	C.V
Bulgaria	661	0.431	0.422	0.004	0.957	97	0.189	2.061	178	0.346	1.375
Cyprus	1.017	0.430	0.467	0.000	0.981	244	0.255	1.709	317	0.331	1.441
Finland	929	0.544	0.402	0.000	1	272	0.321	1.451	212	0.249	1.738
Georgia	1.09	0.317	0.507	0.004	0.931	250	0.362	1.328	91	0.132	2.556
Germany	1.559	0.504	0.461	0.000	1	239	0.167	2.215	550	0.384	1.265
Hungary	892	0.405	0.397	0.000	0.981	221	0.281	1.603	135	0.171	2.208
Italy	813	0.491	0.425	0.000	0.993	164	0.264	1.671	265	0.428	1.156
Moldova	922	0.423	0.413	0.000	0.991	282	0.377	1.286	156	0.208	1.951
Norway	978	0.661	0.352	0.000	1	331	0.345	1.379	276	0.287	1.574
Poland	784	0.408	0 424	0.033	0.993	197	0.326	1.438	102	0.169	2.218
Romania	1.18	0.488	0.415	0.000	0.993	291	0.403	1.238	122	0.148	1.541
Serbia	1.209	0.441	0.437	0.067	0.993	250	0.212	1.929	505	0.474	1.052
Slovenia	784	0.449	0.487	0.000	1	131	0.244	1.766	147	0.274	1.627
Spain	861	0.463	0.434	0.000	1	144	0.187	2.091	381	0.496	1.011
Sweden	897	0.801	0.228	0.021	1	342	0.389	1.254	306	0.348	1.367
Switzerland	1.084	0.611	0.355	0.037	1	262	0.267	1.655	335	0.341	1.391
Turkey	1.067	0.431	0.482	0.000	0.988	390	0.421	1.171	239	0.257	1.701
Ukraine	635	0.481	0 392	0.081		120	0.279	1.609	76	0.176	2.164
United States	1.142	0 499	0 422	0.000	0.993	314	0.278	1.539	199	0.183	1.863

The pro-immigration index is calculated according to fuzzy set theory described in the "Pro-immigration Index" section. Right and Left measure political orientation. The moderate political orientation is omitted because it represents the reference class. For this reason, the sum of individuals who claim to vote for left-wing and right-wing parties is not equal to the number of observations related to the immigration index. C.V. stands for the coefficient variation (or relative standard deviation). This is reported instead of the standard second moment as mean values are substantially different across countries

Table 14 Descriptive statistics (cont.)

Country	News index all	News index negative
Bulgaria	14.07	5.62
Cyprus	14.24	6.92
Finland	13.98	6.53
Georgia	12.47	5.76
Germany	36.67	18.89
Hungary	20.25	10.05
Italy	31.93	15 22
Moldova	11.11	5.55
Norway	25.84	12.61
Poland	20.03	8.98
Romania	18.25	8.65
Serbia	16.31	6.54
Slovenia	13.68	7.01
Spain	34.12	16.81
Sweden	22.26	10.78
Switzerland	29.41	13.87
Turkey	29.06	14.15
Ukraine	20.21	11.08
United States	44.11	21.41

The News index used has the following form: News index all (negative) = ln[e + News all (negative)]

Appendix 1

Indicators Used for the Pro-immigration Index

The variables used for calculating the pro-immigration index can be grouped into eight categories. The eight categories and associated questions, taken from World Values Survey Database, are the following:

i) Social tolerance—Do you want immigrants/foreign workers as neighbors? This question returns a dichotomous response: yes (value 1) or no (value 2);
ii) Economic tolerance—When jobs are scarce, employers should give priority to [domestic] people over immigrants. This question returns a polytomous response: Agree (value 1), Neither (value 2), Disagree (value 3);
iii) Political tolerance—How about people from other countries coming here to work? Which of the following do you think the government should do? This question returns a polytomous response: Let anyone come who wants to? (value 1), Let people come as long as there are jobs available? (value 2), Place strict limits on the number of foreigners who can come here? (value 3), Prohibit people from coming here from other countries? (value 4);
iv) Trust—I'd like to ask you how much you trust people from various groups. Could you tell me whether you trust people of another nationality completely, somewhat, not very much or not at all? This question returns a polytomous response: trust completely (value 1), trust somewhat (value 2), do not trust very much (value 3), do not trust at all (value 4);
v) Requisites for citizenship—In your opinion, how important should the following be as requirements for somebody seeking citizenship of your country? Specify for each requirement if you consider it very important, rather important or not important. In this case, we identify three questions concerning requirements for citizenship: (a) Having ancestors from my country; (b) Being born on my country's soil; (c) Adopting the customs of my country—The questions return a polytomous response: very important (value 1); rather important (value 2); not important (value 3);
vi) Ethnic diversity—Turning to the question of ethnic diversity, with which of the following views do you agree? Please use this scale to indicate your position. This question returns a polytomous response: ethnic diversity erodes a country's unity (value 1), …, ethnic diversity enriches life (value 10).

Weights associated to each member function are reported in Table 12

Data Descriptive Statistics

A first visual summary of the pro-immigrant index distributions due to political orientation is provided in Fig. 1. It can be seen from this figure that the distributions are quite similar for people who vote right and moderate. In particular, we note that the modal value of the indicator is about 0.4. By contrast, the distribution of the indicator for people who vote for left-wing parties shifts to the right, showing greater propensity toward immigration. Moreover, the distribution is bimodal, with the higher mode characterized by lower propensity toward immigration (with a value slightly higher than 0.4); hence, the left-leaning people show a higher heterogeneity

Furthermore, we report the pro-immigration index distributions conditional upon the degree of trust in news (high trust and no trust). The unconditional distribution is also shown as the benchmark distribution. Figure 2 shows the distributions in this case.

We observe that the distribution of people with high confidence in news is more concentrated around the median value, with tails lower than those of the distribution of people with low confidence. We interpret this behavior of the distribution as evidence of a process of convergence in opinion in case of high trust in media. The distribution of

people with no trust in news is very similar to the benchmark distribution except for the extreme values. With respect to the distribution of people with high trust in news, it is less concentrated around the median value and has the right tail fatter. We interpret this behavior of the distribution as evidence of a higher heterogeneity in opinion which is more polarized. Reassuringly, in case of high trust in media, it seems that news convey towards a convergence of opinions, by reducing the effects of prior beliefs.

Tables 13 and 14 present a set of descriptive statistics for the variables of interest. The pro-immigration index average is particularly high in the cases of Finland, Norway, Sweden, and Switzerland, albeit experiencing higher volatility. Georgia has the lowest (0.317), whereas the remaining 14 countries considered range between 0.408 (Poland) and 0.499 (USA). On average, individual respondents who stated they had a political orientation to the right or left were almost equally split, with ten countries out of 19 showing a higher percentage associated to a right-wing political orientation. Descriptive statistics on news are also very informative. Countries with the most exposure to news on immigration are Germany, Italy, Spain, and the USA, whereas eastern European countries appear to be the least exposed. A similar pattern is observed when we look at countries highly exposed to negative news, whereas Bulgaria, Cyprus, Finland, Moldova, and Serbia appear to be the least exposed to negative news.

Appendix 2

Table 15
Table 16
Table 17
Table 18

Table 15 Fixed effects regression results—pro-immigration index and all news for developed countries

	High trust in media news			No trust in media news		
Model	I	II	III	I	II	III
All news						
News right	0.0016	0.0036*	0.0006	−0.0040**	−0.0044*	−0.0006
	(0.002)	(0.017)	(0.0005)	(0.015)	(0.002)	(0.0003)
News left	−0.0011	−0.0014	−0.0006	0.0078**	0.009***	0.0020**
	(0.004)	(0.029)	(0.0008)	(0.002)	(0.003)	(0.0008)
Political orientation (reference group: moderate)						
Right	−0.0176**	−0.0183**	−0.0183**	−0.0113*	−0.0132*	−0.0128**
	(0.006)	(0.067)	(0.006)	(0.060)	(0.006)	(0.006)
Left	0.0361***	0.0374***	0.0372***	0.0250**	0.0262**	0.0261**
	(0.008)	(0.081)	(0.008)	(0.009)	(0.010)	(0.010)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Individual level control variables						
Tolerance		0.0177***		**Income (reference group: low income)**		
		(0.004)				
Altruism		0.0204***		**Medium income**		0.0083
		(0.004)				(0.093)
Trust		0.0545***		**High income**		0.0175**
		(0.006)				(0.068)
Employment		0.088*		**Education (reference group: low education)**		
		(0.004)				
Age		−0.0006***		**High education**		0.0654***
		(0.000)				(0.090)
Gender		−0.0019				
		(0.0027)		**Cities (reference group: small town)**		
				Large town		0.0200***(0.005)
R^2	0.251	0.252	0.251	0.253	0.252	0.253
Obs	8,980	8,980	8,980	8,980	8,980	8,980

***, **, and * denote rejection of the null hypothesis at 1%, 5%, and 10% levels, respectively. Standard errors (reported in brackets) were clustered by country. High income (developed) countries are selected according to the World Bank's Classification of Countries by Income 2009. The countries are Cyprus, Finland, Germany, Italy, Norway, Slovenia, Spain, Sweden, Switzerland, and the USA

Table 16 Fixed effects regression results—pro-immigration index and all news for developing countries

	High trust in media news			No trust in media news			
Model	I	II	III	I		II	III
All news							
News right	0.0016	0.0045*		0.0026	−0.0040**	−0.0044*	−0.0006
	(0.002)	(0.017)		(0.0015)	(0.015)	(0.002)	(0.0003)
News left	−0.0011	−0.0014		0.0036	0.0078**	0.009***	0.0020**
	(0.004)	(0.029)		(0.0008)	(0.002)	(0.003)	(0.0008)
Political orientation (reference group: moderate)							
Right	−0.0176**	−0.0183**		−0.0127**	−0.0113*	−0.0102*	−0.0208**
	(0.006)	(0.067)		(0.006)	(0.060)	(0.006)	(0.006)
Left	0.0361***	0.0374***		0.0372***	0.0250**	0.0262**	0.0261**
	(0.008)	(0.081)		(0.008)	(0.009)	(0.010)	(0.010)
Country dummies	Yes	Yes		Yes	Yes	Yes	Yes
Individual level control variables							
Tolerance		0.0175***		**Income (reference group: low income)**			
		(0.004)					
Altruism		0.0204***		**Medium income**			0.0083
		(0.004)					(0.093)
Trust		0.0525***		**High income**			0.0175**
		(0.006)					(0.068)
Employment		0.045*		**Education (reference group: low education)**			
		(0.004)					
Age		−0.0006***		**High education**			0.0650***
		(0.000)					(0.090)
Gender		−0.0020					
		(0.0027)		**Cities (reference group: small town)**			
				Large town			0.0212***(0.005)
R^2	0.251	0.252	0.251	0.253		0.252	0.253
Obs	9,524	9,524	9,524	9,524		9,524	9,524

***, **, and * denote rejection of the null hypothesis at 1%, 5%, and 10% levels, respectively. Standard errors (reported in brackets) were clustered by country. Low income (developing) countries are selected according to the World Bank's Classification of Countries by Income 2009. The countries are Bulgaria, Georgia, Hungary, Moldova, Poland, Romania, Serbia and Montenegro, Turkey, and Ukraine

Table 17 Fixed effects regression results—pro-immigration index and negative news for developed countries

	High trust in media news			No trust in media news		
Model	I	II	III	I	II	III
Negative news						
News right	0.0012	−0.0015*	0.0004	−0.0020	−0.0009	−0.0002
	(0.001)	(0.0007)	(0.0002)	(0.035)	(0.0009)	(0.0002)
News left	−0.0007	−0.0014	−0.0005	0.0096***	0.0070**	0.0020**
	(0.003)	(0.002)	(0.0008)	(0.003)	(0.002)	(0.0008)
Political orientation (reference group: moderate)						
Right	−0.0210**	−0.0220**	−0.0219**	−0.0142	−0.016*	−0.0164*
	(0.009)	(0.009)	(0.009)	(0.085)	(0.008)	(0.008)
Left	0.0487***	0.0494***	0.0498***	0.0354**	0.0369**	0.0366**
	(0.010)	(0.010)	(0.010)	(0.012)	(0.012)	(0.012)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Individual level control variables						
Tolerance		0.0402***		**Income (reference group: low income)**		
		(0.004)				
Altruism		0.0462***		**Income medium**		0.0296
		(0.004)				(0.016)
Trust		0.0835***		**Income high**		0.0340**
		(0.007)				(0.013)
Employment		0.014				
		(0.010)		**Education (reference group: low education)**		
Age		−0.0010***		**Education high**		0.0963***
		(0.000)				(0.017)
Gender		−0.0031				
		(0.0041)		**Cities (reference group: small town)**		
				Large town		0.0201*** (0.004)
R^2	0.318	0.312	0.301	0.332	0.311	0.291
Obs	8,980	8,980	8,980	8,980	8,980	8,980

***, **, and * denote rejection of the null hypothesis at 1%, 5%, and 10% levels, respectively. Standard errors (reported in brackets) were clustered by country. High income (developed) countries are selected according to the World Bank's Classification of Countries by Income 2009. The countries are Cyprus, Finland, Germany, Italy, Norway, Slovenia, Spain, Sweden, Switzerland, and the USA

Table 18 Fixed effects regression results—pro-immigration index and negative news for developing countries

	High trust in media news			No trust in media news		
Model	I	II	III	I	II	III
Negative news						
News right	0.0012	−0.0025*	0.0004	−0.0020	−0.0009	−0.0002
	(0.001)	(0.0007)	(0.0002)	(0.035)	(0.0009)	(0.0002)
News left	−0.0007	−0.0024	−0.0008	0.0096***	0.0072**	0.0025**
	(0.003)	(0.002)	(0.0008)	(0.003)	(0.002)	(0.0008)
Political orientation (reference group: moderate)						
Right	−0.0210**	−0.0220**	−0.0219**	−0.0142	−0.016*	−0.0164*
	(0.009)	(0.009)	(0.009)	(0.085)	(0.008)	(0.008)
Left	0.0487***	0.0494***	0.0498***	0.0354**	0.0369**	0.0366**
	(0.010)	(0.010)	(0.010)	(0.012)	(0.012)	(0.012)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Individual level control variables						
Tolerance		0.0402***		**Income (reference group: low income)**		
		(0.004)				
Altruism		0.0462***		**Income medium**		0.0296
		(0.004)				(0.016)
Trust		0.0835***		**Income high**		0.0301**
		(0.007)				(0.013)
Employment		0.014				
		(0.010)		**Education (reference group: low education)**		
Age		−0.0010***		**Education high**		0.0563***
		(0.000)				(0.017)
Gender		−0.0031				
		(0.0041)		**Cities (reference group: small town)**		
				Large town		0.0121***(0.004)
R^2	0.318	0.312	0.301	0.332	0.311	0.291
Obs	9,524	9,524	9,524	9,524	9,524	9,524

***, **, and * denote rejection of the null hypothesis at 1%, 5%, and 10% levels, respectively. Standard errors (reported in brackets) were clustered by country. Low income (developing) countries are selected according to the World Bank's Classification of Countries by Income 2009. The countries are Bulgaria, Georgia, Hungary, Moldova, Poland, Romania, Serbia and Montenegro, Turkey, and Ukraine

Data Availability Data are available on request from the authors.

Declarations

Conflict of Interest The authors declare no competing interests.

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