

Diverse News Media Decreases Misperceptions about Immigration *

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Abstract

What are the sources of misperceptions about immigrants? We examine how diversity in the market for news affects misperceptions about the size of the immigrant population in Germany. We propose a theoretical framework in which heterogeneous information from different news outlets diffuses through social interactions. We posit that exposure to diverse information leads to more accurate perceptions in competitive markets. To causally identify effect of news media diversity on misperceptions, we exploit overlapping newspaper coverage areas as a source of exogenous variation in the number of available outlets. Local news monopolies increase misperceptions by between 21% and 38%. We empirically demonstrate that the effect of diverse media hinges on interactions in social networks. For individuals with fewer social connections in ideologically homogeneous networks, misperceptions remain unaffected by media diversity. Our results suggest that consolidation in the market for news can decrease constituents' knowledge about critical policy issues.

Keywords: Political Knowledge; Media; Immigration; Misperception

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1 Introduction

Misperceptions about contentious policy issues, such as immigration, remain pervasive. While anti-immigrant sentiments are a key reason for the recent surge in populism across Europe and the US (Dinas et al. 2019), research suggests that attitudes towards immigrants are often based on false beliefs. In both the US and in Europe, natives vastly overestimate the proportion of immigrants, both at the national and local level (Alesina, Miano and Stantcheva 2018; Hopkins, Sides and Citrin 2018). In a representative survey in 2018, Germans overestimated the proportion of Muslims in the country by more than a factor of four (IPSOS 2018). These misperceptions can have far-reaching consequences: in Europe, the perceived share of immigrants has been shown to be a better predictor of anti-immigrant sentiments and social cohesion than the true proportion of immigrants (Koopmans and Schaeffer 2016; Hooghe and de Vroome 2015; Gorodzeisky and Semyonov 2019). Fittingly, Alesina, Miano and Stantcheva observe that “the political debate about immigration takes place in a world of misinformation”.

Why do individuals hold biased beliefs about immigration? Researchers have investigated the individual-level correlates of knowledge about immigrants (Herda 2010). Others have studied the effects of providing individuals with information treatments in lab or survey experiments (Sides and Citrin 2007; Alesina, Miano and Stantcheva 2018). However, causal evidence on the sources of misperceptions in non-experimental settings remains scarce. In this paper, we examine the causal relationship between misperceptions and an institution that is central to the functioning of democracy: the news media. In particular, we focus on one feature that has recently received considerable attention: diversity and competition in the market for local news (see e.g. Dunaway 2008). We ask whether diversity in the local media landscape affects misperceptions about immigrants. In doing so, we speak to the question of whether further consolidation in the market for news has negative implications for knowledge about salient policy issues.

Our theoretical framework asserts that local newspapers are a key source of information on local events and conditions, including the presence of immigrants. German news outlets vary in their coverage of immigration (Ruhrmann 2002). However, prior research has shown that reporting is, on average, unbiased (Maurer et al. 2019). Even if individuals only consume a single news source, they may be indirectly exposed to information from other outlets through interactions in social networks (Masip, Suau-Martínez and Ruiz-Caballero 2018). Individuals may aggregate diverse information through interpersonal communication, resulting in more accurate perceptions of immigrants (Degroot 1974). As a result, a more diverse news media landscape may lead to more accurate perceptions at the individual level.

Our main data source is a large-scale nationwide survey that was conducted in 2011 (see Koopmans and Schaeffer 2016). About 5,200 respondents reported their perceptions of the relative size of the immigrant population in their local neighborhood. In conjunction with fine-grained census data on the true share of immigrants in those areas, we are able to precisely measure misperceptions at the local level. Akin to work by Ansolabehere, Snowberg and Snyder (2006), we identify the causal effect of news media diversity on misperceptions by exploiting discontinuous changes in the number of available news outlets in neighboring zip code regions. Frequently, newspaper coverage boundaries overlap. As a result, some individuals may have access to multiple news outlets, while their neighbors may only be able to subscribe to one single outlet. We compare individuals living in monopolistic local news markets to neighboring respondents who have access to two or more news sources. We implement this identification strategy through a careful geographic matching algorithm. Our design ensures that individuals in treatment and control groups are both physically close and similar with respect to background characteristics, minimizing the likelihood of confounding.

We find that media diversity reduces misperceptions of the size of the local immigrant population. In monopolistic media markets, misperceptions are between three and five percentage points higher than in segmented media markets. Reassuringly, this result is robust to a number of individual-level controls, as well controls for local population density and un-

employment rates. In addition, we show that the results remain unchanged across a variety of model specifications, model parameter choices, and subsamples. Finally, we devise two empirical tests to rule out that our results are driven by spillovers across neighboring units.

We demonstrate that the effect of media diversity on misperceptions is driven by indirect information aggregation within social networks. In a first step, we leverage an EDCAS survey item that measures the number of local social connections of survey respondents. We show that the effect of news monopolies is strongest when individuals have a large number of social connections. This finding aligns with a model of information diffusion in networks. Individuals in diverse news markets are only exposed to heterogeneous information when their social networks are sufficiently large. In a second step, we use individual political identity as a proxy for ideological homogeneity in networks. In doing so, we explicitly account for homophily in social networks. We document that individuals with a strong political identity are not affected by diversity in the market for news. We conclude that media diversity only affects misperceptions when networks are sufficiently heterogeneous, i.e. when members do not all consume news from the same source.

Our findings contribute to the literature in a number of ways. We present the first causal estimates of the relationship between diversity of the local news media landscape and biased perceptions of immigrants. In doing so, we demonstrate that exposure to information can induce changes in perceptions at the individual level. When individuals obtain their information from a more diverse set of sources, misperceptions are less pronounced. This finding complements experimental work that shows that information treatments can, to some degree, decrease misperceptions (see e.g. Hopkins, Sides and Citrin 2018; Lawrence and Sides 2014). While experimental treatments are frequently one-off interventions in a controlled setting, our study demonstrates the impact of information in the context of continuous exposure to a highly trusted news source.

Second, we underscore the importance of traditional news outlets as sources of informa-

tion and bias in perceptions. Our research is situated in a field that has recently attracted a large degree of attention, as concerns about the spread of false news (Vosoughi, Roy and Aral 2018) and partisan reporting (Haselmayer, Wagner and Meyer 2017) have become widespread. Our work speaks to growing concerns that the declining number of local newspapers reduces constituents' political knowledge, raising issues of democratic accountability and political engagement at the local level (Martin and McCrain 2019; Hayes and Lawless 2015; Ramsay and Moore 2016). We emphasize that misperceptions are not set in stone: rather, a healthy and diverse media landscape can counter false beliefs. Akin to King, Schneer and White (2017), we show that traditional news outlets shape perceptions, discussions and behavior around salient national political issues.

Third, our research also speaks to debates surrounding media polarization and the formation of filter bubbles (Bakshy, Messing and Adamic 2015). While confirmation bias and self-selection likely operate at the individual-level, our results show that media diversity can nevertheless have positive indirect effects. We show that greater variety in the market for news is associated with lower degrees of political misperceptions.

2 Research on Misperceptions

Individuals are prone to overestimate the size of the outgroup. This holds both with respect to immigrants (Koopmans and Schaeffer 2016; Sides and Citrin 2007), as well as for minority populations more generally (Hopkins, Sides and Citrin 2018). In Germany, Herda (2010) estimates that natives overestimate the population share of immigrants by a factor of 1.5. Natives not only misperceive the number of immigrants, but also other factors such as their welfare dependence (Fertig and Schmidt 2001).

A related line of research examines how misperceptions affect political preferences and attitudes. In observational settings, the perceived presence of immigrants has been found

to be more predictive of attitudes and behavior than their actual presence. Hooghe and de Vroome (2015) consider the case of Belgium, and find that a greater perceived presence of immigrants increases natives' hostility towards immigrants, even after accounting for actual contact with immigrants. Similarly, Koopmans and Schaeffer (2016) use data from Germany, the Netherlands, and France to show that the perceived presence of immigrants has a stronger effect on neighborhood cohesion than the true presence of immigrants. Finally, Gorodzeisky and Semyonov (2019) employ survey data from 17 European countries, including Germany, to show that "misperceptions of the size of immigrant population play a more important role than factual reality in shaping public views and attitudes toward immigration". In conclusion, research on misperceptions and anti-immigrant attitudes suggests that perceptions play an outsized role in attitude formation.

How does the media affect misperceptions? A large body of research has examined the relationship between media coverage and attitudes towards immigrants (see e.g. Boomgaarden and Vliegenthart 2007; Vliegenthart, Boomgaarden and Spanje 2012; Schlueter and Davidov 2013; Blinder and Jeannet 2018). However, there is relatively little research on the relationship between media consumption and knowledge about immigration. A major example is Herda (2010), whose findings can be described as ambiguous. Herda regresses Europeans' misperceptions on self-reported measures of radio, newspaper, and TV consumption. While media consumption is associated with misperceptions, the direction of the effect depends on the type of media that respondents consume. Regarding the consumption of newspapers, the literature offers similarly ambiguous findings. Both Vergeer, Lubbers and Scheepers (2000) and Arendt (2010) show that newspaper consumption affects perceived threat and implicit attitudes towards migrants. However, their conclusions on the consumption of multiple outlets diverge. Vergeer, Lubbers and Scheepers (2000) state that consuming multiple outlets makes individuals less likely to perceive immigrants as threatening. Arendt (2010), on the other hand, finds that reading more than one newspaper increases negative implicit attitudes towards immigrants. Our research builds on these valuable insights. We utilize a

research design that exploits discontinuous changes in media market structure. In doing so, we expand on prior research by explicitly accounting for self-selection in media consumption (Freddi 2017).

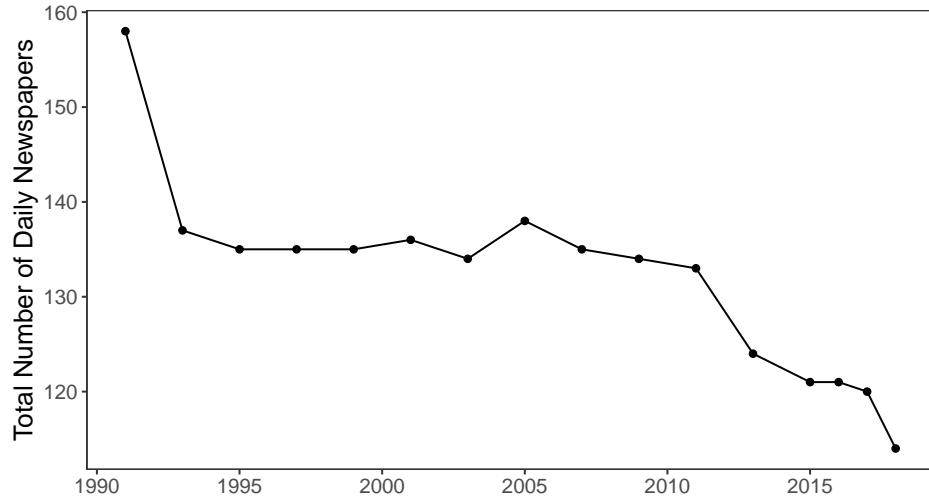
3 Local News in Germany

We measure misperceptions at the local level. Individuals in our sample report on the perceived share of immigrants in their neighborhood. Consequently, we analyze the local media environment as a potential source of misperceptions, as local newspapers are the only outlets that consistently report on the events and local conditions in a given region.

German local newspapers are well-established and highly trusted. In 2011, local newspapers reached 55.8% of all adults in Germany. Although online news sources have become more important in recent years, their relevance was still limited when our data was collected. In a representative survey of the German adult population in 2010, only 16% of respondents indicated that they consumed online news. In addition, daily newspapers were deemed considerably more reputable than online sources: 43% of respondents listed them as their most trusted source of information, compared with only 6% for online news sources (Bundesverband Deutscher Zeitungsverleger 2011). In a 2008 survey, 97% of readers agreed that their local newspaper is a well-established regional institution, while 87% of respondents stated that their local newspaper acts as a “mouthpiece for the people in the region”. According to a representative survey from 2018, Germans view local newspapers as more trustworthy than even the most reputable national newspapers (Nic et al. 2018, p. 81). When asked about the reasons for reading the local newspaper, respondents most frequently mention local news reports about the region (87%), edging out national and international news.

Mirroring trends across a number of industrialized countries, traditional news outlets in Germany face declining readership numbers and market consolidation. Local newspaper

Figure 1: German Newspapers 1991 – 2018



Note: This figure shows the total number of daily newspapers in Germany between 1991 and 2018. Data obtained from Statista (2019).

readership has been in steady decline over the last two decades. The total circulation of local newspapers in Germany has decreased by over 38%, from 18.1 million in 1995 to 11.1 million in 2018, raising concerns about decreasing diversity and consolidation in the market for local news (Trappel et al. 2013). The total number of daily newspapers Germany has declined by 11% between 2011 and 2018 (Bundesverband Deutscher Zeitungsverleger 2018). Similar trends in the market for local news in the UK and the US have sparked concerns that the decreasing number of outlets available at the local level may render citizens less informed about local events. As a consequence, access to fewer news outlets may compromise the extent to which constituents can hold local officials accountable (Hayes and Lawless 2015; Ramsay and Moore 2016).

3.1 News Coverage of Immigrants

German local newspapers frequently report on both first and second-generation immigrants (Müller 2005). Ruhrmann and Meißner (2000) and Delgado (1972) find that coverage often focuses on immigrant crime and labor market participation. In a large-N content analysis,

Fick (2006) shows that local newspaper reporting has become more positive in recent years.

Prior research on immigration coverage in local news suggests a great deal of variance. In an analysis of four local newspapers in the state of Thüringen, Ruhrmann (2002) describes considerable variation in coverage of immigrants. Based on a random sample of 1,150 articles, Ruhrmann shows that the *Thüringische Allgemeine* is about twice as likely to cover immigrants than the *Thüringische Landeszeitung*. In addition to the amount of coverage, the thematic focus of the four news outlets varies considerably. Of all articles covering immigration, about of 30% of those appearing in the *Thüringische Allgemeine* cover immigrant crime. For the *Thüringische Landeszeitung*, the share of crime-related reporting is only 17.6%.

While there is variation in news coverage about immigrants, prior research suggests that local news outlets do not consistently slant their reporting in one direction. This assumption is supported by Maurer et al. (2019), who analyze over 4,000 news reports on immigrants across six German news outlets. They find that, as the number of immigrants increases after 2014, the mean number of reports across all outlets increases proportionally. On average, news coverage accurately reflected composition of immigrants in terms of age, nationality and gender. However, coverage between newspapers varies in frequency of reporting on immigrants as well as in terms of sentiment of the coverage. Taken together, the evidence described by Maurer et al. (2019) indicates that the German media landscape is, on average unbiased in their coverage of immigration.

4 Information Aggregation in Social Networks

It widely recognized that information can diffuse through interactions in social networks (Ellison and Fudenberg 1995; Huckfeldt, Dalton and Levine 1995). Information a given news outlet may therefore reach even those individuals who do not directly consume news from the outlet in question (Druckman, Levendusky and McLain 2018). If multiple outlets cover

topics such as immigration, individuals can be exposed to a variety of viewpoints, both directly and indirectly. While individuals likely select into consuming news from outlets that confirm their prior beliefs (Mullainathan and Shleifer 2005), they may be exposed to other outlets through interactions in social networks. Prior research shows that individuals aggregate multiple opinions or viewpoints from others in their networks (Chandrasekhar, Larreguy and Xandri 2015). Consequently, individuals' perceptions can be approximated as an average of the information they are exposed to in their network (Degroot 1974; Golub and Jackson 2012).

As a result of market consolidation, an increasing number of German regions are covered by only one local news outlet. We expect that individual misperceptions in monopolistic markets to be stronger than in competitive markets. We argue that this is caused by a lack of information aggregation from multiple outlets. Local reporting on immigrants differs across news outlets, even when newspapers are active in the same market (Ruhrmann 2002; Fick 2006). Newspaper vary in terms of frequency, topical content and sentiment of immigration coverage. To put it differently, newspapers 'slant' their coverage of immigrants (Ruhrmann 2002). Differences in coverage may render the issue of immigration more or less salient (see e.g. Boomgaarden and Vliegenthart 2009), affecting perceptions of the size of the local immigrant population. While slant exists, the coverage of immigration in the German news media is, on average unbiased (Maurer et al. 2019, see also Section 3.1 for a more detailed discussion).

In markets with multiple news outlets, information diffusion in social networks enables readers to aggregate information from all available local news outlets. Even if individuals only consume news from one outlet, they may still be indirectly to information from different news outlets through interactions in social networks (Masip, Suau-Martínez and Ruiz-Caballero 2018). We posit that indirect exposure leads to aggregation of information from different sources (Chandrasekhar, Larreguy and Xandri 2015). Following Maurer et al. (2019), we assume that averaging information across multiple outlets is likely more accurate than relying

on information from only one outlet. This leads us to the following hypothesis.

Hypothesis 1: Individual misperceptions are larger in monopolistic markets than in competitive markets.

Information aggregation crucially depends on indirect exposure interactions in social networks. In the absence of such interactions, information aggregation cannot occur. As long as not all network members consume news from the same source, more network connections will increase the number of outlets individuals are exposed to. Therefore, we would expect the effect of media diversity to increase as the number of social connections gets larger.

Hypothesis 2: The difference in misperceptions between monopolistic markets and competitive markets increases in the size of an individual's social network.

In addition to network size, network composition and homophily has been demonstrated to affect information diffusion (Golub and Jackson 2012). Social networks tend to be composed of individuals that are similar with respect to demographic, behavioral and economic characteristics (McPherson, Smith-Lovin and Cook 2001). At the same time, ideologically similar individuals have been shown to select into reading similar outlets (Stroud 2011). When all individuals in a network consume news from one and the same outlet, there can be no indirect exposure to information from other outlets. As a result, we expect that the effect of a diverse market for news should be smallest in highly homogenous networks, where members are alike and therefore consume news from the same outlet.

Hypothesis 3: The difference in misperceptions between monopolistic markets and competitive markets is smallest for individuals who are embedded in ideologically homogenous social networks.

Summarizing our theoretical argument, we argue that a more competitive market for local news should decrease individual misperceptions regarding immigrants. We postulate that individuals are indirectly exposed to diverse information through their social networks. Consequently, they may aggregate information, resulting in more accurate perceptions of

immigrants. Based on the proposed mechanism of information diffusion in networks, we expect that the effect of media diversity should be strongest for individuals embedded in large and sufficiently heterogenous social networks.

5 Data and Empirical Strategy

To study the effect of news media diversity on misperceptions, we combine survey data with fine-grained information on the coverage areas of all German newspapers in 2011. To measure misperception at the individual level, we draw on the *Ethnic Diversity and Collective Action Survey* (EDCAS). With an effective sample size of around 5,200, EDCAS is the largest and most comprehensive survey that measures individual perceptions of the size of the local immigrant population in a single European country. The EDCAS survey was conducted in 2010 by Koopmans and Schaeffer (2016), who also provide more details on the design and sampling procedure of the survey (Schaeffer et al. 2011).

In addition to socio-economic and demographic information, EDCAS includes a large number of survey items related to attitudes towards immigrants, social capital, social cohesion and trust. Most importantly, the EDCAS survey asks respondents to estimate the proportion of immigrants in their local area. For each respondent, we also observe the zip code area where he or she resides. In conjunction with fine-grained data from the 2011 German Census on the true spatial distribution of immigrants across the country, this allows us to precisely measure the degree to which individuals under- or overestimate the local presence of immigrants. We combine this data with a comprehensive dataset on the coverage areas of all local newspapers in Germany. The newspaper coverage data enables us to calculate the number of outlets that report on local news in each respondent's zip code region.¹

¹We obtained the proprietary coverage area data from the media market research company *Zeitungsmarktforschung Gesellschaft* (ZMG). ZMG is a part of the “Federation of German Newspaper Publishers” (BdZV), the trade organization of German newspaper publishers.

5.1 Outcome: Misperceptions

We define misperceptions as the distance between individual estimates of the true immigrant population, and the true presence of immigrants. To measure misperceptions, we combine an EDCAS survey item with grid-square data from the 2011 German Census. In the EDCAS survey, respondents are asked to estimate the combined share of first- and second-generation immigrants in their local neighborhood. The precise question is as follows:

How large is the percentage share of people with a migration background in your neighborhood? Migration background refers to a person that was either not born in Germany, or a person with [at least] one parent born outside of Germany.
Please indicate a number between 0 and 100 percent.²

The survey item implies a relatively small geographic area. In multiple other parts of the survey, ‘neighborhoods’ are defined as areas within ten minutes walking distance from respondents’ homes. For data privacy reasons, we are not able to perfectly align this definition of ‘neighborhood’ with the geographic unit at which the true proportion of immigrants is measured. For each EDCAS respondent, we have information on the zip code region where she or he resides. While zip code regions are larger than the definition of the neighborhood described in the EDCAS survey, they are the smallest geographical units at which we can measure the true proportion of immigrants.

As shown above, EDCAS respondents are explicitly asked to provide an estimate of the relative size of the combined first- and second-generation immigrant population. Consequently, we construct estimates of the combined share of first- and second-generation immigrants for all zip code regions in Germany. In doing so, we rely on population figures from the 2011 German census, which are provided at the 1km^2 grid square level. For each

²Translated from the original German survey item. Please see Section A.4 in the appendix for the German wording.

grid cell, we observe the absolute number of natives and first-generation immigrants. We proceed in two steps. First, we aggregate the grid cells to the zip code level by matching grid centroids to the closest zip code area centroid. This step gives us the share of first-generation immigrants in each zip code area. While the census does not distinguish between second-generation immigrants from natives, county-level figures for those two groups are available from the German Federal Statistical Office. In a second step, we therefore multiply the zip code level proportion of first-generation immigrants by the ratio of first-generation to total immigrant population at the county level.³ Based on the estimated proportion of immigrants at the zip code level, we then define misperceptions of individual i living in zip code region j as follows:

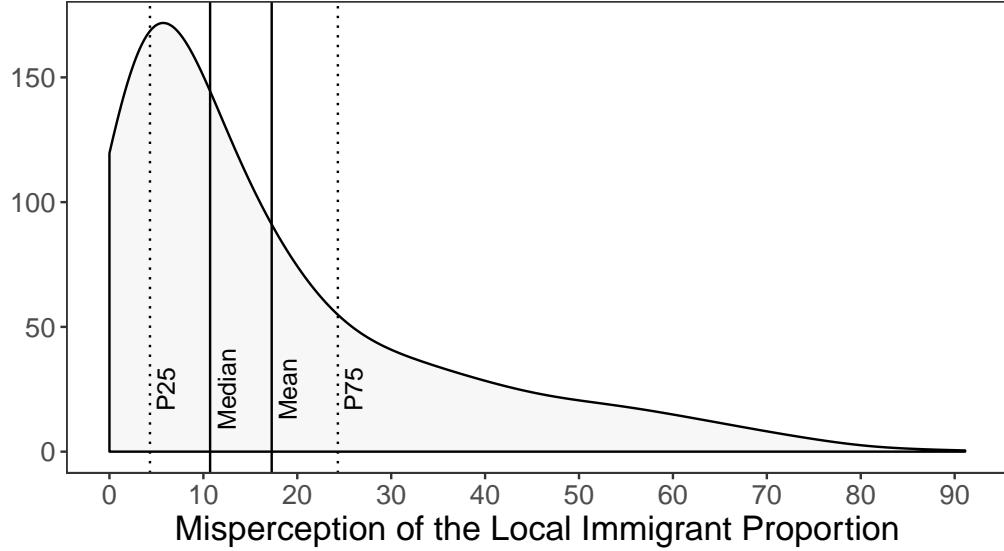
$$Y_{i,j} = |\text{Immigrants}_{i,j}^{\text{Perceived}} - \text{Immigrants}_j^{\text{True}}|$$

We operationalize misperceptions as the absolute difference between the perceived and true proportion of immigrants. Our measure of misperceptions therefore incorporates both overestimation and underestimation of the true presence of immigrants. In Figure 2, we visualize the distribution of our outcome variable. Misperceptions are widespread: respondents misperceive the true proportion of immigrants by, on average, 17 percentage points. Given that the average size of the immigrant population across zip codes is merely 13.66%, misperceptions are sizable.

While respondents consistently fail to provide correct estimates of the true local immigrant proportion, perceptions do map to changes in the proportion of immigrants. In Figure 3, we display the average perceived share of immigrants conditional on the true share in each zip code area. Although overestimation is pervasive, the average perceived share of immigrants increases in the true proportion of immigrants. We also explore the individual-level predictors of misperceptions by regressing misperceptions on a range individual-level covariates. In Figure A.2 in the appendix, we present the results from this supplementary

³We assume that the ratio of first-generation immigrants to individuals with any migration background is constant within counties.

Figure 2: Misperceptions about Immigration



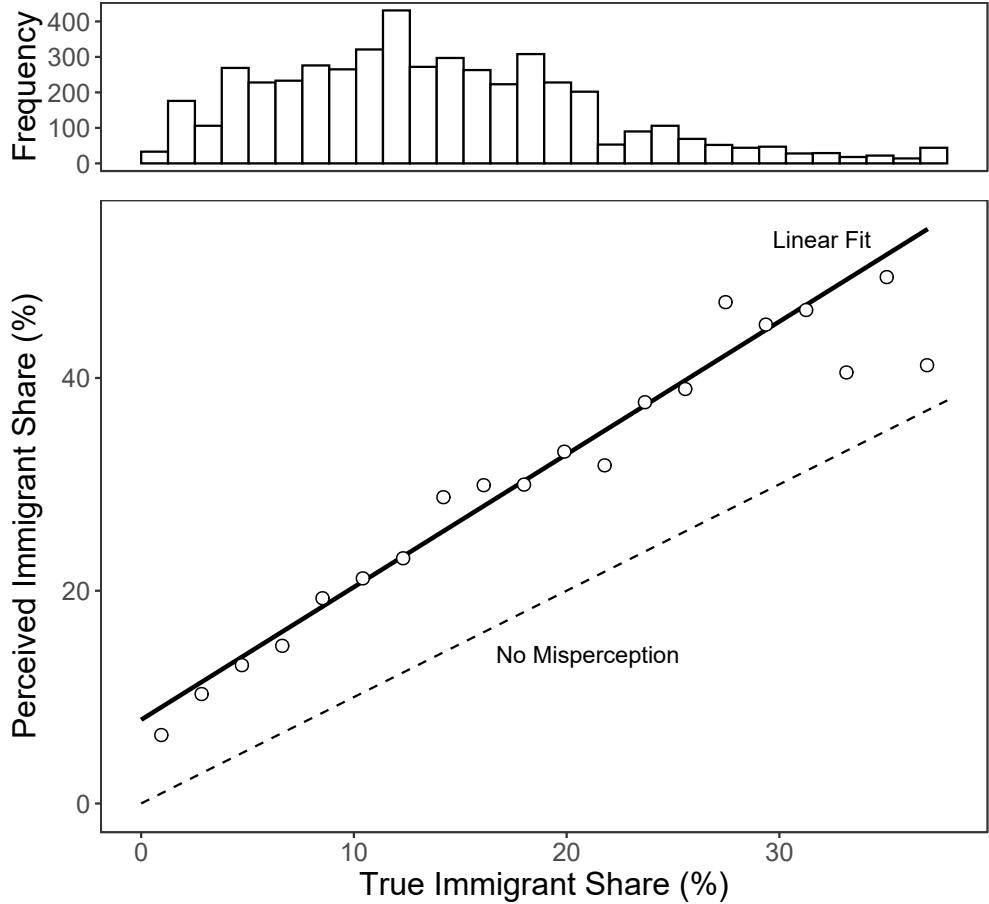
Note: Misperception is defined as the absolute difference between the perceived and true proportion of immigrants for individual i living in zip code region j . The true proportion is measured at the level of the zip code area. The dotted vertical lines indicate the interquartile range, while the solid vertical lines indicate mean and median misperceptions among all survey respondents.

analysis. Misperceptions tend to be less pronounced for older respondents with higher incomes. A minority of EDCAS respondents are migrants themselves. Strikingly, we observe that misperceptions are particularly strong among these immigrant respondents. Possibly, immigrants interact more frequently with other immigrants, leading them to overestimate the presence of immigrants in their local area.

5.2 Explanatory Variable: Media Market Diversity

Our main independent variable is a binary variable $T_{i,j}$, which is equal to one if an individual lives in a zip code region that is covered by only a single local newspaper and zero otherwise, if multiple news outlets cover the area. We argue that the effects of media consolidation are likely most pronounced when they lead to the formation of local monopolies (Gentzkow, Shapiro and Sinkinson 2011). As an additional robustness check, we also discuss a specification that uses the number of outlets in a local market as the primary independent variable

Figure 3: Perceived and Actual Share of Immigrants



Note: In the bottom panel, the x-axis shows the true immigrant share in each zip code area, and the y-axis shows the average perceived share of immigrants. The binned scatter plot shows average perceptions conditional on levels of true immigrant shares. The dashed line illustrates a scenario in which perceptions are unbiased, i.e. where the true share on average equals the perceived share. The solid line displays predicted values from a linear regression model fitted to the EDCAS data. The top panel is a histogram of the true immigrant shares.

in Section 6.2.

There is considerable regional variation in the presence of newspaper monopolies. Figure A.1 in the appendix illustrates the spatial distribution of local news monopolies. In 44.1 % of German zip code regions, the market for local news is monopolistic.⁴

⁴A potential source of measurement error in our newspaper data is that some outlets are available outside of their key coverage regions. Individuals may subscribe to a newspaper regardless of whether this outlet covers local news in their residential area. Former residents of Berlin, for instance, may continue to subscribe to the *Berliner Zeitung* even after moving to a different state. This should not affect our

5.3 Empirical Strategy

To identify the causal effect of local newspaper monopolies on misperceptions, we exploit exogenous geographic variation in the coverage areas of local newspapers. We compare individuals in news monopoly regions to individuals that are similar with respect to a variety of observable characteristics but are situated in neighboring segmented markets. Our empirical strategy hence follows the ‘local randomization’ framework in geographic discontinuity designs in assuming that the treatment is as good as randomly assigned at the border of media market coverage areas (Cattaneo, Titiunik and Vazquez-Bare 2019). We implement this identification strategy through a matching algorithm, which most closely approximates the idea of comparing individuals across the boundaries of coverage areas. We proceed in two steps:

1. For each treated individual residing in a monopoly region, we identify all available control individuals within a radius of z kilometers. Control individuals have to live in regions covered by the treated individual’s newspaper, and also by at least one additional outlet. The last condition allows us to specifically analyze regions where newspaper coverage areas overlap.
2. Among the set of potential control units, we choose the M units that are closest to the treated unit, as measured by the Mahalanobis covariate distance.

We include migration background, gender, age, employment status, and education on the individual level and population density and the unemployment rate at the zip code level as outcome of interest, misperception, since individuals cannot obtain any relevant information about immigrants in their local area through such outlets. However, out-of-state subscriptions may lead us to falsely classify some monopolistic markets as segmented. We address this issue by discarding all outlets that account for less than 1% of all subscriptions in a given region. We emphasize that all of our results hold regardless of this coding procedure.

covariates in this step. As recommended by Imbens and Rubin (2015, p. 451), we vary the maximum number of control units that are matched to each treated unit $M \in \{1, 2, 3, 4\}$ as an additional robustness check.⁵ Finally, we also vary the maximum allowed distance between matched treated and control units z .

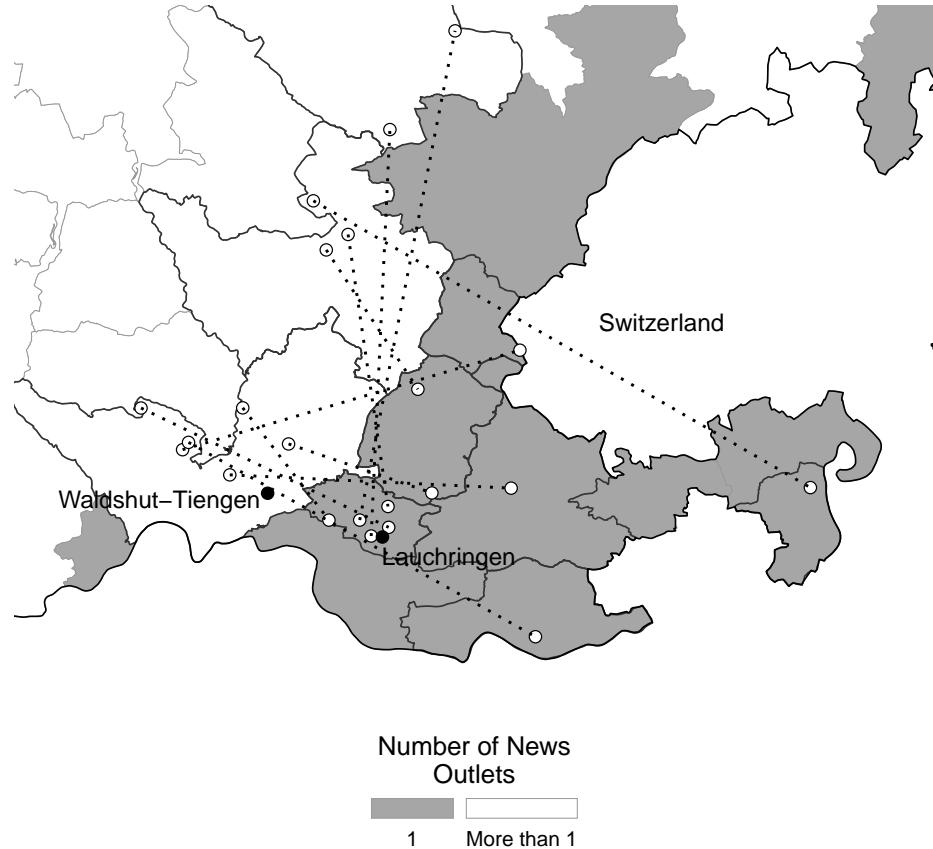
We view matching as a nonparametric pre-processing step in our analysis (Ho et al. 2007; Iacus, King and Porro 2019). All treated units for which no match within a radius of z kilometers could be found are pruned. We also match with replacement, i.e. one control unit can be matched to multiple treated units. In doing so, we prioritize unbiasedness over variance reduction and do not artificially inflate our sample size by duplicating control observations. Each matched control unit enters the dataset only once. All unused control units are removed from the dataset.

We visualize the matching procedure in Figure 4. In the southern part of the state of Baden-Wuerttemberg, two local newspapers, the *Badische Zeitung* and the *Südkurier* are available in the city of Waldshut-Tiengen. However, only the latter newspaper covers the neighboring regions around the city of Lauchringen, creating a local monopoly. We assume that this variance in the independent variable across geographically close regions within one single county is exogenous to our potential outcome of interest. Before we discuss the identifying assumption, we emphasize that spillovers between areas with and without local monopolies could pose a problem in our setting. We use two different tests to address spillovers in Section A.3. We find no evidence that spillovers lead to biased treatment effect estimates.

Generally, we achieve identification by comparing individuals in monopoly markets who live very close to individuals in regions with at least one additional news source. We assume that, conditional on geographic proximity *and* conditional on covariates, the treatment as-

⁵The returns to increasing the number of control units matched to each treated unit with respect to reducing the sampling variance of the treatment effect estimate decrease rapidly beyond $M = 4$ (Rosenbaum 2020).

Figure 4: Visualization of the Matching Procedure



Note: The figure depicts the southern part of the state of Baden Wurttemberg, Germany. Darker-shaded regions are local news monopolies. The jittered white circles represent respondents that are part of the matched sample. Respondents are matched to each other when the circles are connected by dotted lines.

assignment is independent of the potential outcomes for the control units:

$$T_{i,j} \perp\!\!\!\perp Y_{i,j}(0) | X_{i,j}$$

We only require that the treatment assignment is independent of the potential outcomes for the control units. This is possible because (1) we estimate the average treatment effect on the treated (ATT) and (2) the sample moments of the distribution of $Y(1)$ among the treated units are observable (Heckman, Ichimura and Todd 1997, p. 611). As usual when implementing matching estimators, also assume overlap for the control units, i.e.

$0 < P(T_{i,j} = 1|X_{i,j}) < 1$. In Figure A.3, we present balance on observables before and after matching and at varying distance cutoffs z . Our matching algorithm considerably improves balance on observables, particularly with respect to zip code level characteristics.

Our main results are derived from an OLS specification that can be described as follows:

$$Y_{i,j} = \alpha + \tau \text{Monopoly}_j + \varepsilon_{i,j}$$

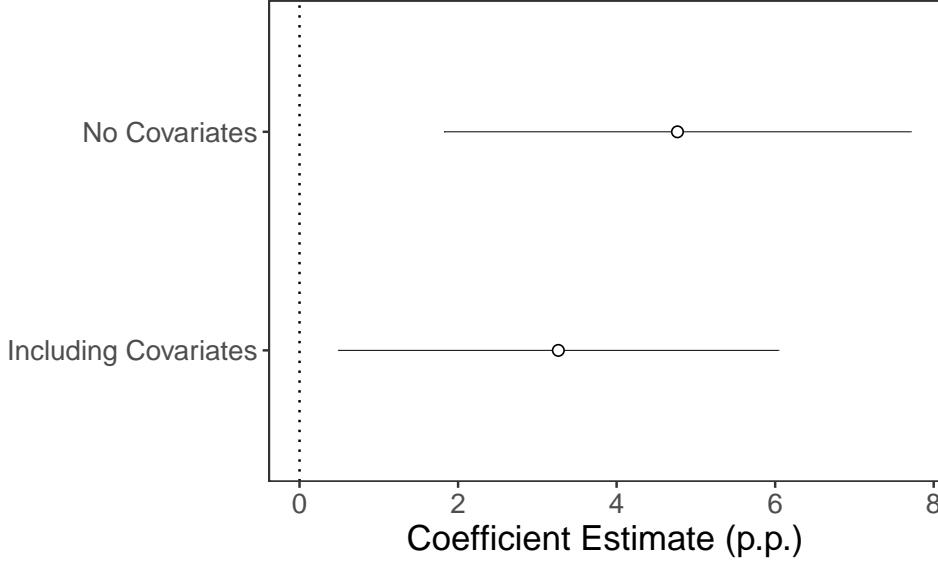
Here, $Y_{i,j}$ measures the level of misperceptions of individual i in zip-code area j , as defined in Section 5. The main estimand in this study is τ , the effect of monopolistic local news markets on individual misperceptions. In addition to the intercept α , we include a vector of covariates $\mathbf{x}_{i,j}$ in some of our model specifications to address any remaining covariate imbalance after matching. We use the exact same covariates that we selected for the matching procedure, i.e. migration background, gender, age, employment status, education on the individual level, as well as population density and unemployment rates at the zip code level. For all models, we cluster standard errors at the zip code level.

6 Results

In Figure 5, we present coefficient estimates from two linear regressions, using the matched dataset as described in Section 5.3. We find that local media market diversity reduces individual-level misperceptions. For individuals in monopolistic newspaper markets, misperceptions are about three to five percentage points greater than for those in segmented markets, depending on the specification. This corresponds to a 21% – 38% increase relative to the non-monopoly baseline, which is the intercept in the models (see Table A.2 in the appendix for more detailed results). The estimates of the average treatment effect on the treated are significant at conventional levels. We find that this result holds when we control for both individual level covariates, as well as for population density and unemployment

rates at the zip code level (see Table A.1 in the appendix for an overview of the covariates).

Figure 5: Post-matching Regression Results



Note: The figure displays treatment effects from a linear regression after matching on adjacency and covariates. The unit of observation is the individual. Treated individuals only have access to one local news outlet, while those in the control group have access to two or more. Positive effect sizes indicate that misperceptions are stronger in monopoly markets. The horizontal lines represent 95% confidence intervals. For detailed results, see Table A.2 in the appendix.

For the main results, we set the distance caliper to be $z = 25$ km and the maximum number of matched units to be $M = 1$. We therefore match each treated unit to one single optimal control unit. We emphasize that the distance caliper specifies the *maximal* permissible distance between treated-control pairs. However, the average distance between observations in the matched data is considerably lower, at about 16 kilometers. In Section 6.2 we demonstrate that our results are robust to different choices of the distance caliper and the maximum number of matched units, regardless of whether we use covariates or not.

6.1 Network Size and Homogeneity

Following our theoretical framework, we posit that the effect of a diverse media landscape works through the indirect aggregation of information in social networks. This effect should

be strongest when networks are (1) larger and (2) more ideologically diverse. We test these observable implications of our theory.

If information from diverse news sources diffuses through interaction with others, individuals with few or no social contacts should be less affected by the local media environment. The EDCAS survey allows us to directly test the moderating effect of social networks through the self-reported number of close contacts or friends in individuals' neighborhoods.⁶ Using the same specification as in Figure 5, we estimate the treatment effect conditional on the size of an individual's social network.⁷

In Figure 6, we show that for respondents who report having zero or one close contacts, misperceptions are unaffected by the local media landscape. Reassuringly, this confirms our theoretical prediction: without indirect exposure to information through social networks, diversity in the market for news does not lead to lower degrees of individual misperceptions. In contrast, we observe sizable monopoly treatment effects for individuals with larger networks. We conclude that a diverse media landscape reduces misperceptions only when individuals can exchange information in social networks.

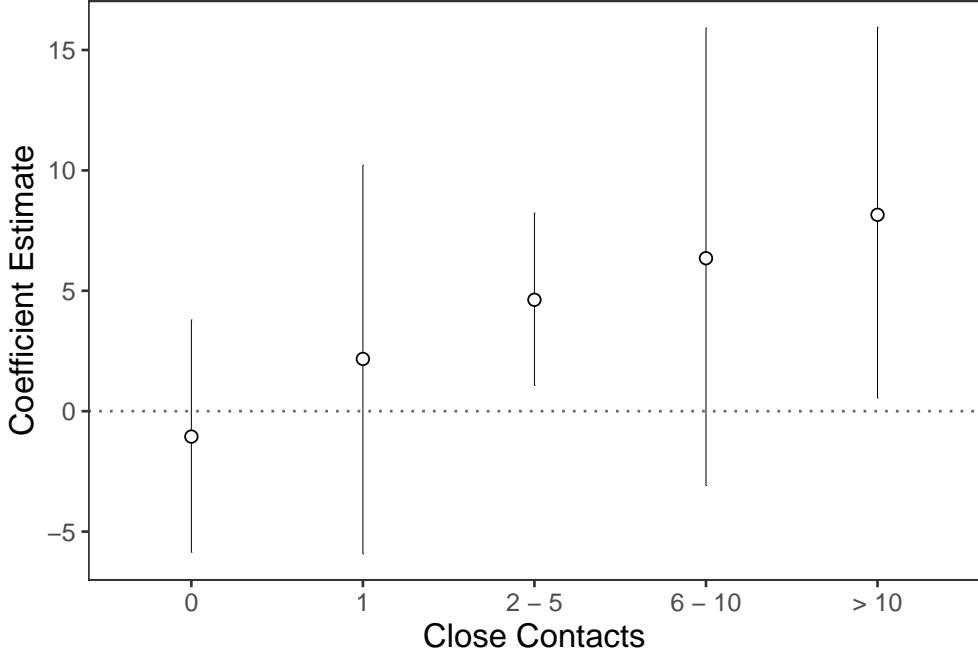
In a second step, we test whether the treatment effect is moderated by homophily within social networks. Testing for the effects of network homophily is challenging, since we do not directly observe the structure of social networks in the sample. As a consequence, we proxy homophily through a survey item that asks respondents to indicate the strength of their political identity.⁸ The strength of political identity has been shown to predict

⁶See Section A.4 in the appendix for the question wording

⁷Specifically, we re-estimate model 2 in Table A.2 in the appendix, but interact the binary treatment indicator with the categorical close contact variable. We then take 10,000 draws from the posterior coefficient distribution. For each draw, we calculate $E[Y|T = 1, C = c] - E[Y|T = 0, C = c]$ at each value of the 'contacts' variable here denoted as C . As a result, we obtain an estimate of the treatment effect conditional on the number of social contacts. By repeating this procedure for each draw from the posterior distribution, we account for post-estimation uncertainty.

⁸Specifically, this survey item asks individuals to indicate the importance of political identity for their

Figure 6: Diverse Media and Social Networks



Note: The figure shows the estimated treatment effect of local media market monopolies on misperceptions, conditional on the number of an individual's close contacts in their respective neighborhood. The effect is the expected difference in misperceptions between individuals located in monopolistic vs. segmented markets. Positive effect sizes indicate that misperceptions are stronger in monopoly markets. The vertical lines represent 95% confidence intervals.

homophily in networks. Individuals who exhibit a stronger sense of political identity tend to interact with more like-minded individuals. As an example, Bakshy, Messing and Adamic (2015) use Facebook friendship network data to show that individuals with stronger political identities are situated in less ideologically diverse social networks. In turn, research on selective exposure (see e.g. Stroud 2011) suggests that members of homogeneous networks may consume news from a less diverse set of sources than individuals in heterogeneous networks.

Given that network size and homophily likely interact, we test for the joint effect of the two moderators. To facilitate this, we dichotomize network size and the self-reported strength of political identity. We consider social networks 'large' if survey respondents report self-image, on a scale ranging from 0 to 10. The exact wording of the item can be found in Section A.4 in the appendix.

having more than one close friend in the neighborhood, and small otherwise. In a similar manner, we code political identity as ‘strong’ if individuals consider their political identity to be more important to their self-image than the median individual in the matched sample. For individuals who report below-median strength of political identity, we code the dichotomized variable as ‘weak’. Since we jointly examine two binary moderators, we end up with four respondent categories, as shown on the y-axis in Figure 7.

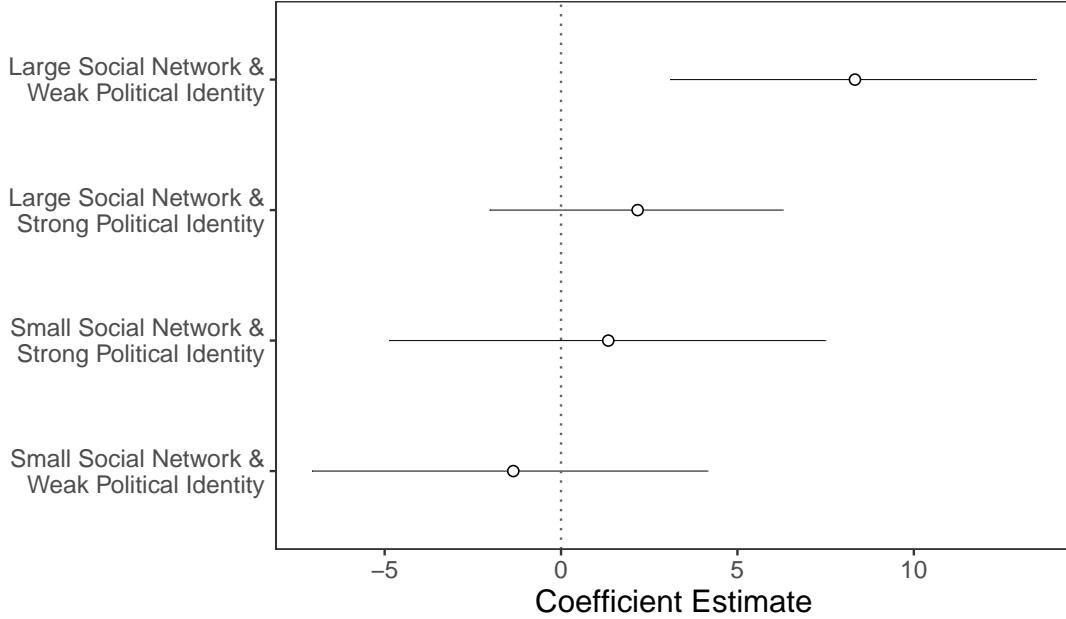
To estimate the effect of network size in combination with homophily as proxied by the strength of political identity, we use the same model specification and baseline sample as in Figure 5. We estimate this model separately in four different subsets of the data. The subsets are defined by the dichotomized network size and the self-reported strength of political identity variables. We find that the effect of a local monopoly is largest when individuals report (1) large social networks and (2) weak political identity. These results hold regardless of the inclusion of all covariates shown in Table A.1. We posit that stronger political identity proxies for a more ideologically homogenous social network. Our findings suggest that, in addition to social network size, a lower degree of network homophily increases the likelihood that a diverse market for news alleviates misperceptions.

6.2 Robustness

Through several additional checks, we address potential concerns regarding the choice of matching parameters, idiosyncrasies of the matched sample, outliers, spillovers, as well as alternative definitions of the treatment and the outcome.

First, we verify that our results are not driven by the matching parameters z and M . In Figure 8, we show the results are robust to varying the distance calipers z and different maximum numbers of control units matched to each treated unit M . Since directly adjacent regions should be most comparable, the conditional independence assumption is most likely to hold for the smallest values of the distance caliper z . Reassuringly, we find large and

Figure 7: Diverse Media, Network Size and Homophily



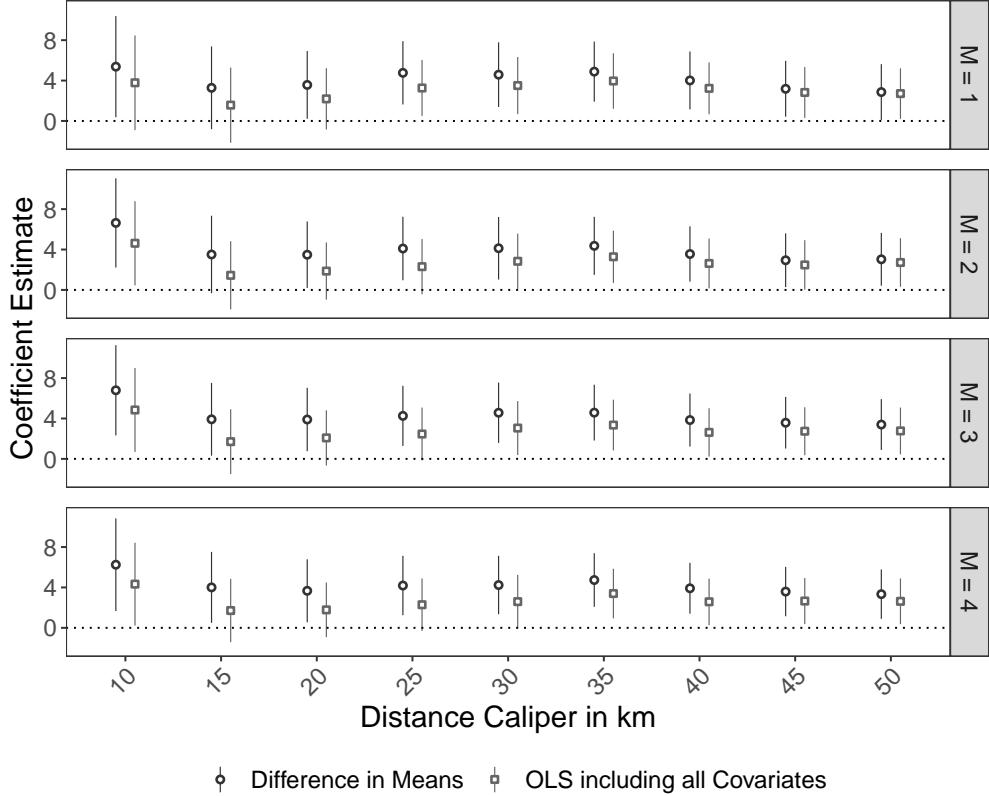
Note: The figure shows the estimated marginal effect of local media market monopolies conditional on the size of individuals' social networks and self-reported strength of political identity. Positive effect sizes indicate that misperceptions are stronger in monopoly markets. The vertical lines represent 95% confidence intervals.

significant effects when we set the distance caliper to its minimum value, $z = 10\text{km}$. Across all 72 model specifications, the mean treatment effect estimate is 3.47 percentage points, which corresponds to a 0.16 standard-deviation increase in the dependent variable.

Second, we present results from models in which we omit the matching procedure and instead consider the full sample. Using fixed effects, we approximate our matching algorithm through a within-state comparison of monopolistic and segmented media markets. In Table A.6 in the appendix, we confirm that the results, while somewhat smaller in magnitude, are consistent with the matching results presented in Figure 5.

Third, we exclude unrealistically high estimates of the local immigrant population. Some respondents estimate that the proportion of immigrants in their neighborhood exceeds 90%. While these responses may correspond to actual beliefs, outliers could also stem from a lack of attention, difficulties in understanding the survey question, or unfamiliarity with

Figure 8: Sensitivity



Note: The plots show the treatment effect estimate at varying treated-control maximum distance thresholds. We also vary the maximum number of control units matched to each treated unit M . The standard errors are clustered by zip code. Information on the total sample size in each matched dataset is provided in Figure A.5 in the appendix. Figure A.4 shows the average distance between treated and control units in the matched sample.

proportions. In models 1 and 2 in Table A.3 in the appendix, we verify that our results are robust to excluding the largest 5% of misperception responses.

Fourth, we limit our analysis to overestimation rather than general misperceptions. For our main specifications in Section 6, we define misperceptions as either under- or overestimation of the local immigrant presence. In models 3 and 4 in Table A.3 in the appendix, we confirm that our results hold when we limit the sample to respondents who overestimate the proportion of immigrants.

Fifth, we use the number of outlets rather than the binary monopoly indicator as the

main explanatory variable. Again, we rely the full sample in conjunction with controls and fixed effects.⁹ Based on our theoretical framework, we expect a non-linear relationship between misperceptions and segmentation in the market for news. When there are already a lot of news outlets in the market, each additional outlet should have a smaller marginal effect compared to markets where there are only one or two outlets. In Table A.7 in the appendix, we present two ways of modeling misperceptions: as a linear and then as a quadratic function of the number of outlets. The evidence points to the quadratic rather than the linear specification. The relationship between misperceptions and the number of outlets is decreasing and convex, confirming our prior expectations. Misperceptions decline as local media markets become more segmented. However, the magnitude of this decline is smaller when there are already a large number of outlets in the market.

Finally, we address the possibility of spillovers between adjacent media markets. Causal identification requires no spatial autocorrelation across individuals, i.e. the potential outcome of person i must be independent of person j 's treatment status. While we cannot entirely rule out spillover effects across zip-code boundaries, we address the issue in two ways. Akin to a ‘donut’-RD design (see Barreca, Lindo and Waddell 2016), we first impose the constraint that treated and control individuals live at least 20 kilometers but no more than 50 kilometers away from each other. In this sample, the geographic distance between treated and control units makes spillovers less likely while still achieving balance on observables. We find that our results are robust to this modification. Second, we perform a placebo test. We subset the data to individuals in competitive markets and regress misperceptions on the proportion of neighboring zip-code regions with monopolistic newspaper markets. In doing so, we capture the degree to which non-treated individuals are exposed to poten-

⁹We deliberately do not employ our matching algorithm to estimate the effect of the continuous treatment. In principle, we could estimate the generalized propensity score, i.e. the conditional density of the treatment level given covariates (Imbens 2000; Imai and Van Dyk 2004). However, given our limited sample size, this would require us to abandon the logic of comparing geographically proximate individuals.

tial spillover effects from monopoly regions. We find no evidence that the treatment status of neighboring regions affects individual misperceptions. Both tests suggest that potential spillovers are not large sources of bias in our design.

7 Discussion

This paper has provided novel causal evidence on the effects of diversity in the market for news on political misperceptions. We focus on perceptions regarding one of the most salient issues today, immigration. Exploiting discontinuous changes in newspaper coverage areas, we show that access to a greater number of news sources decreases individual misperceptions. This effect is particularly pronounced when social networks are larger and network homophily, as proxied by political identity, is smaller. The two moderators lend support to the hypothesis that individuals aggregate information from a variety of sources through interactions with others in networks.

Before discussing the wider implications of our research, two words of caution are in order. First, we only present correlational evidence for our proposed mechanism of information diffusion through social interactions. Our moderating variables may be associated with other, possibly unobserved, variables. While the evidence is therefore only suggestive, the moderating effect of social networks aligns with our theoretical argument.

Second, our study period predates the ascent of the internet and social media as major news sources. We cannot directly speak to how the interplay between traditional news sources and social media affects misperceptions. We stress, however, that local news outlets remain one of the most trusted news sources in Germany (Nic et al. 2018). In addition, social media disproportionately consists of national and international news, leaving traditional news outlets as the main source of information about local events and conditions¹⁰. Therefore,

¹⁰In a recent Pew survey, only 15% of Americans indicate that they turn to social media to obtain local news (Pew Research Center 2019).

we argue that the effects of diverse *traditional* media may persist even in times of increasing exposure to non-traditional news sources. Further research could examine how the effect of diversity in the market for news is mediated by exposure to online news sources.

We highlight the positive aspects of our findings: our research provides a counterpoint to the narrative of filter bubbles (see e.g. Flaxman, Goel and Rao 2016; Zuiderveen Borgesius et al. 2016). A common concern in the context of media polarization is that, when faced with the choice of different information sources, individuals may select into consuming information that aligns with their own priors (Mullainathan and Shleifer 2005). While confirmation bias and self-selection likely operate at the individual-level, our results show that media diversity can have positive indirect effects. In the context of local news, we find that perceptions become *more* accurate as individuals have access to wider set of news sources. We argue that diffusion of information in networks could account for these results, underlining the need to study the indirect effects of media exposure. In doing so, we join a number of researchers who examine the flow of information through social networks (see e.g. Katz 1957; Huckfeldt, Dalton and Levine 1995). Our results complement this line of research, as causal conclusions in the literature on interpersonal political communication commonly stem from one-time lab or survey experiments (Druckman, Levendusky and McLain 2018). We, however, provide causal evidence from an observational, nationwide setting, where individuals are continuously exposed to what many of them consider to be their most trustworthy source of information.

While traditional news sources continue to be relevant, the number of news outlets is steadily declining. In Germany, the number of daily newspapers has decreased by 14%, or 19 outlets, between 2011 and 2018. Our study suggests that policy makers have an incentive to limit further consolidation of the market for local news. Preventing the creation of local monopolies may lead to more accurate perceptions in the long run. In the context of highly politicized issues like immigration, preserving viewpoint diversity is crucial to guarantee that political behavior and preferences are founded on accurate information. Not only are monopolies detrimental for consumers, they also lead to aggravated misperceptions

about vulnerable minority groups. Further consolidation is therefore not only economically inefficient, but also entails substantial negative political externalities.

References

- Alesina, Alberto, Armando Miano and Stefanie Stantcheva. 2018. Immigration and Redistribution. Working Paper 24733 National Bureau of Economic Research.
- Ansobehere, Stephen, Erik C. Snowberg and James M. Snyder. 2006. “Television and the Incumbency Advantage in U.S. Elections.” *Legislative Studies Quarterly* 31(4):469–490.
- Arendt, Florian. 2010. “Cultivation Effects of a Newspaper on Reality Estimates and Explicit and Implicit Attitudes.” *Journal of Media Psychology: Theories, Methods, and Applications* 22(4):147–159.
- Bakshy, Eytan, Solomon Messing and Lada A. Adamic. 2015. “Exposure to Ideologically Diverse News and Opinion on Facebook.” *Science* 348(6239):1130–1132.
- Barreca, Alan I, Jason M Lindo and Glen R Waddell. 2016. “Heaping-Induced Bias in Regression-Discontinuity Designs.” *Economic Inquiry* 54(1):268–293.
- Blinder, Scott and Anne-Marie Jeannet. 2018. “The ‘Illegal’ and the Skilled: Effects of Media Portrayals on Perceptions of Immigrants in Britain.” *Journal of Ethnic and Migration Studies* 44(9):1444–1462.
- Boomgaarden, Hajo G. and Rens Vliegenthart. 2007. “Explaining the Rise of Anti-Immigrant Parties: The Role of News Media Content.” *Electoral Studies* 26(2):404–417.
- Boomgaarden, Hajo G. and Rens Vliegenthart. 2009. “How News Content Influences Anti-Immigration Attitudes: Germany, 1993–2005.” *European Journal of Political Research* 48(4):516–542.
- Bundesverband Deutscher Zeitungsverleger. 2011. “Die Deutschen Zeitungen in Zahlen Und

- Daten – Auszug Aus Dem Jahrbuch Zeitungen 2011/12.”.
- Bundesverband Deutscher Zeitungsverleger. 2018. “Anzahl Der Tageszeitungen in Deutschland in Ausgewählten Jahren von 1954 Bis 2018.”.
- Cattaneo, Matias D, Rocio Titiunik and Gonzalo Vazquez-Bare. 2019. “The Regression Discontinuity Design.”.
- Chandrasekhar, Arun, Horacio Larreguy and Juan Pablo Xandri. 2015. Testing Models of Social Learning on Networks: Evidence from a Lab Experiment in the Field. Technical Report w21468 National Bureau of Economic Research Cambridge, MA: .
- Degroot, Morris H. 1974. “Reaching a Consensus.” *Journal of the American Statistical Association* 69(345):118–121.
- Delgado, Jesus Manuel. 1972. *Die Gastarbeiter in Der Presse. Eine Inhaltsanalytische Studie.* Leske.
- Dinas, Elias, Konstantinos Matakos, Dimitrios Xefteris and Dominik Hangartner. 2019. “Waking up the Golden Dawn: Does Exposure to the Refugee Crisis Increase Support for Extreme-Right Parties?” *Political Analysis* 27(2):244–254.
- Druckman, James N., Matthew S. Levendusky and Audrey McLain. 2018. “No Need to Watch: How the Effects of Partisan Media Can Spread via Interpersonal Discussions.” *American Journal of Political Science* 62(1):99–112.
- Dunaway, Johanna. 2008. “Markets, Ownership, and the Quality of Campaign News Coverage.” *The Journal of Politics* 70(4):1193–1202.
- Ellison, Glenn and Drew Fudenberg. 1995. “Word-of-Mouth Communication and Social Learning.” *The Quarterly Journal of Economics* 110(1):93–125.
- Fertig, Michael and Christoph M. Schmidt. 2001. First- and Second-Generation Migrants in Germany - What Do We Know and What Do People Think? SSRN Scholarly Paper ID 267223 Social Science Research Network Rochester, NY: .

- Fick, Patrick. 2006. “Die Darstellung Ethnischer Minderheiten in Lokalmedien.”.
- Flaxman, Seth, Sharad Goel and Justin M Rao. 2016. “Filter Bubbles, Echo Chambers, and Online News Consumption.” *Public Opinion Quarterly* 80(S1):298–320.
- Freddi, Eleonora. 2017. “Do People Avoid Morally Relevant Information? Evidence from the Refugee Crisis.” *SSRN Electronic Journal* .
- Gentzkow, Matthew, Jesse M. Shapiro and Michael Sinkinson. 2011. “The Effect of Newspaper Entry and Exit on Electoral Politics.” *American Economic Review* 101(7):2980–3018.
- Golub, Benjamin and Matthew O. Jackson. 2012. “How Homophily Affects the Speed of Learning and Best-Response Dynamics.” *The Quarterly Journal of Economics* 127(3):1287–1338.
- Gorodzeisky, Anastasia and Moshe Semyonov. 2019. “Perceptions and Misperceptions: Actual Size, Perceived Size and Opposition to Immigration in European Societies.” *Journal of Ethnic and Migration Studies* 0(0):1–19.
- Haselmayer, Martin, Markus Wagner and Thomas M. Meyer. 2017. “Partisan Bias in Message Selection: Media Gatekeeping of Party Press Releases.” *Political Communication* 34(3):367–384.
- Hayes, Danny and Jennifer L Lawless. 2015. “As Local News Goes, so Goes Citizen Engagement: Media, Knowledge, and Participation in US House Elections.” *The Journal of Politics* 77(2):447–462.
- Heckman, James J., Hidehiko Ichimura and Petra E. Todd. 1997. “Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme.” *The Review of Economic Studies* 64(4):605–654.
- Herda, Daniel. 2010. “How Many Immigrants? Foreign-Born Population Innumeracy in Europe.” *Public Opinion Quarterly* 74(4):674–695.
- Ho, Daniel E, Kosuke Imai, Gary King and Elizabeth A Stuart. 2007. “Matching as Nonpara-

- metric Preprocessing for Reducing Model Dependence in Parametric Causal Inference.” *Political Analysis* 15(3):199–236.
- Hooghe, Marc and Thomas de Vroome. 2015. “The Perception of Ethnic Diversity and Anti-Immigrant Sentiments: A Multilevel Analysis of Local Communities in Belgium.” *Ethnic and Racial Studies* 38(1):38–56.
- Hopkins, Daniel J., John Sides and Jack Citrin. 2018. “The Muted Consequences of Correct Information About Immigration.” *The Journal of Politics* 81(1).
- Huckfeldt, Robert, Russell J. Dalton and Jeffrey Levine. 1995. “Political Environments, Cohesive Social Groups, and the Communication of Public Opinion.” *American Journal of Political Science* 39(4):1025–1054.
- Iacus, Stefano M, Gary King and Giuseppe Porro. 2019. “A Theory of Statistical Inference for Matching Methods in Causal Research.” *Political Analysis* 27(1):46–68.
- Imai, Kosuke and David A Van Dyk. 2004. “Causal Inference with General Treatment Regimes: Generalizing the Propensity Score.” *Journal of the American Statistical Association* 99(467):854–866.
- Imbens, Guido W. 2000. “The Role of the Propensity Score in Estimating Dose-Response Functions.” *Biometrika* 87(3):706–710.
- Imbens, Guido W. and Donald B. Rubin. 2015. *Causal Inference in Statistics, Social, and Biomedical Sciences*. Cambridge University Press.
- IPSOS. 2018. “Perils of Perception 2018.” .
- Katz, Elihu. 1957. “The Two-Step Flow of Communication: An up-to-Date Report on an Hypothesis.” *Public Opinion Quarterly* 21(1):61–78.
- King, Gary, Benjamin Schneer and Ariel White. 2017. “How the News Media Activate Public Expression and Influence National Agendas.” *Science* 358(6364):776–780.
- Koopmans, Ruud and Merlin Schaeffer. 2016. “Statistical and Perceived Diversity and Their

- Impacts on Neighborhood Social Cohesion in Germany, France and the Netherlands.” *Social Indicators Research* 125(3):853–883.
- Lawrence, Eric D and John Sides. 2014. “The Consequences of Political Innumeracy.” *Research & Politics* 1(2):2053168014545414.
- Martin, Gregory J. and Joshua McCrain. 2019. “Local News and National Politics.” *American Political Science Review* 113(2):372–384.
- Masip, Pere, Jaume Suau-Martínez and Carlos Ruiz-Caballero. 2018. “Questioning the Selective Exposure to News: Understanding the Impact of Social Networks on Political News Consumption.” *American Behavioral Scientist* 62(3):300–319.
- Maurer, Marcus, Pablo Jost, Jörg Haßler and Simon Kruschinski. 2019. “Auf den Spuren der Lügenpresse: Zur Richtigkeit und Ausgewogenheit der Medienberichterstattung in der „Flüchtlingskrise“.” *Publizistik* 64(1):15–35.
- McPherson, Miller, Lynn Smith-Lovin and James M Cook. 2001. “Birds of a Feather: Homophily in Social Networks.” *Annual Review of Sociology* 27(1):415–444.
- Mullainathan, Sendhil and Andrei Shleifer. 2005. “The Market for News.” *American Economic Review* 95(4):1031–1053.
- Müller, Daniel. 2005. *Die Darstellung Ethnischer Minderheiten in Deutschen Massenmedien*.
- Nic, Newman, Richard Fletcher, Antonis Kalogeropoulos, David AL Levy and Rasmus Kleis Nielsen. 2018. *Reuters Institute Digital News Report 2018*. Reuters Institute for the Study of Journalism.
- Pew Research Center. 2019. “For Local News, Americans Embrace Digital but Still Want Strong Community Connection.”
- Ramsay, Gordon and Martin Moore. 2016. “Monopolising Local News: Is There an Emerging Democratic Deficit in the UK Due to the Decline of Local Newspapers.”
- Rosenbaum, Paul R. 2020. “Modern Algorithms for Matching in Observational Studies.”

Annual Review of Statistics and Its Application 7.

- Ruhrmann, Georg. 2002. Wie regionale Tageszeitungen über Migranten berichten. Das Beispiel Thüringen. In *Integration durch Politik und Medien?*, ed. Karl-Heinz Meier-Braun and Martin A. Kilgus. Baden-Baden: Nomos.
- Ruhrmann, Georg and Bettina Meißner. 2000. “Das Ausländerbild in Den Thüringer Tageszeitungen 1995-1999.” *Eine quantitative und qualitative Inhaltsanalyse*. Jena: Friedrich-Schiller-Universität .
- Schaeffer, Merlin, Ruud Koopmans, Susanne Veit, Mareike Wagner and Jonas Wiedner. 2011. “The Ethnic Diversity and Collective Action Survey (EDCAS): Technical Report.” .
- Schlueter, Elmar and Eldad Davidov. 2013. “Contextual Sources of Perceived Group Threat: Negative Immigration-Related News Reports, Immigrant Group Size and Their Interaction, Spain 1996–2007.” *European Sociological Review* 29(2):179–191.
- Sides, John and Jack Citrin. 2007. *How Large the Huddled Masses? The Causes and Consequences of Public Misperceptions about Immigrant Populations*.
- Statista. 2019. “Anzahl Der Tageszeitungen in Deutschland in Ausgewählten Jahren von 1954 Bis 2018.” .
- Stroud, Natalie Jomini. 2011. *Selective Exposure in Theory and in Practice*. Oxford University Press.
- Trappel, Josef, Werner A Meier, Klaus Schrape and Michaela Wölk. 2013. *Die Gesellschaftlichen Folgen Der Medienkonzentration: Veränderungen in Den Demokratischen Und Kulturellen Grundlagen Der Gesellschaft*. Springer.
- Vergeer, Maurice, Marcel Lubbers and Peer Scheepers. 2000. “Exposure to Newspapers and Attitudes toward Ethnic Minorities: A Longitudinal Analysis.” *Howard Journal of Communications* 11(2):127–143.
- Vliegenthart, Rens, Hajo G. Boomgaarden and Joost Van Spanje. 2012. “Anti-Immigrant

Party Support and Media Visibility: A Cross-Party, Over-Time Perspective.” *Journal of Elections, Public Opinion and Parties* 22(3):315–358.

Vosoughi, Soroush, Deb Roy and Sinan Aral. 2018. “The Spread of True and False News Online.” *Science* 359(6380):1146–1151.

Zuiderveen Borgesius, Frederik, Damian Trilling, Judith Moeller, Balázs Bodó, Claes H. de Vreese and Natali Helberger. 2016. Should We Worry About Filter Bubbles? SSRN Scholarly Paper ID 2758126 Social Science Research Network Rochester, NY: .

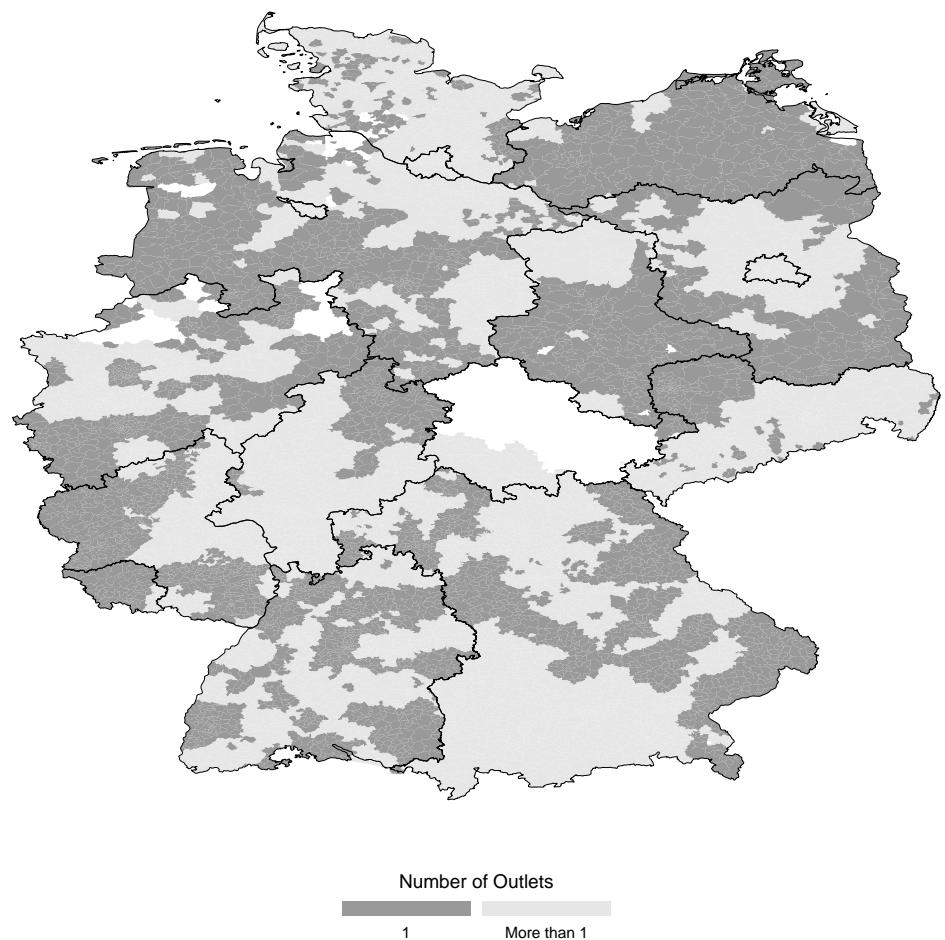
A Supporting Information (Online Only)

Table A.1: Summary Statistics

	Full Sample			Matched Sample		
	Mean	Median	SD	Mean	Median	SD
Individual Characteristics						
Age	48.24	47	16.81	46.06	45	16.01
Gender: Female	0.54		0.50	0.49		0.50
Education: Primary	0.02		0.15	0.03		0.16
Education: Lower Secondary	0.04		0.20	0.04		0.20
Education: Upper Secondary	0.45		0.50	0.54		0.50
Education: Post-secondary	0.17		0.38	0.17		0.37
Education: Tertiary	0.30		0.46	0.23		0.42
Native	0.60		0.49	0.61		0.49
First Gen. Immigrant	0.28		0.45	0.26		0.44
Second Gen. Immigrant	0.13		0.33	0.12		0.33
Friends: 0	0.30		0.46	0.29		0.46
Friends: 1	0.10		0.30	0.10		0.30
Friends: 2–5	0.37		0.48	0.39		0.49
Friends: 6–10	0.11		0.32	0.11		0.31
Friends: >10	0.10		0.30	0.11		0.31
Misperception (p.p.)	17.28	10.72	17.53	15.64	9.82	16.50
Zip Code Characteristics						
Immigrant Population (%)	13.66	12.42	8.25	12.66	12.01	7.24
Population Density / km ²	1768.26	1979	1388.57	802.65	397.50	916.52
Unemployment Rate	0.04	0.04	0.02	0.03	0.03	0.01
Number of News Outlets	2.60	2	1.62	1.38	1	0.60
Local News Monopoly	0.27		0.44	0.68		0.47

Note: The table shows summary statistics for individual and zip code level characteristics. For continuous variables, we show medians in addition to means. For the categorical variables, the categories may not add up to one due to rounding.

Figure A.1: Newspaper Monopolies Across Germany



Note: The map shows the distribution of local news monopolies in Germany. Dark areas indicate regions where only one local news outlet is available.

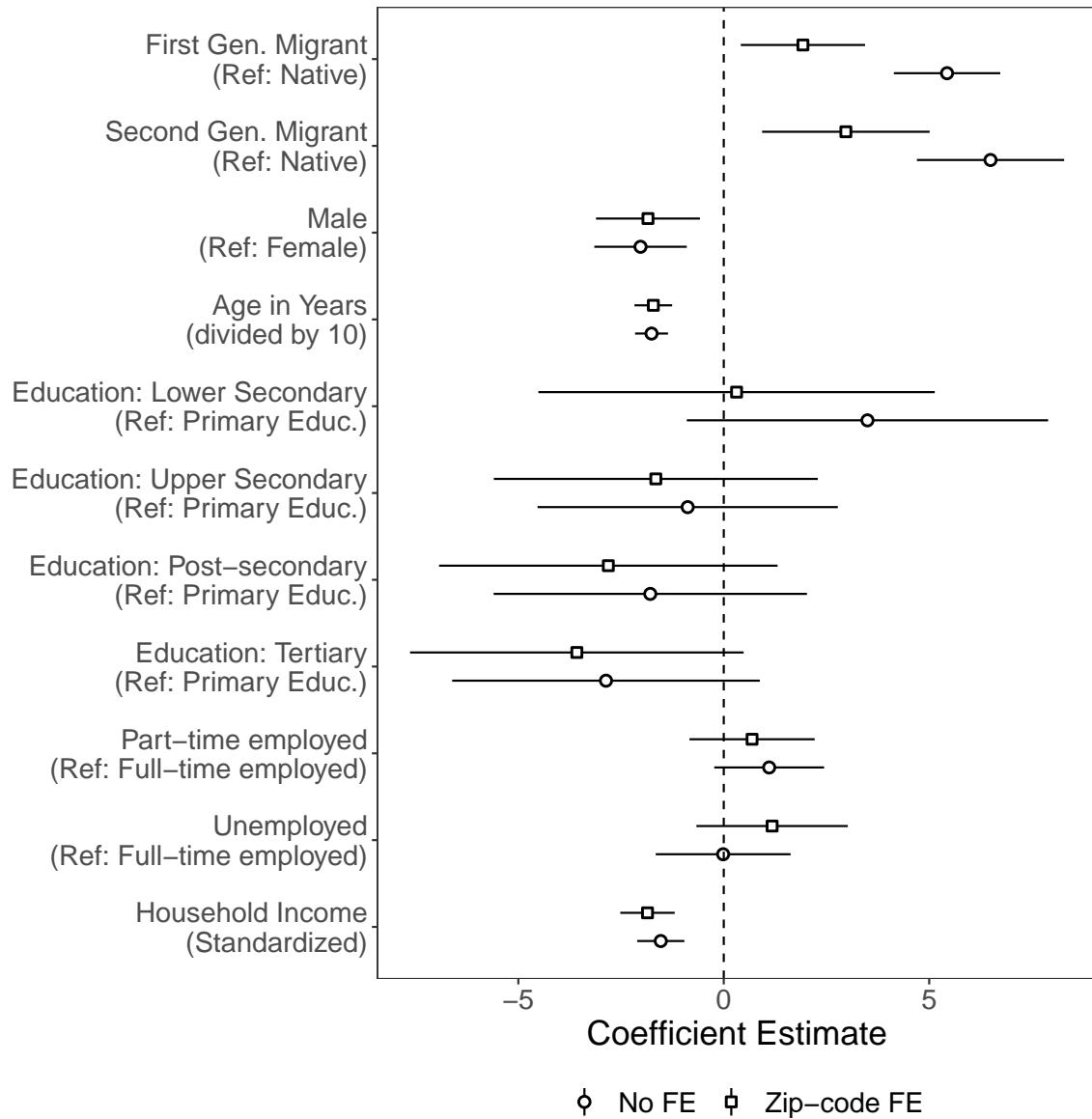


Figure A.2: Individual-level predictors of misperceptions: The plot shows coefficient estimates from OLS regressions of the outcome variable ‘misperception’ on individual-level covariates. We show results from a model without fixed effects (circles) and a model that includes zip code fixed effects (squares). For categorical variables, we include the reference category in parentheses.

A.1 Additional Analyses – Matched Sample

Table A.2: Post-matching Regressions

	DV: Misperception	
	(1)	(2)
Media market monopoly	4.767*** (1.599)	3.265** (1.413)
Indiv. covariates	No	Yes
Zip covariates	No	Yes
Distance caliper	25 km	25 km
Average distance	15.94 km	15.94 km
Max. No. of controls per treated	1	1
Mean of DV	15.64	15.64
Observations	546	546
R ²	0.018	0.190

Note: The table displays treatment effects from a linear regression after matching on adjacency and covariates. The coefficients correspond to those shown in Figure 5. The unit of observation is the individual. Treated individuals only have access to one local news outlet, while those in the control group have access to two or more. The included covariates in model 2 are the same as those used to calculate the Mahalanobis distance between observations as part of the matching algorithm. At the zip code level, we control for population density and unemployment rates. Standard errors in parentheses are clustered at the zip code level. ***p < .01; **p < .05; *p < .1

Table A.3: Post-matching Regressions

	Misperception					
Media market monopoly	3.726*** (1.106)	2.227** (1.002)	6.861*** (2.565)	5.057** (2.354)	5.805*** (1.740)	3.712** (1.605)
Indiv. Covariates	No	Yes	No	Yes	No	Yes
Zip Covariates	No	Yes	No	Yes	No	Yes
Distance caliper	25 km	25 km	25 km	25 km	25 km	25 km
Max. controls per treated	1	1	1	1	1	1
DV mean	13.04	13.04	22.32	22.32	17.93	17.93
Excluding Outliers	Yes	Yes	No	No	Yes	Yes
Overestimation Only	No	No	Yes	Yes	Yes	Yes
N	518	518	292	292	264	264
R-squared	0.020	0.184	0.026	0.221	0.033	0.231

Note: The table displays treatment effects from a linear regression after matching on adjacency and covariates. The unit of observation is the individual. Treated individuals only have access to one local news outlet, while those in the control group have access to two or more. At the zip code level, we control for population density and unemployment rates. Standard errors in parentheses are clustered at the zip code level. ***p < .01; **p < .05; *p < .1

Table A.4: Post-matching regressions, excluding close matches

	DV: Misperception	
	(1)	(2)
Media market monopoly	3.100** (1.430)	2.444* (1.310)
Indiv. covariates	No	Yes
Zip covariates	No	Yes
Distance caliper	20–50 km	20–50 km
Max. No. of. controls per treated	1	1
DV mean	17.07	17.07
N	816	816
R ²	0.006	0.138

Note: The table displays treatment effects from a linear regression after matching on adjacency and covariates. The unit of observation is the individual. Treated individuals only have access to one local news outlet, while those in the control group have access to two or more. We only include matched units that are further than 20km and no more than 50km apart. The included covariates in model 2 are the same as those used to calculate the Mahalanobis distance between observations as part of the matching algorithm. At the zip code level, we control for population density and unemployment rates. Standard errors in parentheses are clustered at the zip code level. ***p < .01; **p < .05; *p < .1

Table A.5: Regression of misperceptions on the proportion of neighboring treated units.

	DV: Misperception	
	(1)	(2)
Proportion of neighboring treated units	3.923 (4.738)	-2.496 (2.410)
Indiv. covariates	Yes	Yes
Sample	Full	Matched
Zip covariates	Yes	Yes
Distance caliper	25 km	None
Max. No. of controls per treated	4	
Mean of DV	12.56	17.68
Observations	185	2557
R ²	0.191	0.134

Note: We limit the sample to regions with more than one local outlet. The treatment is the share of directly adjacent zip code regions that are local news monopolies. The unit of observation is the individual. In model 1, we use the same matched sample as in Table A.2. In model 2, we consider the full sample. The included covariates in model 2 are the same as those used to calculate the Mahalanobis distance between observations as part of the matching algorithm. At the zip code level, we control for population density and unemployment rates. Standard errors in parentheses are clustered at the zip code level. ***p < .01; **p < .05; *p < .1

A.2 Additional Analyses – Full Sample

Table A.6: OLS regressions, using the full sample

	Misperception			
	(1)	(2)	(3)	(4)
Media market monopoly	2.375*** (0.804)	2.012*** (0.702)	2.029* (1.184)	1.560* (0.925)
State FE	Yes	Yes	Yes	Yes
Indiv. Covariates	Yes	Yes	Yes	Yes
Zip Covars	Yes	Yes	Yes	Yes
Excluding outliers	No	Yes	No	Yes
Overestimation only	No	No	Yes	Yes
<i>N</i>	4,489	4,267	2,728	2,507
R ²	0.147	0.131	0.141	0.128

Notes: The table contains results from four OLS regressions. The unit of observation is the individual. Treated individuals only have access to one local news outlet, while those in the control group have access to two or more. The outcome is the absolute value of the difference between the perceived and the true proportion of immigrants in the neighborhood. Standard errors in parentheses are clustered at the zip code level. ***p < .01; **p < .05; *p < .1

Table A.7: OLS Regressions using the full sample - continuous treatment

	DV: Misperception			
	(1)	(2)	(3)	(4)
Number of outlets	-0.388 (0.315)	-0.251 (0.296)	-2.021* (1.042)	-2.012** (0.919)
Number of outlets (squared)			0.276* (0.154)	0.297** (0.135)
State FE	Yes	Yes	Yes	Yes
Indiv. covariates	Yes	Yes	Yes	Yes
Zip covariates	Yes	Yes	Yes	Yes
Excluding outliers	No	Yes	No	Yes
<i>Observations</i>	4,489	4,267	4,489	4,267
R ²	0.145	0.128	0.145	0.130

Notes: The table contains results from six OLS regressions. The unit of observation is the individual. The treatment is the number of local newspapers that individuals have access to. The outcome is the absolute value of the difference between the perceived and the true proportion of immigrants in the neighborhood. Standard errors in parentheses are clustered at the zip code level. ***p < .01; **p < .05; *p < .1

A.3 Additional Information: Matched Sample

Figure A.3: Covariate balance before and after one-to-one matching as pre-processing with replacement at varying distance cutoffs. Points show standardized difference in means between treated and control groups in sample with 95% confidence intervals.

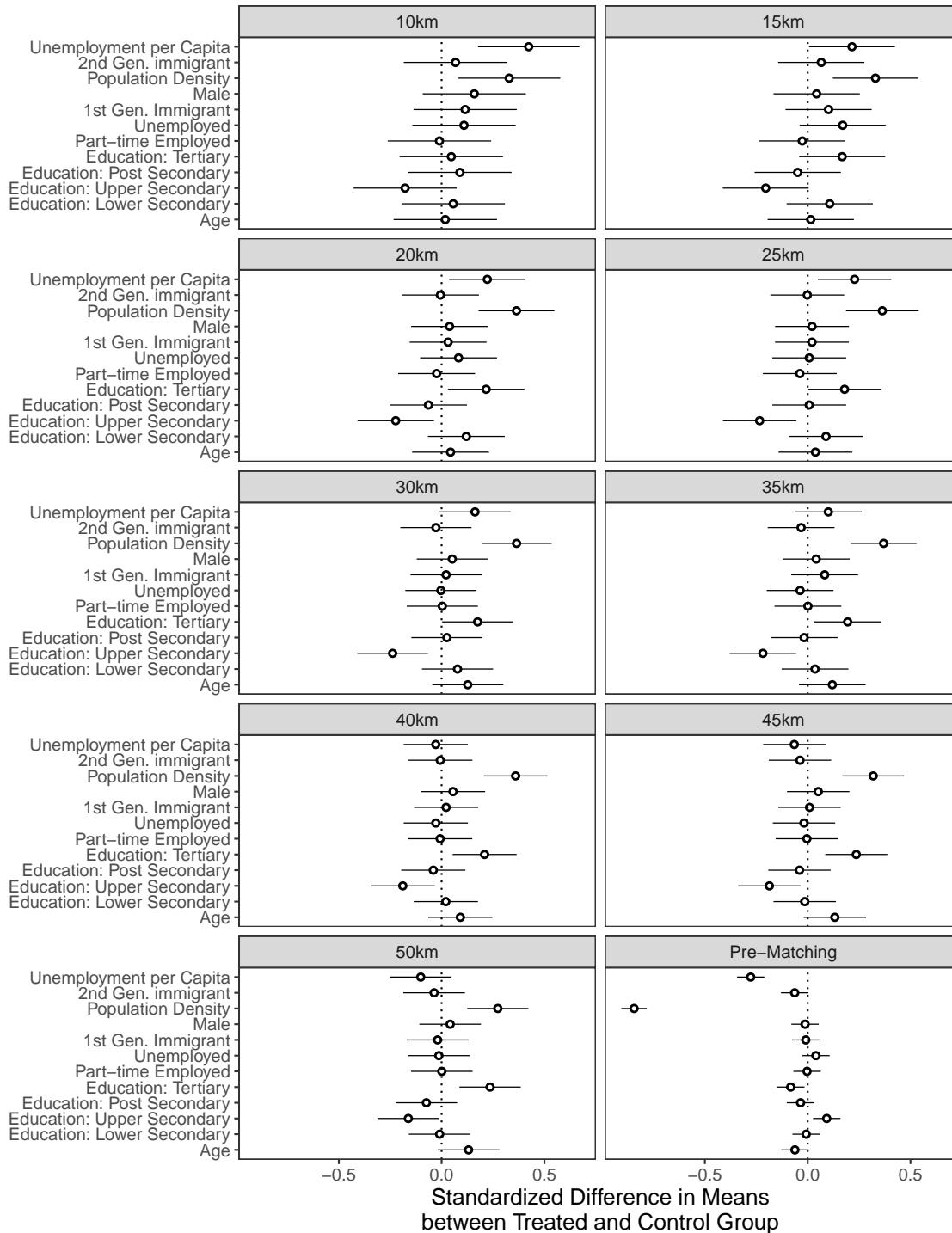


Figure A.4: Average distance between treated and control units in pre-processed dataset in kilometers at varying maximum distance thresholds and maximum number of control units matched to each treated unit.

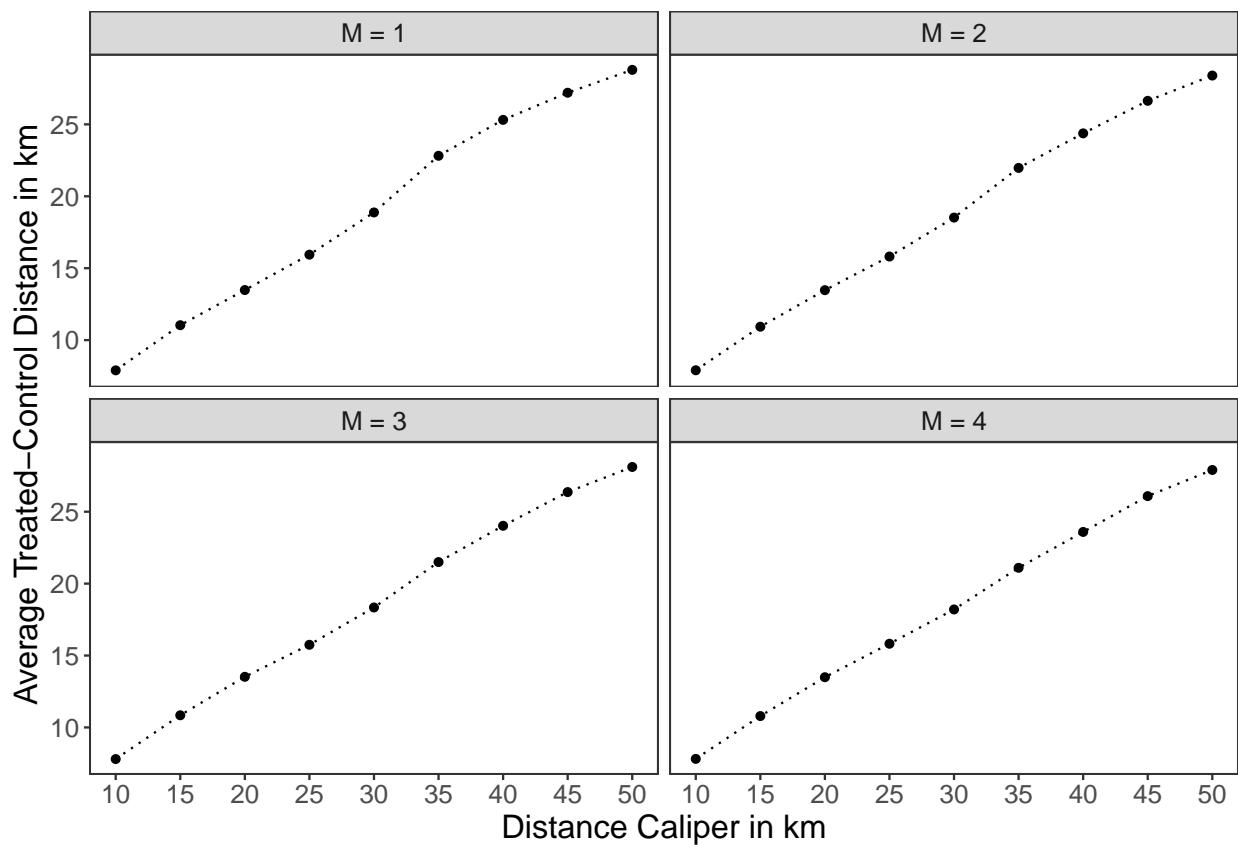
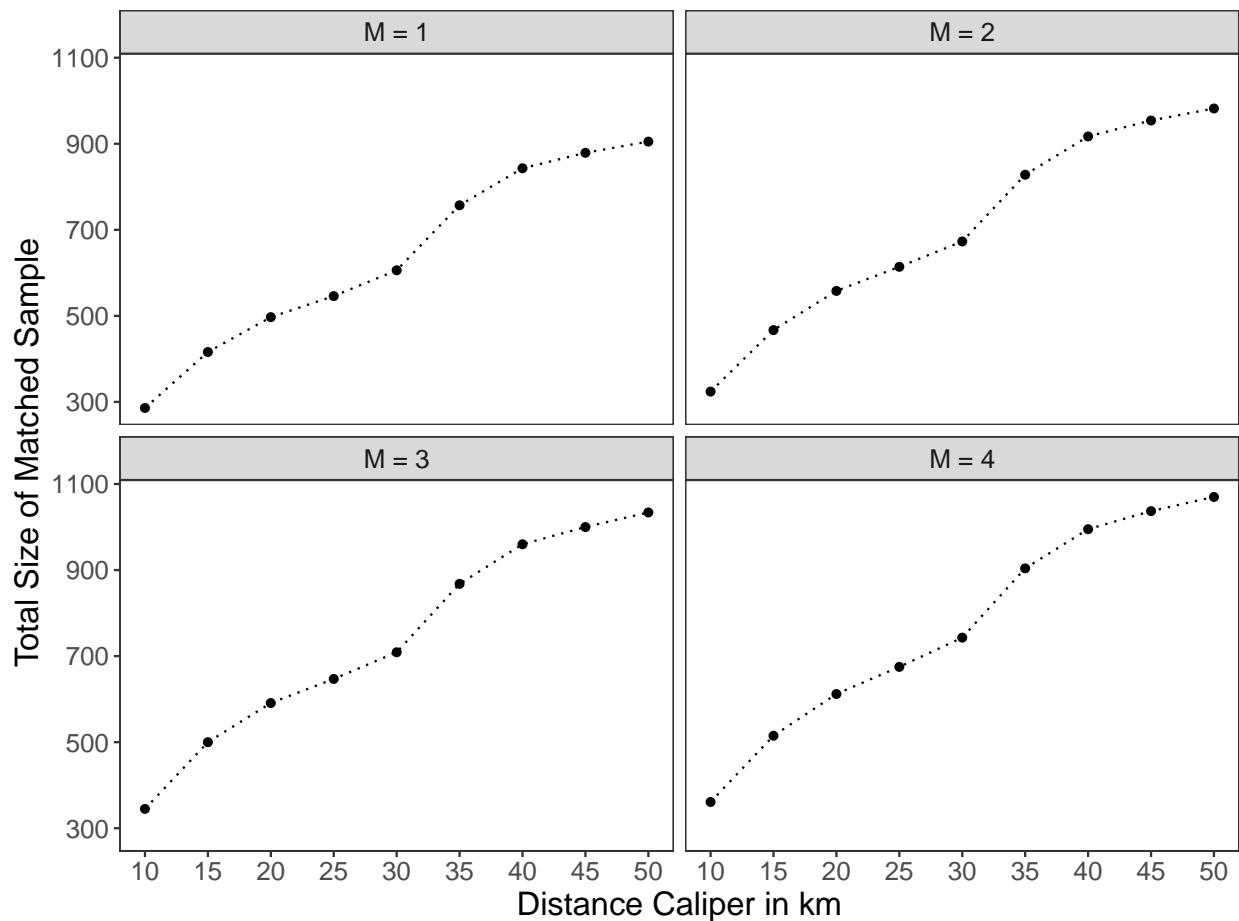


Figure A.5: Total sample size after matching at varying maximum distance thresholds and maximum number of control units matched to each treated unit.



A.4 EDCAS question wording

A.4.1 Immigrants in the neighborhood

The original question regarding the local presence of immigrants in the neighborhood is as follows:

“Wie hoch schätzen Sie den prozentualen Anteil von Menschen mit Migrationshintergrund in Ihrer Nachbarschaft? Mit Migrationshintergrund ist gemeint, das eine Person nicht in Deutschland geboren wurde oder eines ihrer Elternteile nicht in Deutschland geboren wurde. Bitte nennen Sie mir eine Zahl zwischen 0 und 100 Prozent.“

The question can be translated as follows:

“How large is the percentage share of people with a migration background in your neighborhood? Migration background refers to a person that was either not born in Germany, or a person with [at least] one parent born outside of Germany. Please indicate a number between 0 and 100 percent.”

A.4.2 Network size

To measure the size of the local network, we rely on a question that asks respondents to report the number of friends in the local neighborhood. The original question wording is as follows:

“Wie viele Ihrer Freunde wohnen in Ihrer Nachbarschaft? Sind das...

- Keiner
- Eine
- 2–5
- 6–10

- Mehr als 10”

The question can be translated as follows:

“How many of your friends live in your neighborhood?

- One
- Two
- 2–5
- 6–10
- More than 10”

A.4.3 Strength of political identity

The original question on the self-reported level of political identity is as follows:

“Bitte geben Sie auf einer Skala von 0 bis 10 an, wie wichtig die folgenden Dinge dafür sind, wie Sie sich selbst sehen. 0 bedeutet dass Sie überhaupt nicht wichtig sind und 10 dass Sie sehr wichtig sind. Wenn Sie an sich selbst denken, wie wichtig ist Ihre politische Orientierung?”

It can be translated as follows:

“Please indicate how important the following things are for how you view yourself, on a scale from 0 to 10. 0 means that something is not important at all, and 10 means that it is very important. If you think about yourself, how important is your political orientation?”