DIFFUSING POLITICAL CONCERNS:
HOW UNEMPLOYMENT INFORMATION PASSED BETWEEN SOCIAL TIES INFLUENCES DANISH VOTERS *

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JANUARY 2020

While social pressure is widely believed to influence voters, evidence that information passed between social ties affects beliefs, policy preferences, and voting behavior is limited. We investigate such information diffusion by examining whether networks of strong and mostly weak social ties relay information about unemployment shocks in Denmark. We link surveys with rich population-level administrative data that logs unemployment shocks afflicting respondents’ familial, vocational, and educational networks. We find that the share of second-degree social ties—individuals that voters learn about indirectly—that became unemployed within the last year increases a voter’s perception of national unemployment, self-assessed risk of becoming unemployed, support for unemployment insurance, and voting for left-wing political parties. Voters update about national aggregates from all shocks equally, whereas subjective perceptions and preferences respond primarily to unemployment shocks affecting second-degree ties in similar vocations. This suggests that information diffusion through social ties principally affects political preferences via egotropic—rather than sociotropic—motives.

*We thank Allison Carnegie, Charlotte Cavaille, Bob Erikson, Alex Hertel-Fernandez, Thomas Groll, Torben Iversen, Dipali Mukhopadhyay, Carlo Prato, Tonya Putnam, Philipp Rehm, Oskar Nordström Skans, Brandon Stewart, Edoardo Teso, Yiqing Xu, and participants at APSA, Berkeley, Buffalo, Columbia, Copenhagen, Emory, EPSA, MIT, MPSA, and Stockholm for excellent feedback and advice. Financial support from a Sapere Aude grant from the Danish Council for Independent Research and an ERC Starting Grant (#313673) are gratefully acknowledged.
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1 Introduction

It is widely believed that social networks—the web of strong ties that individuals interact with regularly and weak ties that individuals interact with occasionally—play a central role in explaining economic and social outcomes (e.g. Banerjee et al. 2013; Carrell, Sacerdote and West 2013; Chetty, Hendren and Katz 2016; Sacerdote 2001). Indeed, it is hard to overstate the potential importance of the composition and structure of the networks in which people spend many of their waking hours. However, political scientists have only recently started to exploit exogenous variation and use detailed network data to rigorously examine their empirical importance (see Fowler et al. 2011).

Social networks could influence economic and political beliefs and behavior through at least two channels. First, social ties may exert powerful pressures to conform with or coordinate around norms of political engagement through explicit threats or learned norms (e.g. Bond et al. 2012; Gerber, Green and Larimer 2008; Larson 2017; Marshall 2019; Nickerson 2008; Siegel 2009). This pressure appears to be exerted predominantly by an individual’s few strong ties (Sinclair 2012). Second, social networks may diffuse information that influences citizens’ attitudes and voting behavior (e.g. Carlson 2019; Huckfeldt and Sprague 1995; Katz and Lazarsfeld 1955). The most novel information, relating to events beyond a voter’s own experiences, may be conveyed by an individual’s many weaker ties that possess more distinctive social networks (Granovetter 1973).

While the political significance of networks’ social pressure function among strong ties is now well-established, the information diffusion role of social networks has received limited rigorous empirical attention. This in part stems from the difficulty of reliably mapping large networks of weaker ties (Eagle, Pentland and Lazer 2009) and the information possessed by each node. Nevertheless, since voters—even in the world’s most politically engaged democracies—are often poorly informed about their economic and political environment, cheap and frequent access to information through social ties has the potential to substantially affect voters’ beliefs, preferences, and behavior. Beyond the academic value of distinguishing between the diffusion and social pressure mechanisms, establishing the importance of information diffusion within social networks may
guide how political parties and NGOs should target their information campaigns and illuminate whether voters cast their ballots based on aggregated information.

This article examines how the diffusion of unemployment information between social ties affects voters’ perceptions of the national economy and their own unemployment prospects, policy preferences, and voting behavior. In the aftermath of the 2008 financial crisis, we estimate the diffusion effects of other individuals becoming unemployed within the last year in Denmark. In a context where policies to address unemployment were politically salient, the diffusion of information relating to such unemployment shocks could affect political attitudes through two main channels. On one hand, “egotropic” interests may drive a voter’s economic and social policy preferences (e.g. Iversen and Soskice 2001; Moene and Wallerstein 2001; Rehm 2011b). This implies that information inducing individuals to believe that they personally face greater unemployment risks will lead them to support more generous social insurance and the left-wing parties advocating such policies (Rehm 2011a). On the other hand, “sociotropic” voters may instead use their assessment of the national economy—rather than their personal economic situation—to inform their vote choice (Kinder and Kiewiet 1981). This theory instead implies that information about unemployment shocks affecting others will reduce a voter’s support for the government.

By linking Danish administrative data with surveys eliciting economic and political beliefs, preferences, and behaviors between 2010 and 2013, we address two major obstacles to identifying the political effects of unemployment shocks that diffuse through social networks. First, our rich administrative data enables us to objectively and accurately map networks of social ties through which information could pass for all living Danes since 1980. Our network of strong and mostly weak ties includes: (i) nuclear family and partner; (ii) recent co-workers; and (iii) the graduating cohort of an individual’s most recent degree program. Although information may not always pass between every individual tie, our nationally representative survey validates that conversations—including about unemployment—are common between these ties. While survey methods effectively identify close ties, our approach to mapping both strong and weak ties at scale reduces the severe risk of introducing biases by omitting relevant ties (Chandrasekhar and Lewis 2016).
Second, the administrative data enable us to estimate the effects of second-degree social ties—individuals about whom someone could learn only through shared first-degree ties, but does not interact with directly—becoming unemployed within the last 12 months. We focus on information about shocks that must pass through two ties in order to: (i) mitigate the challenges of estimating causal effects within social networks using non-experimental data; and (ii) help distinguish information diffusion from social conformity pressures or emotional reactions that are most likely to arise when one actually knows people that become unemployed. Our identification strategy, which builds on Bramouillé, Djebbari and Fortin (2009), rests on two key features. First, our focus on unemployment shocks, rather than status, alleviates the “reflection problem” (Manski 1993) by establishing the shock’s source, and thus the direction that information must pass. Second, beyond focusing on shocks affecting second-degree social ties, we further mitigate the risk that common shocks—that could reflect vocation-specific risks, exposure to different political perspectives, differences in local economic conditions, and localized access to media content—might instead drive voter responses by: (i) restricting the sample of second-degree ties to those living in different locations from either the respondent or the tie connecting the respondent to the individual that became unemployed; and (ii) including fine-grained fixed effects that ensure that our identifying variation comes only from differences in the distribution of shocks within the networks of respondents in the same parish and same industry, occupation, and educational categories within any given year.

We find that the beliefs, policy preferences, and voting behavior of Danes are highly responsive to unemployment shocks afflicting second-degree social ties. Indicating that information relatively frequently flows through our networks of predominantly weak ties, an increase in the share of second-degree ties that became unemployed within the last years increases voters’ expectations of unemployment—for both the country at large and themselves. These concerns are reflected in increased support for more generous unemployment insurance, which was proposed by Denmark’s left-wing parties after the financial crisis. Such second-degree unemployment shocks also influence voting behavior, increasing a voter’s probability of voting for a left-wing political party. Variation in incumbency within our sample indicates that voters are not simply punishing the incumbent party,
as predicted by sociotropic theories. Beyond showing that information acquired through social ties is a key force underlying policy preferences and voting behavior, the magnitude of our estimates could account for the left-bloc’s wafer-thin electoral victory in 2011. Indeed, a 3 percentage point increase in the share of second-degree ties that became unemployed in the last year increases a voter’s probability of voting for a left-wing party by around 3 percentage points.

Although we cannot directly observe interactions between millions of voters, our analysis of transmission mechanisms suggests that our findings reflect information diffusion through social networks and egotropic economic interests guiding policy and political responses to updated beliefs about unemployment. First, our survey data indicate that voters regularly discuss unemployment shocks with others, and that such conversations often entail discussing unemployment risks, unemployment insurance policies, and—to a lesser extent—politics. Second, consistent with social ties sharing unemployment information relatively frequently, responses to first-degree ties becoming unemployed are around five times greater than responses to second-degree ties becoming unemployed. Third, increased subjective unemployment risks and increased support for greater unemployment insurance and left-wing parties primarily reflect shocks to second-degree ties in the same industry or occupation as a respondent. Such heterogeneity suggests that egotropic interests drive political preferences. This interpretation is further supported by voters not differentiating between the industries or occupations of second-degree social ties when they update about the national unemployment rate, and barely altering their policy preferences or voting behavior when second-degree ties in industries or occupations other than their own become unemployed.

This article makes two main contributions. First, we leverage network data with unprecedented detail to demonstrate that social ties play an important role in the political lives of Danish voters by diffusing information pertaining to individuals outside a voter’s immediate network. Given the predominance of weak ties in our networks, our findings chime with seminal studies suggesting that weak ties facilitate job opportunities by supplying more novel information (Granovetter 1973) and that economic and political information often emanates from friends and neighbors (Huckfeldt and Sprague 1995; Katz and Lazarsfeld 1955; Kiewiet 1983). More recent studies have highlighted
the importance of peers for enhancing work and educational performance (e.g. Cornelissen, Dustmann and Schönberg 2017; Sacerdote 2001), exposure to alternative perspectives (Barberá 2015), providing political expertise (e.g. Ahn et al. 2013), and mobilizing turnout (Bond et al. 2012; Gerber, Green and Larimer 2008; Nickerson 2008) and collective action (Siegel 2009; Steinert-Threlkeld 2017). In contrast with these studies, and the research already highlighting the role of information and especially social pressure among individuals with close ties (e.g. Sinclair 2012), we show that information diffusion through relatively weak ties significantly affects political preferences and voting behavior in an unfavorable real-world economic environment. Our findings thus lend external validity to experimental studies that identify information diffusion within networks in more artificial laboratory or online contexts (Ahn et al. 2013; Barberá 2015; Carlson 2019; Klar and Shmargad 2017; Mutz 2002).

Second, our analysis indicates that concerns about unemployment primarily influence policy preferences and voting behavior via egotropic, rather than sociotropic, considerations. We overcome the difficulty of distinguishing such accounts (see Ansolabehere, Meredith and Snowberg 2014) by separating personal and national unemployment expectations and differentiating sensitivity to the similarity of the industry of the individual that becomes unemployed. Our results support the insurance-based theories proposed by Iversen and Soskice (2001), Moene and Wallerstein (2001), and Rehm (2011b). Moreover, our findings suggest that the wealth of previous findings attributed to sociotropic voting (e.g. Hansford and Gomez 2015) could instead reflect voters updating about their unemployment prospects from the signals they receive within their social networks.

2 Information diffusion through social networks

The potential for information to diffuse through networks to reach uninformed individuals is widely recognized (see Jackson 2010). ¹ Indeed, citizens become informed about job opportunities and increase their productivity through their social ties (e.g. Caldwell and Harmon 2019; Cornelissen,

¹Our focus is not on how different network structures or the position of shocked individuals influence information diffusion (see e.g. Klar and Shmargad 2017).
Dustmann and Schönberg 2017). Granovetter (1973) further distinguishes strong ties that individuals interact with more frequently from weak ties that individuals interact with occasionally. The more novel information that weak ties with low levels of network overlap can provide is often most valuable (Aral and Van Alstyne 2011; Granovetter 1973), whereas strong ties may be comparatively important for supporting monitoring and enforcement within groups (e.g. Larson 2017).

The informative role of social networks may be especially important in political contexts. Given that voters with limited interest in politics face weak incentives to acquire costly political information for themselves (Downs 1957; Huckfeldt and Sprague 1995), many voters in advanced democracies encounter politically-relevant information through a somewhat diverse group of friends and family (Huckfeldt, Johnson and Sprague 2004; Kiewiet 1983). Better-informed opinion leaders are particularly influential within these networks (Huckfeldt and Sprague 1995; Katz and Lazarsfeld 1955). While information is inevitably modified somewhat as it diffuses between individuals (Carlson 2019), social ties remain a critical source of politically-relevant information—in large part because many citizens, even in media-abundant contexts, are exposed to little else.

In the context of unemployment shocks afflicting others, we expect that such information will often be passed between strong and weak ties in some form. Regardless of the accuracy of their prior beliefs about economic conditions, learning of more cases of others becoming unemployed is likely to increase a voter’s perception of aggregate unemployment rates. Such signals may also increase an individual’s perception of their own unemployment risk, if their risk is perceived to be associated with the risk of those that became unemployed. In line with studies demonstrating that West European voters update in sophisticated ways from politically-relevant information provided by credible media and political sources (e.g. Alt, Lassen and Marshall 2016; Kendall, Nannicini and Trebbi 2015), we expect that:

**H1.** Exposure to information relating to more individuals becoming unemployed that is conveyed through social ties will increase an individual’s perception of aggregate unemployment.

**H2.** Exposure to information relating to more individuals becoming unemployed that is conveyed through social ties will increase an individual’s perceived risk of becoming unemployed.
themselves, especially when the unemployment shocks affect those in similar vocations.

Persistent changes in posterior beliefs about national and individual unemployment prospects could in turn alter voters’ political preferences and voting behavior. This could reflect egotropic or sociotropic logics. Proponents of the egotropic approach posit that voters facing higher individual or occupational unemployment risks will increase their support for government programs, including demanding more generous unemployment insurance in the face of greater risks of becoming unemployed (Iversen and Soskice 2001; Moene and Wallerstein 2001; Rehm 2011a) and voting for the left-wing political parties typically espousing such policies (Rehm 2011b). To the extent that learning of unemployment shocks afflicting others causes voters to update their own expectations of becoming unemployed, the egotropic logic predicts that:

**H3.** If voters are guided by egotropic motivations, being exposed to information about unemployment shocks that is conveyed through social ties will increase an individual’s support for more generous social insurance programs and left-wing political parties.

This preference for insurance could also translate into greater support for general redistribution on the margin, although such policies remain costly for higher-income voters when employed.

While the egotropic logic rests on voters supporting policies that they expect will personally benefit them materially, sociotropic voters instead vote on the basis of national-level economic performance (Kinder and Kiewiet 1981). This could reflect a self-interested desire to elect a competent government or more altruistic motivations. Regardless, we expect voters that come to believe that the national unemployment rate is higher than they previously believed will then hold the government responsible and accordingly decrease their support for the parties in government:

**H4.** If voters are guided by sociotropic motivations, being exposed to information about unemployment shocks that is conveyed through social ties will decrease an individual’s support for incumbent parties.
3 Danish social and political context

We study the effects of unemployment shocks transmitted through social ties on economic concerns and political preferences in the aftermath of the 2008 financial crisis in Denmark. Elections follow a proportional representation system, and Denmark has historically been governed by alternating center-right (Venstre/Liberal and Conservative parties) and center-left (Social Democrat and Socialist People’s parties) coalition governments. The center-right governed between 2001 and 2011, before regaining control in 2015. Denmark’s 98 municipalities, the primary unit of subnational government, contain 2,187 parishes (in 2011)—the country’s smallest administrative unit.

3.1 Informal social ties

Informal networks, rather than formally constituted organizations and activities,\(^2\) are the primary basis of social ties in Danish society. While family ties are undoubtedly important, various studies also highlight the workplace (e.g. Glitz and Vejlin 2014) and educational institutions (e.g. Nielsen and Svarer 2009) as important sources of social interaction in Denmark. In the workplace, individuals are likely to spend more time with coworkers than almost anyone else. A European Commission (2004) survey further shows that 44% of adults report meeting socially with colleagues outside of work at least once a month. Almost all students complete a total of 10 years of school, and 93% of the 2012-cohort continued into some form of high school program. High school graduates either enter the labor market or tertiary education. Given that only five metropolitan areas in Denmark offer university degrees, the geographic diversity of social ties often expands at this point. For many individuals, their closest friends emerge from their final educational institution, while 64% of adults report having social contact with friends at least once a week (European Commission 2004).

Social interactions through these informal networks often diffuse economic and political information. For example, 52% of survey respondents report that they would rely on their social network

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\(^2\)Low church attendance means that religious networks are weak.
to receive help with paperwork (related to taxes, social benefits, etc.), 73% say that they would use their social network to discuss private problems, and 40% indicate that they would use their social network to borrow money (European Commission 2004). These types of interactions are also consequential, as labor market information from former coworkers affects displaced workers’ re-employment probabilities (Glitz and Vejlin 2014) and job-to-job mobility (Caldwell and Harmon 2019). More generally, discussion of unemployment and politics is common among family members, current and former colleagues, and former classmates. On a scale from 0 to 10, ranging from “never talk to these people about this subject” to “often talk to these people about this subject,” Figure 1a shows that the majority of the working age population discusses unemployment within each class of tie in 2015, and most frequently among work colleagues. Figure 1b documents similar patterns and higher frequencies regarding the discussion of politics in general. In comparative perspective, the 2008-2010 wave of the European Values Study ranked Denmark 4th of 46 countries in terms of discussing politics with friends, and 26th and 20th in terms of discussing politics with their mothers and fathers, respectively.

In adult life, social ties tend to be stable over time due to limited geographical mobility. In 2014, the number of people changing their official address amounted to 15% of the population, of which
only 35% moved across municipalities. Young people typically move across municipal borders when they leave their parents’ home around the age of 20-22, and mobility is below average for all age groups above 37. Ties with some former classmates, and especially ties with current and former co-workers, thus remain stable and active for many Danes over their adult lives.

3.2 Unemployment as a political issue following the 2008 financial crisis

After a decade of low (gross) unemployment rates in the 2000s, reaching 2% in early 2008, unemployment almost tripled to around 6% by the 2011 general election. The economy, and especially unemployment, was central to the political debate. Nearly 20% of voters cited unemployment as the most important issue for politicians to address, while a further 20% regarded the welfare state as most important. After the election, unemployment remained around 6%, and the share of Danes regarding unemployment as the biggest political problem rose from 18% in late 2011 to 36% by late 2013. Only in 2014 did the unemployment rate start to fall, stabilizing at around 4% in 2016.

Left-right ideological differences in party platforms were clear in response to the unemployment surge during the financial crisis. The Venstre-led center-right government implemented a “tax freeze” before proposing and passing several market-oriented policies, including a regressive tax cut in 2009-2010, a 2011 “growth program” providing subsidies to small businesses and promising cuts to corporation tax, and—most controversially—a 2010 reform of Denmark’s unemployment insurance system that limited the maximum benefit duration of the generous voluntary insurance scheme from four to two years. In contrast, the Social Democrats and Socialist People’s Party winning 2011 campaign revolved around their “Fair Solution.” This program also contained many policies focused on labor market imbalances, but instead emphasized demand-side and educational policies. They strongly criticized the reform of the unemployment insurance system, and called for public investments, labor agreements, and improved education to create new jobs.

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3 Statistics Denmark, Statistikbanken, Flytninger, table FLY33 and table FLY66, link.
4 Gross (unlike net) unemployment counts those in active labor market programs as unemployed.
5 Danish Election Study, cited here.
6 The 2011 Danish Election Study poll is available here. The 2013 Jyllands-Posten poll is here.
7 The insurance system and this reform are described further in Appendix section A.1.
4 Empirical design

This section first introduces our main variables and operationalizes social ties, before detailing our empirical strategy for identifying the effects of unemployment shocks afflicting second-degree ties that could diffuse through first-degree social ties to influence respondents to our panel survey. We focus on shocks to second-degree individuals that survey respondents do not interact with directly to mitigate the risk that common shocks drive our estimates and to help distinguish information diffusion from social conformity.

4.1 Panel survey and administrative data

We leverage two high-quality sources of data. First, our outcome variables are questions from the 2010-2013 rounds of the Danish Panel Study of Income and Asset Expectations capturing subjective unemployment perceptions, policy preferences, and vote choice. Each survey was fielded in January and February. This telephone survey first sampled around 6,000 Danes registering some labor income between 1998 and 2004, and has randomly resampled from this pool to maintain the sample size over time. Although this sample is slightly older, better educated, and richer, comparing columns (1) and (2) with columns (3) and (4) in Table 1 shows that our survey respondents broadly resemble the Danish working age population.

Second, to define unemployment shocks and social ties between individuals, we rely on detailed individual-level administrative data for the entire population. These government-collected registers, which contain family relations, education, and income tax returns, are available annually between 1980 and 2012. We thus possess unique identifiers and data for all 7.98 million individuals living in Denmark over this period. Panel survey responses were linked to these records by Statistics Denmark. Access to this administrative data is described in Appendix section A.2.

8The initial response rate was 50% (including unreachables), and attrition into 2011 was 31%.
Table 1: Summary statistics for the population and our sample

<table>
<thead>
<tr>
<th></th>
<th>Full population, aged 20-65</th>
<th>Survey respondents</th>
<th>Survey respondents’ first-degree social ties</th>
<th>Survey respondents’ second-degree social ties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (1)</td>
<td>Median (2)</td>
<td>Mean (3)</td>
<td>Median (4)</td>
</tr>
<tr>
<td>Woman</td>
<td>0.50</td>
<td>0</td>
<td>0.49</td>
<td>0.16</td>
</tr>
<tr>
<td>Age</td>
<td>42.90</td>
<td>43.00</td>
<td>45.61</td>
<td>46.43</td>
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<tr>
<td>Children</td>
<td>0.78</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Single</td>
<td>0.35</td>
<td>0</td>
<td>0.22</td>
<td>0</td>
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<tr>
<td>Gross income (DKK)</td>
<td>325,251</td>
<td>294,646</td>
<td>406,620</td>
<td>362,241</td>
</tr>
<tr>
<td>Total assets (DKK)</td>
<td>848,888</td>
<td>375,907</td>
<td>1,231,939</td>
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</tr>
<tr>
<td>Total debt (DKK)</td>
<td>635,145</td>
<td>271,566</td>
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<td>563,647</td>
</tr>
<tr>
<td>Homeowner</td>
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<td>1</td>
</tr>
<tr>
<td>Education basic</td>
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<td>0.19</td>
<td>0</td>
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<tr>
<td>Education short</td>
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<td>Education medium</td>
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<tr>
<td>Education long</td>
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<td>0</td>
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<tr>
<td>Unemployed</td>
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<td>0.04</td>
<td>0</td>
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<tr>
<td>Unemployment shock</td>
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<td>0</td>
<td>0.03</td>
<td>0</td>
</tr>
<tr>
<td>Observations</td>
<td>13,385,137</td>
<td>13,385,137</td>
<td>17,816</td>
<td>17,816</td>
</tr>
</tbody>
</table>

Notes: To comply with Statistics Denmark’s anonymity restrictions, medians and lower and upper bounds of ranges are computed across five observations. The summary statistics in columns (3)-(8) are for the largest sample used in our analyses below.

4.1.1 Outcomes: economic and political beliefs and preferences

With respect to beliefs about unemployment, we measure national and personal assessments. First, we measure beliefs about aggregate unemployment in two ways: in 2011-2013, the survey elicited respondents’ best guess at the current national unemployment rate; and in 2011 and 2013, the survey elicited respondents’ national unemployment rate forecast for the next year. Second, an individual’s risk of becoming unemployed is based on their self-assessed probability, from 0 to 1, of becoming unemployed in the forthcoming year.

We define three indicator variables to capture policy preferences: for the 34% of respondents expressing support for increasing unemployment insurance above the existing level; for the 38% of respondents believing that the government should do more to support the poor; and for the 39% of respondents believing that the government should use a non-market-based stimulus—public investments or a temporary increase in unemployment insurance, as opposed to (income or VAT) tax cuts or firm subsidies—to address the economic crisis (only available in the 2010 survey).\(^9\)

\(^9\)In each case, “don’t know” or “none of the above” were coded as 0.
Two further outcomes measure support for political parties: intention to vote for a left-wing party—the Social Democrats, Social Liberals, Socialist Party, or Red-Green Alliance; and an indicator for voters that reported having voted for such a left-wing party at the 2011 election.\footnote{Reported turnout rates in our survey were 98\%, although nationwide turnout in 2011 was 88\%.} Respectively, 42\% and 50\% of respondents supported the left by these two measures.

### 4.1.2 Individual unemployment shocks

To capture individual unemployment shocks that represent novel information, we focus on instances of other individuals recently becoming unemployed.\footnote{When exiting employment, individuals are transferred to unemployment status and receive unemployment benefits or cash assistance (see Appendix section A.1).} In contrast, longer-term unemployment status is less likely to be discussed and is more vulnerable to biases arising from common shocks. Accordingly, we define unemployment shocks within the last year using an indicator that denotes whether an individual was registered as unemployed in the November preceding the survey—the snapshot at which the Danish administrative data is collected—but was not registered as unemployed in November the year prior.\footnote{Following international standards, those in active labor market program count as unemployed.} On average, 3\% of working age Danes experience such a shock each year over our study period. The timing of these shocks makes it unlikely that survey respondents heard about them just before completing the surveys conducted in January and February.

### 4.1.3 Mapping social networks of strong and weak ties

Our administrative data presents a rare opportunity to extensively map social ties throughout a population. Although some ties are closer than others, a comprehensive network is critical for ensuring that bias is not introduced by the omission of ties through which information passes. Indeed, our estimates would be upwardly biased if unemployment shocks directly or indirectly affecting social ties were correlated with shocks affecting other unmeasured ties. Chandrasekhar and Lewis (2016) further prove that missing ties can produce non-classical measurement error that can severely upwardly bias estimates, even when nodes are missing at random. Such concerns are
pertinent in Denmark, where—as Figure 1 illustrates—information related to employment often passes between relatively weak ties (see also Caldwell and Harmon 2019; Glitz and Vejlin 2014). To minimize biases, we adopt an inclusive definition of social ties that encompasses ties of varying strengths. This enables us to estimate effects that average across any information that flows between more and less distant ties.

Specifically, we approximate an individual’s first-degree network of strong and predominantly weak ties using the following criteria:

1. **Family**: parents, adoptive parents, siblings, half-siblings, and partners.\(^{13}\)

2. **Vocation**: coworkers from within the previous two years. For firms with 25 or more employees or for individuals that accumulated more than 50 co-workers across multiple firms, we only include coworkers within the same one-digit educational category.

3. **Education**: fellow students from the cohort at the institution where their highest level of educational degree was obtained (e.g. subject-degree class at a specific university for university-level degrees), or the cohort at the point of dropping out of school without a degree.

The firm size restriction reflects the likelihood that individuals in large firms interact primarily with recent colleagues doing similar types of jobs within the firm. The education restriction captures the likelihood that ties attenuate upon moving on to another educational institution. Although our definition of weak ties inevitably includes some omissions,\(^{14}\) our results are robust to defining larger networks that include more past colleagues and high school and university-degree graduating classes, as well as adjusting for indicators of firm- and education-level network truncation as a robustness check.

Although the interaction between some of these individuals may be negligible, our operationalization of social ties does capture meaningful real-world communications between Danes. First,

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\(^{13}\) Siblings and parents are linked if a father or mother is alive and was registered by the Danish government at any point between 1980 and 2012.

\(^{14}\) The most obvious omissions are (non-work and non-school) friends and non-nuclear family members. If such individuals live locally and have local friends themselves, our sample restrictions described below should mitigate the bias from these omissions.
Figure 2: Histograms showing the share of first-degree weak ties that individuals converse with

Notes: All questions were phrased to reflect our operational definitions of first-degree weak ties (see Appendix section A.3). Conversations about economics or politics represent a lower bound because, since we cannot identify the union of the exact individuals that respondents refer to, we take the maximum of the percentage of ties conversed with about each topic.

data from the mobile money app MobilePay shows that these familial, vocational, and educational ties are all significant predictors of electronic payments between Danes (Sheridan 2019). Second, we further conducted a nationally representative survey of 1,506 Danish adults in November 2018 to validate our operationalization of social ties.\textsuperscript{15} Figure 2 shows that respondents report having conversed with significant numbers of social ties by our definition. Within the last year, the mean respondent had a general conversation with more than 50% of individuals within our family and vocational categories, and a conversation about economics or politics with at least 30%. Respondents converse with fewer members of their terminal educational cohort, although the relationships that they do sustain may comprise their closest ties. The robustness checks in Appendix Table A4 report similar results when shocks that could only be transmitted through educational ties are excluded.

We combine the familial, vocational, and educational information above to construct an adjacency matrix characterizing first-degree social ties between every individual in the Danish popula-

\textsuperscript{15}Appendix section A.3 describes the survey protocols.
tion alive between 1980 and 2012. Appendix section A.4 explains how this matrix was computed. We focus on the social ties of the 8,747 unique labor force participants that appear in our 2010-2013 surveys. The mean and median survey respondent in a given year respectively register 224 and 81 first-degree ties, of which 2% and 5%, 74% and 43%, and 24% and 52% are familial, vocational, and educational ties, respectively.

4.2 Identification strategy

Our goal is to estimate the effect of information relating to unemployment shocks that diffuse through social ties on a voter’s economic and political beliefs, preferences, and behavior. To maintain a reasonable probability that information about unemployment shocks reaches our survey respondents, while reducing the possibility that this is confounded by social pressure or emotional reactions that could arise when respondents are linked directly to those becoming unemployed, we leverage our population-level network data to exploit unemployment shocks afflicting working age (20-65) second-degree ties. A second-degree tie is an individual that is a first-degree tie of at least one of a respondent’s first-degree ties, but is not a first-degree tie of the respondent. After excluding nearby second-degree ties and including fine-grained fixed effects that account for factors that could generate differences in respondents’ networks, this approach leverages distant shocks to “friends of friends” that are plausibly exogenous to other determinants of a respondent’s beliefs, preferences, and behavior. We now explain this identification strategy in detail.

More formally, our empirical design focuses on “intransitive triads” where individuals $i$ and $j$ are connected and individuals $j$ and $k$ are connected, but $i$ and $k$ are not connected.\(^{16}\) To trace informational shocks, we exploit variation in the share of $i$’s second-degree ties—that is to say $k$’s that are only connected to $i$ through a $j$—that became unemployed in a given year. Because $k$ is only connected to $i$ through a $j$ that is a first-degree tie for both $i$ and $k$, unemployment shocks afflicting $i$’s second-degree ties should only affect $i$ by diffusing through $j$. Figure 3 illustrates this design, where $i$ is our panel survey respondent, $j$ is a first-degree tie, and $k$ is a second-degree tie.

\(^{16}\)Appendix section A.4 illustrates how second-degree social ties are constructed.
Leveraging unemployment shocks afflicting second-degree ties addresses two key challenges that often impede the estimation of information diffusion effects within social networks. First, our focus on \( k \)-specific unemployment shocks addresses the reflection problem—that correlated economic or political outcomes between individuals \( i \) and \( k \) could reflect \( i \) affecting \( k \) through \( j \) or \( k \) affecting \( i \) through \( j \) (see Manski 1993)—by establishing the source of the shock, and thus the direction in which any information must diffuse. Second, by focusing on unemployment shocks and shocks with two degrees of separation, we reduce the risk that any correlation between shocks afflicting second-degree ties and \( i \)'s beliefs, preferences, and behavior reflects common characteristics or experiences shared by \( i \) and \( i \)'s second-degree ties (Bramoullé, Djebbari and Fortin 2009).

Nevertheless, a key concern is that respondents and their second-degree ties experience common shocks. Consequently, \( i \) would receive essentially the same, or highly correlated, information about an unemployment shock to \( k \) without receiving such information from a \( j \) linking \( k \) to \( i \). We address the spatial component of this concern by first excluding all second-degree ties \( k \) located in the same municipality as \( i \). Second-degree ties \( k_1 \) and \( k_2 \) in Figure 4a are examples of such excluded cases. To address an analogous problem arising when \( j \) experiences shocks correlated with \( k \), we further exclude any second-degree tie \( k \) that is located in a parish where any first-degree tie \( j \) that indirectly connects \( i \) and \( k \) resides. This excluded case is exemplified by the second-degree tie \( k_3 \) in Figure 4a. Consequently, our identification strategy only exploits unemployment shocks to individuals \( k \) in a different location from both individuals \( i \) and \( j \), as illustrated in Figure 4b.

These two restrictions reduce the number of second-degree ties used to compute the share of

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\(^{17}\) Appendix Table A4 shows similar results if we further exclude \( k \)'s from \( i \)'s region.

\(^{18}\) Appendix Table A4 reports similar point estimates when \( k \)'s located in the same municipality as \( j \) are excluded.
Figure 4: Illustration of excluded and included second-degree social ties

(a) Excluded cases

(b) Included cases

(a) Excluded cases

(b) Included cases

Figure 4: Illustration of excluded and included second-degree social ties

a respondent’s second-degree ties that become unemployed by around half. Before applying these exclusions, survey respondents had a mean of 17,632 and a median of 7,831 second-degree ties in a given year; after the exclusions, the mean and median respectively drop to 7,130 and 4,364 second-degree ties. Although excluding proximate ties that could generate biases will reduce the external validity of the shocks somewhat, Table 1 shows that the socioeconomic characteristics of the remaining working age second-degree ties are broadly similar to the working age population.

We further address more general common shocks by including fine-grained fixed effects. Specifically, we use four sets of fixed effects at the respondent-by-year level to restrict attention to variation in unemployment shocks that arise due to differences in network composition between individuals within the same industry, occupation, educational, and geographic groupings.19 First, \( i \)’s industry \( \times \) year fixed effects absorb common economic and political attitudes as well as vocational interactions among voters within a particular two-digit industry classification in a given year. Second, \( i \)’s occupation \( \times \) year fixed effects absorb differences across one-digit occupational classifications in a given year. Third, \( i \)’s education \( \times \) year fixed effects absorb differences across time in the attitudes of voters within a given one-digit educational classification. Appendix section A.5 describes these digit classifications. Fourth, \( i \)’s parish \( \times \) year fixed effects absorb parish-specific shocks—such as common community preferences or localized media coverage—that could induce

19Rather than leverage within-respondent variation, we exploit cross-sectional differences because—by the law of large numbers—there is limited variation in the share of a respondent’s second-degree ties becoming unemployed each year (conditional on year-interacted fixed effects).
individuals with different networks to adopt similar unemployment concerns and political preferences. Together, these fixed effects capture many potential common shocks, and increase confidence that our estimates reflect differences in the distribution of second-degree shocks experienced by otherwise similar individuals. A placebo test and robustness checks employing more demanding adjustment strategies and sample restrictions further address common shock concerns.

In sum, we estimate the effect of an increase in the share of respondent $i$’s second-degree ties that recently became unemployed on outcomes for $i$ using the following OLS regression,

$$Y_{it} = \beta_\text{Second-degree unemployment shock share}_{it} + \gamma_{\text{wt}} + \delta_{\text{ot}} + \eta_{et} + \mu_{pt} + \epsilon_{it},$$  \hspace{1cm} (1)

where $\text{Second-degree unemployment shock share}_{it}$ is the share of $i$’s (non-excluded) second-degree ties that were unemployed two months before the survey in year $t$ (having not been unemployed in year $t-1$), and $\gamma_{\text{wt}}, \delta_{\text{ot}}, \eta_{et},$ and $\mu_{pt}$ are respondent-level industry, occupation, education, and parish fixed effects that vary by year $t$. Standard errors are clustered by $i$’s municipality.

5 The diffusion of unemployment shocks and economic and political beliefs, preferences, and behavior

This section presents our main finding that unemployment shocks to second-degree social ties significantly affect economic and political beliefs, preferences, and behavior, before leveraging placebo and sensitivity analyses to demonstrate the robustness of our findings.

5.1 Effects of unemployment shocks afflicting second-degree social ties

Table 2 reports our main results estimating the effect of an increase in the share of working-age Danish voters’ second-degree social ties that became unemployed in the last year on our outcomes of interest. A unit increase in the share experiencing an unemployment shocks implies a shift from 0% of second-degree ties becoming unemployed to 100%, while the standard deviation is 1.5%.
Table 2: Estimates of second-degree social tie unemployment shocks on a respondent’s economic and political beliefs, preferences, and behavior

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Guess national unemployment rate (1)</th>
<th>National unemployment rate expectation (2)</th>
<th>Own unemployment expectation (3)</th>
<th>Want more unemployment insurance (4)</th>
<th>Government should support the poor (5)</th>
<th>Support non-market-based stimulus (6)</th>
<th>Intend to vote for left party in 2011 (7)</th>
<th>Voted for left party in 2011 (8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second-degree unemployment shock share</td>
<td>0.226*** (0.056)</td>
<td>0.260*** (0.059)</td>
<td>0.743*** (0.211)</td>
<td>0.652* (0.354)</td>
<td>0.279 (0.327)</td>
<td>0.212 (0.427)</td>
<td>0.780** (0.301)</td>
<td>1.242** (0.577)</td>
</tr>
<tr>
<td>Observations</td>
<td>13,000</td>
<td>8,667</td>
<td>17,816</td>
<td>17,816</td>
<td>17,816</td>
<td>4,816</td>
<td>17,816</td>
<td>5,209</td>
</tr>
<tr>
<td>Outcome range</td>
<td>[0,1]</td>
<td>[0,1]</td>
<td>[0,1]</td>
<td>[0,1]</td>
<td>[0,1]</td>
<td>[0,1]</td>
<td>[0,1]</td>
<td>[0,1]</td>
</tr>
<tr>
<td>Outcome standard deviation</td>
<td>0.055</td>
<td>0.050</td>
<td>0.302</td>
<td>0.467</td>
<td>0.487</td>
<td>0.490</td>
<td>0.496</td>
<td>0.500</td>
</tr>
<tr>
<td>Unemployment shocks mean</td>
<td>0.022</td>
<td>0.022</td>
<td>0.023</td>
<td>0.023</td>
<td>0.023</td>
<td>0.025</td>
<td>0.023</td>
<td>0.022</td>
</tr>
<tr>
<td>Unemployment shocks std. dev.</td>
<td>0.014</td>
<td>0.014</td>
<td>0.015</td>
<td>0.015</td>
<td>0.015</td>
<td>0.018</td>
<td>0.015</td>
<td>0.014</td>
</tr>
</tbody>
</table>

Notes: All specifications are estimated using OLS, and include respondent-level industry × year, occupation × year, education × year, and parish × year fixed effects. Standard errors are clustered by respondent municipality. * p < 0.1, ** p < 0.05, *** p < 0.01.

We first find, in line with hypothesis H1, that voters significantly update their beliefs about aggregate unemployment rates. Our point estimates in columns (1) and (2) indicate that a percentage point increase in the share of second-degree ties that became unemployed in the last year increases both an individual’s current guess at the national unemployment rate and their expectation for the coming year by around 0.25 percentage points. In both cases, a standard deviation increase in the share of a respondent’s second-degree ties becoming unemployed implies around a 0.06 standard deviation increase in an individual’s assessment of aggregate unemployment rates. Even among a relatively informed electorate, and consistent with Alt, Lassen and Marshall (2016), voter beliefs about national unemployment rates are thus quite malleable.

Voters further update their beliefs about their own unemployment risk. Supporting H2, column (3) shows that each percentage point increase in the share of a respondent’s second-degree social ties that became unemployed in a given year increases an individual’s self-assessed probability of becoming unemployed within the next year by 0.74 percentage points on average. This level of responsiveness, which exceeds voter updating about aggregate unemployment, implies that a 3 percentage point—or almost a two standard deviation—increase in unemployment shocks afflicting individuals that a respondent is indirectly connected to increases the subjective risk of unemployment by 2.2 percentage points. Such an effect is around 14 times smaller than the 31 percentage
point increase in the perceived risk of being unemployed associated with respondents themselves suffering an unemployment shock in the last year (see panel C of Table 3 below). These results suggest that voters place significant weight on the unemployment experiences of second-degree social ties that are relayed by “word of mouth.”

Beyond influencing a respondent’s economic outlook, unemployment shocks afflicting “friends of friends” also affect policy preferences. Consistent with both H3 and H4, column (4) shows that a 3 percentage point increase in the share of second-degree ties becoming unemployed increases the probability that an individual supports more generous unemployment insurance by 2.0 percentage points. This represents around one eighth of the greater support for unemployment insurance among respondents that themselves became unemployed. Although the estimates in columns (5) and (6) are not statistically significant, they suggest that unemployment shocks afflicting second-degree ties may also increase support for redistribution toward the poor and non-market-based government stimulus. It is possible that changes in support for such measures are more limited because they are less directly targeted toward citizens expecting to become unemployed. Together, these findings suggest that unemployment shocks transmitted through networks of mostly weak ties cause voters to adopt more left-wing policy positions.

Consistent with the expectation that risk and distributive preferences translate into support for left-wing political parties, unemployment concerns and policy preferences are mirrored in the increased propensity of a respondent to vote for one of Denmark’s left-wing parties. Columns (7) and (8) demonstrate that a 3 percentage point increase in the share of a respondent’s second-degree ties that became unemployed in the last year increases the intention to vote for a left-wing party and actually voting for a left-wing party in the 2011 election by 2.3 and 3.7 percentage points respectively. By way of comparison, these effects are around half the size of the difference in left vote between respondents that did and did not themselves become unemployed. The relatively substantial effects of information that diffuses through social ties thus suggest that networks of mostly weak ties could alter electoral outcomes and governing coalitions, particularly in the close elections experienced recently in Denmark.
Thus far, our findings are consistent with both egotropic (H3) and sociotropic (H4) voting motivations. Even the elevated vote for the left-wing opposition party in 2011 could have reflected sociotropic voting if voters updated negatively about the center-right incumbent’s competence. However, Appendix Table A2 shows that unemployment shocks did not reduce intention to vote for the government, which comprised left-wing parties in 2012 and 2013 survey rounds. We provide further evidence against the sociotropic interpretation of voter responses below by showing that political preferences respond primarily to concerns about their own unemployment risks.

Although social interactions between familial, vocational, and educational weak ties are all fairly common in Denmark, it is natural to consider heterogeneity by type of social tie. Appendix Tables A6 and A7 interact unemployment shocks with the type of ties linking a respondent to a first-degree weak tie and linking a respondent’s first-degree tie to a second-degree tie. The results overall suggest that shocks transmitted through each type of tie operate relatively similarly.

5.2 Robustness checks

Perhaps the greatest concern is that our estimates reflect common shocks afflicting both the respondent and their second-degree social ties. Beyond our sample restrictions and fine-grained fixed effect structure, we address further this concern using various robustness checks.

First, we conduct a placebo test designed to detect common shocks afflicting respondents with similar types of network by assigning respondents “fake” first-degree social ties that are similar to a respondent’s actual social ties. Specifically, each \( j \) was replaced by a randomly selected \( j' \neq j \) from our sample (without replacement) that lives in the same municipality and works in the same one-digit industry as \( j \) in a given year, but is not actually a first-degree tie of the respondent. We then examine the effects of shocks affecting the \( k' \)'s associated with each \( j' \). Consistent with common shocks not driving our results, panel A of Table 3 reports no evidence that shocks influence respondent beliefs and preferences. The negative coefficients in columns (5), (7), and (8) for the variables capturing left-wing attitudes run in the opposite direction to our main findings.

Second, shocks afflicting second-degree social ties belonging to the respondent’s same cohort
Table 3: Placebo and main robustness checks

<table>
<thead>
<tr>
<th>Guess national unemployment rate (1)</th>
<th>National unemployment rate expectation (2)</th>
<th>Own unemployment expectation (3)</th>
<th>Want more unemployment insurance (4)</th>
<th>Government should support the poor (5)</th>
<th>Support non-market-based stimulus (6)</th>
<th>Intend to vote for left party in 2011 (7)</th>
<th>Voted for left party in 2011 (8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel A: placebo test examining shocks to similar first-degree social ties that the respondent does not know</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Placebo second-degree unemployment shock share</td>
<td>0.036</td>
<td>0.024</td>
<td>0.117</td>
<td>0.097</td>
<td>-0.345**</td>
<td>0.022</td>
<td>-0.489***</td>
</tr>
<tr>
<td>Observations</td>
<td>13,000</td>
<td>8,667</td>
<td>17,816</td>
<td>17,816</td>
<td>17,816</td>
<td>4,816</td>
<td>17,816</td>
</tr>
<tr>
<td>Panel B: controlling for respondent cohort \times year fixed effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second-degree unemployment shock share</td>
<td>0.220***</td>
<td>0.265***</td>
<td>0.629***</td>
<td>0.748**</td>
<td>0.386</td>
<td>0.292</td>
<td>0.828***</td>
</tr>
<tr>
<td>Observations</td>
<td>13,000</td>
<td>8,667</td>
<td>17,816</td>
<td>17,816</td>
<td>17,816</td>
<td>4,816</td>
<td>17,816</td>
</tr>
<tr>
<td>Panel C: adjusting for the respondent themselves suffering an unemployment shock</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second-degree unemployment shock share</td>
<td>0.223***</td>
<td>0.257***</td>
<td>0.667***</td>
<td>0.617*</td>
<td>0.262</td>
<td>0.137</td>
<td>0.774**</td>
</tr>
<tr>
<td>Unemployment shock share</td>
<td>0.056</td>
<td>0.058</td>
<td>0.216</td>
<td>0.351</td>
<td>0.337</td>
<td>0.431</td>
<td>0.302</td>
</tr>
<tr>
<td>Observations</td>
<td>12,991</td>
<td>8,664</td>
<td>17,799</td>
<td>17,799</td>
<td>17,799</td>
<td>4,808</td>
<td>17,799</td>
</tr>
<tr>
<td>Panel D: adjusting for 10 predetermined respondent covariates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second-degree unemployment shock share</td>
<td>0.199***</td>
<td>0.246***</td>
<td>0.380*</td>
<td>0.477</td>
<td>0.138</td>
<td>0.123</td>
<td>0.718**</td>
</tr>
<tr>
<td>Observations</td>
<td>12,991</td>
<td>8,664</td>
<td>17,799</td>
<td>17,799</td>
<td>17,799</td>
<td>4,808</td>
<td>17,799</td>
</tr>
</tbody>
</table>

Notes: All specifications are estimated using OLS, and include respondent-level industry \times year, occupation \times year, education \times year, and parish \times year fixed effects. The placebo test in panel A is described in the main text. The covariates included in panel D are: gender, age, whether single, number of children, annual income, total asset wealth, total debt, homeowner status, whether unemployed, and the number of second-degree social ties; the regression coefficients for these variables are reported in Table A3. Standard errors are clustered by respondent municipality. * \( p < 0.1 \), ** \( p < 0.05 \), *** \( p < 0.01 \).

could be associated with those affecting the respondent themselves (e.g. due to legislation or labor demand decisions that differentially affect certain age groups). We address this potential source of common shocks by including (birth year) cohort \times year fixed effects, and thus exploit only variation in unemployment shocks to second-degree ties belonging to the same cohort in a given year. Panel B shows that the inclusion of such fixed effects does not alter our findings.

Third, we further address the concern that our findings are spurious by adjusting for predetermined covariates. Panel C includes an indicator for a respondent becoming unemployed in the last year. Panel D adds nine further respondent-level socioeconomic and demographic covariates: gender, age, whether single, number of children, annual income, total asset wealth, total debt, homeowner status, whether unemployed, and the number of second-degree social ties. In neither case does adjusting for these covariates substantively alter our findings.

Appendix Table A4 reports the results of seven additional checks addressing potentially confounding factors or sensitivity to network construction. We show that our findings are robust to
further excluding second-degree ties from the same region as the respondent, excluding second-degree ties that live in the same municipality as the first-degree tie linking them to the respondent, adjusting for indicators for respondents whose social networks were truncated at the $i$ and $j$ levels by our vocational and educational restrictions, excluding respondents with more than 10,000 or 5,000 second-degree ties, and dropping all possible unemployment shocks to second-degree ties that rely on ties generated by familial or educational ties. Appendix Table A5 further shows that the effect of increasing the share of second-degree ties that became unemployed is relatively linear.

6 Information transmission mechanisms driving voter responses

We next illuminate the process through which unemployment shocks to second-degree social ties influence voters. The following analyses indicate that information diffuses through first-degree ties, who update similarly, and suggest that political responses are primarily driven by egotropic rather than sociotropic motivations.

6.1 Information diffusion through first-degree social ties

Information diffusion between second-degree connections likely requires that the intermediary internalizes unemployment shocks at least somewhat similarly to the ultimate recipient. It is difficult to see how a respondent could be sensitive to unemployment shocks experienced by individuals that they do not interact with without such a chain of events.

To assess this transmission mechanism, we first fielded a nationally representative survey in 2018 to examine what information is passed to others when “someone you know” becomes unemployed. Figure 5 shows that most respondents at least occasionally relay this event to others within their social network. Furthermore, many respondents instigate discussions with others about unemployment risk, unemployment insurance, and—to a lesser extent—the need for more left-wing politicians in response to someone they know becoming unemployed. Only 9% of respondents report never instigating any kind of discussion after someone they know becomes unemployed.
Figure 5: Discussions that individuals instigate when a first-degree social tie becomes unemployed

Notes: All responses are from our 2018 nationally representative survey of adult Danes. All questions refer to what happens after “someone you know becomes unemployed.”

Danes thus often seem to diffuse politically-relevant information to their first-degree social ties when another first-degree tie becomes unemployed.

A second implication of the information diffusion mechanism is that intermediary ties should alter their beliefs and preferences in response to unemployment shocks in a similar manner to our respondents. Ideally, we would test this by estimating the effect of unemployment shocks afflicting second-degree ties on the intermediary tie j that links respondent i to the k’s. Unfortunately, very few of these intermediaries also participated in our panel survey. In the spirit of two-sample instrumental variable techniques, we instead use the first-degree tie between i and j to substitute for the first-degree tie between j and k that we would ideally estimate. If i-j and j-k links are independently sampled from the same population, then we will obtain the same estimates in expectation (see Inoue and Solon 2010). Table 1 shows that our respondents’ first-degree social ties are broadly similar to both our respondents and their second-degree ties, as required. We then approximate the first step in the transmission of information from k to j by estimating the following OLS regression:
Table 4: Estimates of first-degree social tie unemployment shocks on respondent economic and political beliefs, preferences, and behavior

<table>
<thead>
<tr>
<th></th>
<th>Guess national unemployment rate (1)</th>
<th>National unemployment rate expectation (2)</th>
<th>Own unemployment expectation (3)</th>
<th>Want more unemployment insurance (4)</th>
<th>Government should support the poor (5)</th>
<th>Support non-market-based stimulus (6)</th>
<th>Intend to vote for left party (7)</th>
<th>Voted for left party in 2011 (8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First-degree unemployment shock share</td>
<td>0.014 (0.012)</td>
<td>0.012 (0.015)</td>
<td>0.205*** (0.068)</td>
<td>0.156** (0.065)</td>
<td>0.166** (0.084)</td>
<td>0.165 (0.125)</td>
<td>0.133* (0.069)</td>
<td>0.388** (0.190)</td>
</tr>
<tr>
<td>Observations</td>
<td>12,771</td>
<td>8,496</td>
<td>17,454</td>
<td>17,454</td>
<td>17,454</td>
<td>4,683</td>
<td>17,454</td>
<td>5,137</td>
</tr>
<tr>
<td>Outcome range</td>
<td>[0.1]</td>
<td>[0.1]</td>
<td>[0.1]</td>
<td>[0.1]</td>
<td>[0.1]</td>
<td>[0.1]</td>
<td>[0.1]</td>
<td>[0.1]</td>
</tr>
<tr>
<td>Outcome mean</td>
<td>0.085</td>
<td>0.076</td>
<td>0.171</td>
<td>0.319</td>
<td>0.387</td>
<td>0.405</td>
<td>0.440</td>
<td>0.502</td>
</tr>
<tr>
<td>Outcome standard deviation</td>
<td>0.055</td>
<td>0.050</td>
<td>0.299</td>
<td>0.466</td>
<td>0.487</td>
<td>0.491</td>
<td>0.496</td>
<td>0.500</td>
</tr>
<tr>
<td>Unemployment shocks mean</td>
<td>0.025</td>
<td>0.026</td>
<td>0.027</td>
<td>0.027</td>
<td>0.027</td>
<td>0.031</td>
<td>0.027</td>
<td>0.025</td>
</tr>
<tr>
<td>Unemployment shocks std. dev.</td>
<td>0.053</td>
<td>0.052</td>
<td>0.057</td>
<td>0.057</td>
<td>0.057</td>
<td>0.065</td>
<td>0.057</td>
<td>0.046</td>
</tr>
</tbody>
</table>

Notes: All specifications are estimated using OLS, and include respondent-level industry \( \times \) year, occupation \( \times \) year, education \( \times \) year, and parish \( \times \) year fixed effects. These estimates are not directly comparable to those in Table 2 because the denominator underpinning the unemployment shock share differs; the sample is slightly lower than Table 2 because respondents whose first-degree ties all live in the same municipality are excluded. * \( p < 0.1 \), ** \( p < 0.05 \), *** \( p < 0.01 \).

\[ Y_{it} = \beta \text{First-degree unemployment shock share}_{it} + \gamma_{wt} + \delta_{ot} + \eta_{et} + \mu_{pt} + \varepsilon_{it}. \] (2)

where \( \text{First-degree unemployment shock share}_{it} \) is now the share of a respondent’s first-degree social ties that became unemployed within the last year. The fixed effect structure is analogous to equation (1), while we similarly remove first-degree ties located in the same municipality as their corresponding respondent.

The results reported in Table 4 add further credence to the information diffusion mechanism. An increase in the share of first-degree social ties that became unemployed influences respondents’ own unemployment concerns and policy and political preferences in the same direction as we found for shocks to second-degree ties in Table 2. Specifically, a 3 percentage point increase in the share of first-degree ties that became unemployed in the last year significantly increases a respondent’s own perceived risk of becoming unemployed by 0.6 percentage points, their support for unemployment insurance by 0.5 percentage points points, and their support for left-wing political parties by 0.5-1 percentage points. We now also observe a statistically significant increase in support for government policies supporting the poor.

However, the effects of unemployment shocks afflicting first-degree ties also differ from the effects of shocks afflicting second-degree ties in two important ways. First, the effects of first-
degree ties becoming unemployed on a respondent’s own concerns and political preferences are notably larger per shock. To see this, first note that the point estimates in Tables 2 and 4 are not comparable because the denominators that define the share of ties that became unemployed differ substantially: in these empirical analyses, the mean respondent has 186 first-degree social ties, but 4,487 second-degree social ties. To compare the effect of a single tie becoming unemployed, we divide the coefficients in Tables 2 and 4 by these means respectively. This implies that, per shock, the effects of a first-degree social tie becoming unemployed on unemployment concerns, social policy preferences, and vote choices are 4-8 times greater than the effects of a second-degree tie becoming unemployed. Second, and in stark contrast, the per shock effect of unemployment shocks to first- and second-degree ties on a respondent’s national unemployment outlook are relatively similar in magnitude. This contrast suggests that the differential in magnitude between the effects of shocks to first- and second-degree ties cannot be entirely attributed to information decay arising from the greater probability that $i$ learns about a shock to $j$ than $i$ learns about a shock to $k$ through $j$.

One possible explanation is that the differential response between subjective expectations and preferences and aggregate perceptions reflects the likelihood that first-degree social ties are more similar to respondents than second-degree ties. Consequently, respondents may be more sensitive to unemployment shocks afflicting first-degree ties because shocks to similar people cause respondents to update more about their own risks, whereas any unemployment shock is relevant when inferring national aggregates. We further test this interpretation by next examining whether respondents are indeed most responsive to shocks afflicting individuals that are similar to themselves, as hypothesis H2 predicts.

### 6.2 Preferences and voting behavior are motivated by egotropic interests

The greater effects of unemployment shocks afflicting first-degree social ties corroborate the information diffusion mechanism, but also suggest that voters may differentiate information about unemployment shocks on the basis of their implications for their personal economic interests. We
Table 5: Heterogeneity in the effect of the share of second-degree social ties that became unemployed in the last year on respondent economic and political beliefs, preferences, and behavior, by economic similarity of respondent and second-degree ties

<table>
<thead>
<tr>
<th></th>
<th>Guess national unemployment rate</th>
<th>National unemployment rate expectation</th>
<th>Own unemployment expectation</th>
<th>Want more unemployment insurance</th>
<th>Government should support the poor</th>
<th>Support non-market-based stimulus</th>
<th>Intend to vote for left party in 2011</th>
<th>Voted for left party in 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second-degree unemployment shock share</td>
<td>0.212***</td>
<td>0.237***</td>
<td>0.274</td>
<td>-0.145</td>
<td>0.224</td>
<td>-0.616</td>
<td>0.632</td>
<td>0.372</td>
</tr>
<tr>
<td>Second-degree share similar</td>
<td>0.007</td>
<td>0.002</td>
<td>-0.098***</td>
<td>-0.093**</td>
<td>-0.028</td>
<td>-0.122*</td>
<td>0.004</td>
<td>0.028</td>
</tr>
<tr>
<td>Observations</td>
<td>13,000</td>
<td>8,667</td>
<td>17,816</td>
<td>17,816</td>
<td>17,816</td>
<td>4,816</td>
<td>17,816</td>
<td>5,209</td>
</tr>
<tr>
<td>Second-degree share similar mean</td>
<td>0.434</td>
<td>0.435</td>
<td>0.430</td>
<td>0.430</td>
<td>0.430</td>
<td>0.418</td>
<td>0.430</td>
<td>0.428</td>
</tr>
</tbody>
</table>

Notes: All specifications are estimated using OLS, and include respondent-level industry × year, occupation × year, education × year, and parish × year fixed effects. Standard errors are clustered by respondent municipality. * p < 0.1, ** p < 0.05, *** p < 0.01.

test the argument that unemployment shocks afflicting similar people provide a stronger signal of an individual’s prospects by estimating the following specifications:

\[ Y_{it} = \beta_1 \text{Second-degree unemployment shock share}_{it} + \beta_2 \text{Second-degree share similar}_{it} \\
+ \beta_3 (\text{Second-degree unemployment shock share}_{it} \times \text{Second-degree share similar}_{it}) \\
+ \gamma_{it} + \delta_{it} + \eta_{it} + \mu_{pt} + \epsilon_{it}, \tag{3} \]

where Second-degree share similar_{ikt} is the share of a respondent’s second-degree ties that are in the same two-digit industry or in the same one-digit occupation in survey year \( t \).\(^{20}\)

In line with H2, the results in Table 5 suggest that voters indeed respond more to unemployment shocks afflicting second-degree ties that are economically similar to themselves. The interaction coefficients capture the differential effect of an increase in the share of second-degree ties that became unemployed within the last year as the share of economically similar second-degree ties rises from 0% to 100%. Our estimates show that the effect of unemployment shocks to second-degree ties on subjective unemployment expectations and support for more generous unemployment insurance is substantially greater than for unemployment shocks to dissimilar second-degree weak ties.

\(^{20}\)The analogous approach for first-degree social ties is under-powered because, by definition, most first-degree ties are from the same industrial or educational group.
The interaction is also large and positive for self-reported vote choice, although it is not quite statistically significant. Aggregate unemployment perceptions suggest a stark contrast, as respondents update similarly from unemployment shocks afflicting all types of second-degree ties. This lack of distinction reinforces the finding above that respondents update roughly equally about aggregate employment from shocks to first- and second-degree ties becoming unemployed, and further suggests that greater sensitivity to shocks affecting similar people does not simply reflect information filtering by $j$. Together, these results indicate that voters distinguish the relevance of different types of information that diffuse through networks comprising strong and predominantly weak ties.

Given that individuals’ economic concerns and policy preferences are more sensitive to unemployment shocks to similar individuals, these findings suggest that voters are primarily motivated by personal interests. In contrast with sociotropic accounts (H4), Table 5 demonstrates that unemployment shocks affecting all types of second-degree tie influence perceptions of national unemployment, but only shocks to similar second-degree ties affect political preferences. In sum, these findings support an egotropic interpretation of voter preferences (H3), whereby information that diffuses between even relatively weak social ties increases a voter’s own concern about unemployment, which is reflected in a stronger preference for left-wing policies and political parties.

6.3 Discussion of mechanisms

Our main results show that Danish voters’ economic and political beliefs and preferences are significantly affected by unemployment shocks affecting second-degree social ties. Furthermore, our evidence examining the mechanisms suggests that this information diffuses through the intermediaries indirectly connecting respondents to the second-degree ties that became unemployed, that voters update their beliefs in a logical fashion (upweighting similar types when considering their own unemployment prospects, but not doing this when forming aggregate unemployment projections), and base their policy and political preferences primarily on their subjective concerns.

It is difficult to see how social conformity could solely account for these findings. A strictly social conformity explanation would require that an unemployment shock to a second-degree tie
changes their behavior in a way that alters the social expectations governing the behavior of a first-degree tie in the presence of our respondent when the second-degree tie that suffered the shock is not present. This alternative account relies on no relevant information being transferred between individuals at either step in the chain, only changes in behavior.

However, it is unlikely that an increase in the share of $k$’s that became unemployed would change social norms in the first-degree networks that the $k$’s and $j$’s share in ways that influence norms in the networks that our respondents and their $j$’s share. This is especially unlikely under our design because $k$ and $j$ and $j$ and $i$ live in different locations. Furthermore, the social conformity explanation struggles to explain why respondents react more to shocks afflicting second-degree ties in the same industry or occupation, given that knowledge of their similarity could only arise from information diffusion. We thus believe that our findings most likely reflect information transmission within social networks.

An important question largely beyond the scope of this study is how, and what type of, information diffuses between strong and weak social ties. On one hand, there are major benefits to our design with respect to plausibly isolating exogenous variation in unemployment shocks—at an unprecedented scale and level of detail—that could only plausibly reach an individual via at least some information diffusion. On the other, the exact nature of what is diffused is “black-boxed” beyond the general discussions described in Figure 5. Specifically, we cannot discern what second-degree ties communicate to a respondent’s first-degree ties, how this information is parsed by these intermediary connections, and what politically-relevant discussions arise between our respondents and their first-degree ties as a consequence of the second-degree ties becoming unemployed. We are therefore unable to determine whether changes in second-degree social ties’ economic beliefs and political preferences, or just the information about unemployment shocks themselves, induce the changes we observe among voters two degrees of separation away.\footnote{Instrumenting for a peer’s unemployment expectations with second-degree unemployment shocks (Bramoullé, Djebarri and Fortin 2009) is likely to violate the exclusion restriction.}
7 Conclusion

We show that information diffusion within networks of strong and mostly weak ties plays an important role in shaping economic and policy beliefs and preferences, and ultimately voting behavior. Combining Denmark’s extraordinarily detailed individual-level data with an identification strategy exploiting unemployment shocks to second-degree social ties at scale, we address the identification and network measurement challenges faced by previous studies investigating the impact of information diffusion within social networks. By focusing on shocks that must pass through intermediary ties, our approach also helps to distinguish information diffusion from social pressure. Our findings show that voters are highly responsive to unemployment shocks afflicting second-degree ties, updating their beliefs about both national unemployment levels and personal unemployment risk. However, while perceptions of national aggregates respond to any person becoming unemployed, self assessments are only responsive to shocks afflicting those in the same industry. Consistent with individuals being motivated primarily by their economic self-interest, voters disproportionately alter their policy preferences and vote choices in response to shocks afflicting second-degree ties that are economically similar. This induces them to support more generous unemployment insurance and vote for left-wing political parties.

Our finding that the political importance of information diffusion within social networks suggests that the information diffusion capacity of social networks may be just as important as networks’ conformity pressures faces two limitations. First, although this study represents a rare opportunity to employ observational data that is both detailed and—especially given that Denmark’s political and labor market institutions and experiences with the financial crisis were similar to other Western European nations—may generalize to other economic downturns (Pietryka and DeBats 2017), our findings are nevertheless specific to the context and time period examined. Further studies are thus required to assess information diffusion’s effects between weak ties in other contexts, on a wider range of political behaviors, and in direct comparison with social pressure’s influence.

Second, an important limitation demanding future research are the questions of what types of
information are transmitted between social ties and how they are transmitted. Qualitative and panel studies in the United States observing political discussion in small communities (e.g. Huckfeldt and Sprague 1995; Walsh 2004) suggest one blueprint. Such studies could be complemented by experiments focusing on small groups in settings where communication, conformity pressures, and beliefs can be controlled and monitored (e.g. Klar and Shmargad 2017). Despite lower external validity, progress in examining how and what information is passed between both strong and weak ties relies on understanding these processes in detail.
References


A Online Appendix

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A.1 Unemployment insurance in Denmark

Danish citizens are entitled to a means-tested government benefit (kontanthjælp) of around US$1,650 per month, with a supplement for those with children and a further supplement for single parents. Legislation coming into force in 2012 made immigrants eligible for the standard unemployment benefit. Until January 2012, unemployed immigrants were also subject to a special transfer which was lower than the standard transfer.\footnote{This applied to everyone who had not been a resident of the European Union for a minimum of 7 years within the last 8 years.} A lower transfer for immigrants was reinstated in September 2015. Educated people below the age of 30 receive a lower benefit equal to the monthly government student transfer (around US$1,150), which is further reduced for uneducated people below the age of 30.\footnote{This age limit for a special student transfer was increased from 25 to 30 years old by an unemployment benefits reform agreed on in June 2013 and implemented in January 2014.}

Workers can also enter a voluntary unemployment insurance system (dagpenge). This is principally financed by members (a flat fee independent of income covering two thirds of the expenses), but also supported by the government (one third of the costs). Members of this insurance system receive benefits of around 90\% of an individual’s pre-unemployment wage up to a threshold of around US$35,000, beyond which compensation is capped. This threshold is lower for people below the age of 25: the rate for graduates is 71.5\% of the standard rate (82\% if they have children), and the rate for people below age 25 is 50\% of the standard rate. The maximum duration of such unemployment insurance was four years until July 2012, when it was contentiously reduced to two years. To receive unemployment insurance (and to regain the right to receive the transfer), one must have worked sufficient hours to equal one year’s full time employment (1,924 hours) within the last three years, stay in Denmark permanently, and be actively looking for a job. When unemployment insurance expires, the unemployed remain eligible for the means-tested government transfer which has no maximum duration.
A.2 Accessing the Danish administrative data

The administrative data used in this paper is based on several Danish administrative registers which are merged using the Danish equivalent of social security numbers. Physically, these administrative micro data are located on specific computers at Statistics Denmark and may not be transferred to computers outside Statistics Denmark due to data security considerations. Researchers and their research assistants are allowed to use these data if their research project is approved by Statistics Denmark and if they are affiliated with a research institution accepted by Statistics Denmark. Access to the data at Statistics Denmark is provided through the internet. At the moment, researchers or their assistants are only allowed access to these data from research institutions in Denmark. If a researcher at a university or other research institution outside Denmark wishes to use the data, this may be accomplished by visiting a Danish research institution or by cooperating with researchers or research assistants working in Denmark. If researchers want to analyze our data for replication purposes, we will provide guidance with regard to getting a project approval from Statistics Denmark. The replication code will be provided online upon publication.

A.3 Details of survey validating first-degree social ties

To validate our definition of social networks and our claim that the first-degree social ties identified in our data are potentially sources of information about the economy, we carried out a representative survey of the Danish adult (18+) population in November 2018. The survey was conducted by YouGov and recruited 1,506 respondents.

We first asked a series of questions aiming to elicit the fraction of ties of each type—familial, vocational, and educational—that respondents had conversed with recently. These questions were specifically designed to reflect our definition of social ties in the data. We carefully clarified the meaning of conversation, fraction of ties by tie type, and the specific groups of people to think about when answering the questions. The following question is an example of one of our questions regarding familial first-degree ties and conversations within the last year: “What percentage of
immediate family members have you had a conversation with at least once within the last year?” [Open answer, allow numbers between 0 and 100.]

We also asked a second set of questions designed to understand the extent to which people talk to others about unemployment shocks afflicting someone they know. These questions probed the content of what was being talked about when respondents experienced unemployment in their immediate network. One example is the following question where the information communicated is just the event itself: “When someone you know becomes unemployed, do you tell other people about their particular experience?” [Never; Rarely; Sometimes; Often; Always.]

A.4 Computation of second-degree social ties

The starting point to compute the set of second-degree social ties in the Danish population is the symmetric 7,974,509 × 7,974,509 adjacency matrix that captures all possible first-degree ties, as defined in the main paper. Each entry is either 0 or 1, indicating a tie between \( i \) and \( j \). In practice this was computed by first associating \( i \) with a parent or partner, work institution (from within 2 years and satisfying our other restrictions), and educational institution, and then generating second-degree ties through the process described below. In the case of parents and partners, first-degree ties were also retained.

To illustrate our computation, consider a 5 × 5 adjacency matrix \( g \) relating 5 individuals to each other. In our example, persons 1 and 2, 1 and 4, 2 and 3, and 3 and 5 are all first-degree social ties. Matrix multiplying \( g \) with itself produces a matrix containing the number of second-degree ties between each pair of individuals, except along the diagonal, which gives the network degree or the number of first-degree ties to other individuals. Finally, we define our second-degree matrix \( S \) as a matrix of indicators for second but not first-degree ties between each pair of individuals, with the diagonal set to zero. In this example, there are 3 second-degree ties, between individuals 1 and 3, 2 and 5, and 2 and 4. In the Danish population, the number is far higher because the average
individual has approximately $150^2$ second-degree ties.\(^3\)

\[
\begin{bmatrix}
0 & 1 & 0 & 1 & 0 \\
1 & 0 & 1 & 0 & 0 \\
0 & 1 & 0 & 0 & 1 \\
1 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 \\
\end{bmatrix}
\quad
\begin{bmatrix}
2 & 0 & 1 & 0 & 0 \\
0 & 2 & 0 & 1 & 1 \\
1 & 0 & 2 & 0 & 0 \\
0 & 1 & 0 & 1 & 0 \\
0 & 1 & 0 & 0 & 1 \\
\end{bmatrix}
\quad
\begin{bmatrix}
0 & 0 & 1 & 0 & 0 \\
0 & 0 & 0 & 1 & 1 \\
1 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 \\
\end{bmatrix}
\]

\(g \equiv \begin{bmatrix} 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \end{bmatrix} \quad g'g = \begin{bmatrix} 2 & 0 & 1 & 0 & 0 \\ 0 & 2 & 0 & 1 & 1 \\ 1 & 0 & 2 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 \end{bmatrix} \quad S = \begin{bmatrix} 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \end{bmatrix}
\]

In our particular application, the definition of educational ties means that the adjacency matrix is not symmetric. This is because someone who only completed high school would be linked to someone in their graduating cohort that went on to attend university, but not vice versa. Nevertheless, unreported robustness checks show that our results are robust to extending our definition of social networks to allow for high school and university-degree graduating cohorts.

### A.5 Industry, occupation, and education digits

Table A1 shows the full one-digit classification by industry, occupation, and education used in this article. The two-digit industry classification that we use is available online;\(^4\) we omit the full list for brevity.

### A.6 Variable definitions

**Guess national unemployment rate.** Respondent’s answer (given as a fraction, not a percentage) to the question “Unemployment in Denmark is typically measured by the unemployment rate, that is, the share of people who want to work but don’t have a job. Over the last 25 years, the unemployment rate has been between 1.5 and 12%. What is your estimate of the current unemployment rate in Denmark? We would like your best estimate, even if you are not entirely sure.”

**National unemployment rate expectation.** Respondent’s answer (given as a fraction, not a

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\(^3\)The number is in practice slightly lower because some connections are shared.

Table A1: Industry, occupation, and education one-digit classifications

**Industry one-digit classification**
1: agriculture, fishery  
2: industry  
3: construction  
4: trade and transport  
5: information and communication  
6: finance and insurance  
7: real estate and rental service  
8: service business  
9: public administration, teaching, and health care  
10: culture and other services

**Occupation one-digit classification**
1: military  
2: management  
3: work that requires knowledge at the highest level within that field  
4: work that requires knowledge at the intermediate level within that field  
5: office work, customer service  
6: service and sales  
7: agriculture, fishery  
8: craftsman  
9: machine operator, installation, transportation  
10: other manual work

**Education one-digit classification**
1: primary school  
2: regular high school  
3: business high school  
4: vocational school  
5: short higher education  
6: intermediate higher education  
7: bachelor’s degree  
8: long higher education (university)  
9: research  
10: none

percentage) to the question “What is your best estimate of what unemployment will be in 2013? We would like your best estimate, even if you are not entirely sure.”

**Own unemployment expectation.** The probability, as a fraction, assigned by the respondent
to the possibility that they will experience a period of unemployment in the forthcoming year. Respondents were asked the following question: “What is your assessment of the probability that you will experience a period without a job during the year of [current year]? I would like you to provide a number between 0 and 100, where 0 means that you think that the event certainly does not occur and 100 means that you think that the event certainly occurs.”

**Want more unemployment insurance.** An indicator coded 1 for respondents that registered 1 in response to the following question: “The economic crisis has caused many people to lose their jobs. Do you think that the Government should support those who become unemployed: 1. More than they do now, 2. Less than they do now 3. The same as they do now.”

**Government should support the poor.** An indicator coded 1 for respondents that registered 2 or less in response to the following scale: “Some think the Government should do all it can to raise the standard of living for poor Danes: that is 1 on the scale. Others think it is not the responsibility of government, each should take care of themselves: that is 5.”

**Support non-market-based solutions.** An indicator coded 1 for respondents that answered 2 or 5 in response to the following question: “If politicians were to implement yet another policy to mitigate the effects of the economic crisis, which type of policy would you then prefer: 1. Tax cuts, 2. Public investments, 3. Support to firms, 4. Temporary VAT cuts, 5. Temporary higher unemployment benefits, 6. None of these policies.”

**Intend to vote for left party.** An indicator coded 1 for respondents that report intending to vote for a left party (Social Democrats, Social Liberals, Socialist People’s, or Red-Green parties). Respondents were asked “How would you vote tomorrow?”

**Intend to vote for an incumbent party.** An indicator coded 1 for respondents that report intending to vote for an incumbent party (Venstre (Liberal Party of Denmark) or The Conservative People’s Party for the 2010 and 2011 surveys, and Social Democrats, Social Liberals, or Socialist People’s parties for the 2012 and 2013 surveys). Respondents were asked “How would you vote tomorrow?”

**Voted for left party in 2011.** An indicator coded 1 for respondents that reported voting for
a left party (Social Democrats, Social Liberals, Socialist People’s, of Red-Green parties) in the previous election.

**Second-degree unemployment shock share.** The share of a respondent’s second-degree social ties that were registered as unemployed in the November preceding the survey, but were not registered as unemployment in the prior November.

**First-degree unemployment shock share.** The share of a respondent’s first-degree social ties that were registered as unemployed in the November preceding the survey, but were not registered as unemployment in the prior November.

**Woman.** An indicator coded 1 for respondents that identify as women.

**Age.** The respondent’s age in years.

**Children.** The number of children that a respondent has.

**Whether single.** An indicator coded 1 for respondents that are single.

**Gross income (DKK, 1,000,000).** Total annual income, including wage income, government transfers, and capital income, in millions of Danish Krone.

**Total assets (DKK, 1,000,000).** Value of total assets, including bank deposits, bonds, stocks, and property, in millions of Danish Krone.

**Total debt (DKK, 1,000,000).** Value of total debt, including bank loans, credit card debt, and mortgage debt, in millions of Danish Krone.

**Homeowner.** An indicator coded 1 for respondents that own property.

**Education basic.** An indicator coded 1 for respondents that have completed high school or less.

**Education short.** An indicator coded 1 for respondents that have completed vocational school.

**Education medium.** An indicator coded 1 for respondents that have a bachelor’s degree.

**Education long.** An indicator coded 1 for respondents that have a master’s degree or a PhD.

**Whether unemployed.** An indicator coded 1 for respondents that are unemployed.

**Second-degree network size.** A respondent’s number of second-degree social ties (that survive our restrictions).
Second-degree share similar. The share of a respondent’s second-degree social ties that are in the same two-digit industry or the same one-digit occupation as the respondent.

First-degree familial/vocational/educational tie share. Share of respondents who are connected to first-degree social ties by a familial/vocational/educational tie.

Second-degree familial/vocational/educational tie share. Share of ties (of our respondent) who are connected to second-degree social ties (of our respondent) by a familial/vocational/educational tie.

A.7 Additional results

In this section we present the various additional results cited in the main article.

A.7.1 Incumbent party vote intention

Table A2 examines the effect of unemployment shock on intention to vote for an incumbent party. Contrary to sociotropic accounts, the results show that unemployment shocks afflicting second-degree social ties do not significantly affect support for the incumbent party. Unlike the 2011 vote choice, this outcome is particularly helpful in separating the personal insurance and sociotropic explanations because the vote intention variable extends across center-right and center-left governments.

A.7.2 Full results for the specification including additional respondent covariates

Panel D of Table 3 shows that our results are robust to simultaneously adjusting for nine further respondent-level predetermined socioeconomic and demographic covariates, in addition to whether a respondent themselves became unemployed: gender, age, whether single, number of children, annual income, total asset wealth, total debt, homeowner status, and the number of second-degree social ties. Table A3 reports all the regression coefficients for each of these covariates.
Table A2: Estimates of second-degree social tie unemployment shocks on intention to vote for a party from the governing coalition

<table>
<thead>
<tr>
<th></th>
<th>Intend to vote for an incumbent party</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
</tbody>
</table>
| Second-degree unemployment shock share | -0.286  
|                                  | (0.299)                               |
| Observations                   | 17,816                                |
| Outcome range                  | {0,1}                                 |
| Outcome mean                   | 0.292                                 |
| Outcome standard deviation     | 0.455                                 |
| Unemployment shocks mean       | 0.023                                 |
| Unemployment shocks standard deviation | 0.015                               |

Notes: Specification is estimated using OLS, and include respondent-level industry × year, occupation × year, education × year, and parish × year fixed effects. Standard errors are clustered by respondent municipality. * p < 0.1, ** p < 0.05, *** p < 0.01.

A.7.3 Additional robustness checks reported in the main paper

The robustness tests section of the main paper briefly notes a number of additional robustness checks that we conducted. This subsection provides the results of these tests in full.

First, to further allay concerns relating to geographically-dispersed common shocks, panel A of Table A4 excludes second-degree social ties from within the same region—one of Denmark’s five regions—as the respondent. Although this entails dropping around half the sample (including those between whom information is most likely to flow), and thus substantially reducing estimate precision, the point estimate magnitudes are relatively robust.

Second, our main estimates exclude k’s located in the same parish as the j (or j’s) that link them to i. However, to further address the potential concern that j experiences shocks correlated with k, panel B excludes k’s that are linked to i through a j located within the same municipality as k. Although this further reduces our sample, the magnitudes of our estimates are similar, and thus suggest that such correlated shocks are not driving our findings.

Third, although our networks of social ties are unique in how comprehensively they can capture weak ties, there nevertheless remains the concern that omitted weak ties could still bias our estimates. We address this concern by adjusting for indicators for respondents whose networks were
Table A3: Estimates of second-degree social tie unemployment shocks on respondent economic and political beliefs, preferences, and behaviors, including additional respondent covariates

<table>
<thead>
<tr>
<th></th>
<th>Guess national unemployment rate</th>
<th>National unemployment rate expectation</th>
<th>Own unemployment expectation</th>
<th>Want more unemployment insurance</th>
<th>Government should support the poor</th>
<th>Support non-market-based stimulus</th>
<th>Intend to vote for left party</th>
<th>Voted for left party in 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second-degree unemployment share</td>
<td>0.199***</td>
<td>0.246***</td>
<td>0.380*</td>
<td>0.477</td>
<td>0.138</td>
<td>0.123</td>
<td>0.718**</td>
<td>1.155**</td>
</tr>
<tr>
<td></td>
<td>(0.053)</td>
<td>(0.057)</td>
<td>(0.209)</td>
<td>(0.359)</td>
<td>(0.333)</td>
<td>(0.438)</td>
<td>(0.287)</td>
<td>(0.564)</td>
</tr>
<tr>
<td>Female</td>
<td>0.016***</td>
<td>0.011***</td>
<td>0.025***</td>
<td>0.046***</td>
<td>0.028**</td>
<td>-0.084**</td>
<td>0.014</td>
<td>0.018</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.007)</td>
<td>(0.012)</td>
<td>(0.012)</td>
<td>(0.022)</td>
<td>(0.014)</td>
<td>(0.019)</td>
</tr>
<tr>
<td>Age</td>
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<td>-0.000**</td>
<td>-0.001*</td>
<td>0.004**</td>
<td>0.002***</td>
<td>0.002**</td>
<td>0.002**</td>
<td>0.003***</td>
</tr>
<tr>
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<td>(0.000)</td>
<td>(0.000)</td>
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<td>Single</td>
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<td>-0.000</td>
<td>0.023***</td>
<td>-0.036**</td>
<td>-0.001</td>
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<td>(0.008)</td>
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<td>(0.014)</td>
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<td>Number of children</td>
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<td>-0.008***</td>
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<td>0.003</td>
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<td>(0.001)</td>
<td>(0.002)</td>
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<td>(0.013)</td>
<td>(0.022)</td>
<td>(0.006)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Income (DKK 1,000,000)</td>
<td>-0.001</td>
<td>-0.001</td>
<td>-0.054***</td>
<td>-0.021</td>
<td>-0.025**</td>
<td>0.032</td>
<td>-0.039**</td>
<td>-0.117**</td>
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<tr>
<td></td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.015)</td>
<td>(0.018)</td>
<td>(0.011)</td>
<td>(0.023)</td>
<td>(0.022)</td>
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<tr>
<td>Total Assets (DKK 1,000,000)</td>
<td>-0.000</td>
<td>-0.000</td>
<td>0.006***</td>
<td>0.002</td>
<td>-0.001</td>
<td>-0.004</td>
<td>0.003</td>
<td>-0.010**</td>
</tr>
<tr>
<td></td>
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<td>(0.000)</td>
<td>(0.001)</td>
<td>(0.013)</td>
<td>(0.003)</td>
<td>(0.005)</td>
<td>(0.004)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>Total Debt (DKK 1,000,000)</td>
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<td>0.000</td>
<td>-0.007***</td>
<td>-0.010***</td>
<td>-0.006</td>
<td>-0.007</td>
<td>-0.014***</td>
<td>-0.007</td>
</tr>
<tr>
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<td>(0.002)</td>
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<td>(0.003)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.005)</td>
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<td>-0.006***</td>
<td>-0.003</td>
<td>-0.031***</td>
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<td>-0.040***</td>
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<td>-0.052**</td>
<td>-0.026</td>
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<td>(0.002)</td>
<td>(0.007)</td>
<td>(0.012)</td>
<td>(0.012)</td>
<td>(0.022)</td>
<td>(0.015)</td>
<td>(0.017)</td>
</tr>
<tr>
<td>Whether unemployed</td>
<td>0.012***</td>
<td>0.007</td>
<td>0.310***</td>
<td>0.142***</td>
<td>0.094***</td>
<td>0.126***</td>
<td>0.027</td>
<td>0.062</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.018)</td>
<td>(0.028)</td>
<td>(0.029)</td>
<td>(0.047)</td>
<td>(0.025)</td>
<td>(0.044)</td>
</tr>
<tr>
<td>Unemployment shock</td>
<td>0.005**</td>
<td>0.010**</td>
<td>0.475***</td>
<td>0.127***</td>
<td>0.095***</td>
<td>0.068</td>
<td>0.079**</td>
<td>0.049</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.005)</td>
<td>(0.017)</td>
<td>(0.025)</td>
<td>(0.027)</td>
<td>(0.054)</td>
<td>(0.021)</td>
<td>(0.044)</td>
</tr>
<tr>
<td>Number of second-degree social ties</td>
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<td>0.000</td>
<td>-0.000***</td>
<td>-0.000***</td>
<td>0.000</td>
<td>-0.000</td>
<td>-0.000</td>
<td>-0.000</td>
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<tr>
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<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Observations</td>
<td>13.000</td>
<td>8.667</td>
<td>17.816</td>
<td>17.816</td>
<td>17.816</td>
<td>4.816</td>
<td>17.816</td>
<td>5.209</td>
</tr>
<tr>
<td>Outcome range</td>
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<td>[0.1]</td>
<td>[0.1]</td>
<td>[0.1]</td>
<td>[0.1]</td>
<td>[0.1]</td>
<td>[0.1]</td>
<td>[0.1]</td>
</tr>
<tr>
<td>Outcome mean</td>
<td>0.085</td>
<td>0.076</td>
<td>0.174</td>
<td>0.320</td>
<td>0.387</td>
<td>0.402</td>
<td>0.438</td>
<td>0.499</td>
</tr>
<tr>
<td>Outcome standard deviation</td>
<td>0.055</td>
<td>0.050</td>
<td>0.302</td>
<td>0.467</td>
<td>0.487</td>
<td>0.490</td>
<td>0.496</td>
<td>0.500</td>
</tr>
<tr>
<td>Unemployment shocks mean</td>
<td>0.022</td>
<td>0.022</td>
<td>0.023</td>
<td>0.023</td>
<td>0.023</td>
<td>0.025</td>
<td>0.023</td>
<td>0.022</td>
</tr>
<tr>
<td>Unemployment shocks std. dev.</td>
<td>0.014</td>
<td>0.014</td>
<td>0.015</td>
<td>0.015</td>
<td>0.015</td>
<td>0.018</td>
<td>0.015</td>
<td>0.014</td>
</tr>
</tbody>
</table>

Notes: All specifications are estimated using OLS, and include respondent-level industry × year, occupation × year, education × year, and parish × year fixed effects. Standard errors are clustered by respondent municipality. * p < 0.1, ** p < 0.05, *** p < 0.01.

truncated at the i and j levels by our vocational and educational network restrictions. The results in panel C suggest that our estimates are unlikely to reflect biases resulting from incomplete networks.

Fourth, two concerns could arise if the results depended on familial second-degree ties. First, familial ties may be more accurately measured than vocational and educational ties, and thus drive the effects that we estimate. Second, familial ties could drive the results due to a higher frequency of contact, although section 3.1 in the main paper indicates that Danes may be more likely to discuss unemployment and political issues with vocational and educational than any given familial ties. To address these potential concerns, we drop second-degree ties generated by familial first-degree ties. Panel D shows that our results are not substantively affected by dropping such ties.

Fifth, we also show that the results are robust to removing all k’s generated by educational
Table A4: Additional robustness checks not reported in the main paper

<table>
<thead>
<tr>
<th>Panel</th>
<th>Description</th>
<th>Guess national unemployment rate (1)</th>
<th>National unemployment rate expectation (2)</th>
<th>Own unemployment expectation (3)</th>
<th>Want more unemployment insurance (4)</th>
<th>Government should support the poor (5)</th>
<th>Support non-market-based stimulus (6)</th>
<th>Intend to vote for left party in 2011 (7)</th>
<th>Voted for left party in 2011 (8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel A: second-degree social ties living in a different region from the respondent</td>
<td>Second-degree unemployment shock share</td>
<td>0.096** (0.045)</td>
<td>0.106** (0.042)</td>
<td>0.435*** (0.156)</td>
<td>0.377 (0.254)</td>
<td>0.278 (0.239)</td>
<td>-0.374 (0.287)</td>
<td>0.093 (0.159)</td>
<td>0.711 (0.626)</td>
</tr>
<tr>
<td>Observations</td>
<td></td>
<td>12,992</td>
<td>8,662</td>
<td>17,798</td>
<td>17,798</td>
<td>17,798</td>
<td>4,806</td>
<td>17,798</td>
<td>5,204</td>
</tr>
<tr>
<td>Panel B: removing second-degree social ties living in the same municipality as the first-degree social tie linking them to the respondent</td>
<td>Second-degree unemployment shock share</td>
<td>0.216*** (0.053)</td>
<td>0.235*** (0.058)</td>
<td>0.597*** (0.203)</td>
<td>0.503 (0.331)</td>
<td>0.298 (0.312)</td>
<td>0.192 (0.405)</td>
<td>0.736** (0.299)</td>
<td>1.483* (0.781)</td>
</tr>
<tr>
<td>Observations</td>
<td></td>
<td>12,999</td>
<td>8,666</td>
<td>17,815</td>
<td>17,815</td>
<td>17,815</td>
<td>4,816</td>
<td>17,815</td>
<td>3,242</td>
</tr>
<tr>
<td>Panel C: adjusting for social tie network construction truncation</td>
<td>Second-degree unemployment shock share</td>
<td>0.254*** (0.058)</td>
<td>0.269*** (0.059)</td>
<td>0.928*** (0.225)</td>
<td>0.633* (0.357)</td>
<td>0.280 (0.318)</td>
<td>0.267 (0.429)</td>
<td>0.843*** (0.315)</td>
<td>1.822** (0.776)</td>
</tr>
<tr>
<td>Observations</td>
<td></td>
<td>13,000</td>
<td>8,667</td>
<td>17,816</td>
<td>17,816</td>
<td>17,816</td>
<td>4,816</td>
<td>17,816</td>
<td>3,243</td>
</tr>
<tr>
<td>Panel D: removing second-degree social ties connected to the respondent by a familial second- or first-degree weak tie</td>
<td>Second-degree unemployment shock share</td>
<td>0.130*** (0.049)</td>
<td>0.160** (0.063)</td>
<td>0.320 (0.231)</td>
<td>0.527* (0.272)</td>
<td>0.752** (0.328)</td>
<td>0.147 (0.388)</td>
<td>0.496 (0.299)</td>
<td>0.287 (0.572)</td>
</tr>
<tr>
<td>Observations</td>
<td></td>
<td>12,425</td>
<td>8,249</td>
<td>16,934</td>
<td>16,934</td>
<td>16,934</td>
<td>4,509</td>
<td>16,934</td>
<td>3,135</td>
</tr>
<tr>
<td>Panel E: removing second-degree social ties connected to the respondent by an educational second- or first-degree weak tie</td>
<td>Second-degree unemployment shock share</td>
<td>0.051 (0.040)</td>
<td>0.108 (0.028)</td>
<td>0.246** (0.112)</td>
<td>0.026 (0.142)</td>
<td>0.346** (0.132)</td>
<td>0.377** (0.183)</td>
<td>0.188 (0.165)</td>
<td>0.321 (0.371)</td>
</tr>
<tr>
<td>Observations</td>
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<td>12,858</td>
<td>8,567</td>
<td>17,598</td>
<td>17,598</td>
<td>17,598</td>
<td>4,740</td>
<td>17,598</td>
<td>3,212</td>
</tr>
<tr>
<td>Panel F: restrict sample to respondents with at most 10,000 second degree social ties</td>
<td>Second-degree unemployment shock share</td>
<td>0.122*** (0.057)</td>
<td>0.257*** (0.062)</td>
<td>0.515** (0.219)</td>
<td>0.532 (0.351)</td>
<td>0.295 (0.348)</td>
<td>0.119 (0.475)</td>
<td>0.789** (0.313)</td>
<td>1.052* (0.597)</td>
</tr>
<tr>
<td>Observations</td>
<td></td>
<td>9,432</td>
<td>6,339</td>
<td>13,102</td>
<td>13,102</td>
<td>13,102</td>
<td>3,670</td>
<td>13,102</td>
<td>3,795</td>
</tr>
<tr>
<td>Panel G: restrict sample to respondents with at most 5,000 second degree social ties</td>
<td>Second-degree unemployment shock share</td>
<td>0.200*** (0.063)</td>
<td>0.249*** (0.071)</td>
<td>0.451* (0.255)</td>
<td>0.360 (0.362)</td>
<td>0.301 (0.398)</td>
<td>0.087 (0.535)</td>
<td>0.982*** (0.312)</td>
<td>1.324** (0.662)</td>
</tr>
<tr>
<td>Observations</td>
<td></td>
<td>6,214</td>
<td>4,216</td>
<td>8,718</td>
<td>8,718</td>
<td>8,718</td>
<td>2,504</td>
<td>8,718</td>
<td>2,563</td>
</tr>
</tbody>
</table>

Notes: All specifications are estimated using OLS, and include respondent-level industry × year, occupation × year, education × year, and parish × year fixed effects. The placebo test in panel A is described in the main text. Panel D includes indicators for vocational or educational network truncation at the i and j levels as controls. Standard errors are clustered by respondent municipality. * p < 0.1, ** p < 0.05, *** p < 0.01.

ties, which Figure 2 shows to be the network tie category that produces the most ties that do not somewhat regularly converse on average. This entails removing any k that is only a second-degree tie to i because either the i-j or j-k dyad is based on an educational tie. To avoid introducing biases from incomplete networks, we do not reconstruct networks without considering educational ties. The smaller point estimates in panel E suggest that educational ties are partly driving the effects that we observe.
Finally, we show that our results are robust to focusing only on respondents with relatively small second-degree networks—that is to say, respondents for whom less than 10,000 or 5,000 second-degree social ties satisfy the restrictions defining our identification strategy above. After the latter restriction, we are only left with 5,544 unique i’s and 8,718 unique i-year observations. Although the drop in sample size reduces the power of these estimates, panels F and G reinforce our main findings by reporting similar point estimate magnitudes. These tests indicate that our results are not driven by the individuals with the largest networks of second-degree ties.

A.7.4 Tests for nonlinearity of effects

Table A5 reports two tests of effect linearity. Panel A includes a quadratic term for the second-degree unemployment shock share. Panel B divides the distribution of the second-degree unemployment shock shares into quartiles. The mean share in the first quartile is 0.010, while the mean share in the second quartile is 0.016, the mean share in the third quartile is 0.024, and the mean share in the fourth quartile is 0.041. The mix of mostly statistically insignificant positive and negative coefficients on the quadratic term in panel A provides little evidence of systematic nonlinearity. The increasing effects by quartile in panel B minimally imply generally monotonically increasing effects, but also suggest a relatively linear relationship.

A.7.5 Heterogeneity by type of social tie

Tables A6 and A7 respectively report interactions between the share of second-degree social tie unemployment shocks and the share of type of ties between respondent and first-degree tie and between first-degree and second-degree ties. Note that some ties can reflect multiple types. The results, and the F tests at the foot of the table, suggest that different types of tie produce relatively similar effects.
Table A5: Estimates of nonlinear effects of second-degree social tie unemployment shocks on respondent economic and political beliefs, preferences, and behavior

<table>
<thead>
<tr>
<th></th>
<th>Guess national unemployment rate (1)</th>
<th>National unemployment rate expectation (2)</th>
<th>Own unemployment expectation (3)</th>
<th>Want more unemployment insurance (4)</th>
<th>Government should support the poor (5)</th>
<th>Support non-market-based stimulus (6)</th>
<th>Intend to vote for left party in 2011 (7)</th>
<th>Voted for left party in 2011 (8)</th>
</tr>
</thead>
</table>
| Panel A: Linear and quadratic estimates
| Second-degree unemployment shock share | 0.220** (0.098) | 0.163 (0.111) | 0.485 (0.362) | 1.402*** (0.442) | 0.301 (0.516) | 0.999 (0.807) | 0.672 (0.475) | 2.367** (1.183) |
| Second-degree unemployment shock share^2 | 0.034 (0.376) | 0.489 (0.317) | 1.625 (1.619) | -4.729*** (1.307) | -0.137 (2.292) | -6.035 (4.254) | -6.381 (1.386) | -10.432 (10.050) |
| Unemployment shocks mean | 0.022 | 0.022 | 0.023 | 0.023 | 0.023 | 0.025 | 0.023 | 0.022 |
| Unemployment shocks std. dev. | 0.014 | 0.014 | 0.015 | 0.015 | 0.015 | 0.018 | 0.015 | 0.014 |
| Panel B: Nonparametric estimates
| Second-degree unemployment shock share Q2 | -0.001 (0.001) | -0.001 (0.002) | 0.011 (0.008) | 0.027*** (0.013) | 0.014 (0.013) | 0.022 (0.026) | 0.021* (0.011) | 0.059*** (0.020) |
| Second-degree unemployment shock share Q3 | 0.003 (0.002) | 0.003 (0.003) | 0.014* (0.008) | 0.045*** (0.015) | 0.019 (0.015) | -0.001 (0.032) | 0.021 (0.017) | 0.057** (0.025) |
| Second-degree unemployment shock share Q4 | 0.007*** (0.003) | 0.005 (0.003) | 0.022** (0.011) | 0.048*** (0.016) | 0.016 (0.017) | 0.034 (0.038) | 0.021 (0.017) | 0.039 (0.025) |
| Unemployment shocks Q1 mean | 0.010 | 0.010 | 0.010 | 0.010 | 0.010 | 0.009 | 0.010 | 0.010 |
| Unemployment shocks Q2 mean | 0.016 | 0.016 | 0.016 | 0.016 | 0.016 | 0.016 | 0.017 | 0.016 |
| Unemployment shocks Q3 mean | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.027 | 0.024 | 0.024 |
| Unemployment shocks Q4 mean | 0.038 | 0.038 | 0.041 | 0.041 | 0.041 | 0.048 | 0.041 | 0.039 |
| Observations | 13,000 | 8,667 | 13,816 | 17,816 | 17,816 | 4,816 | 17,816 | 5,209 |
| Outcome mean | 0.085 | 0.076 | 0.174 | 0.320 | 0.387 | 0.402 | 0.439 | 0.500 |
| Outcome standard deviation | 0.055 | 0.050 | 0.302 | 0.467 | 0.487 | 0.490 | 0.496 | 0.500 |

Notes: All specifications are estimated using OLS, and include respondent-level industry × year, occupation × year, education × year, and parish × year fixed effects. Standard errors are clustered by respondent municipality. * p < 0.1, ** p < 0.05, *** p < 0.01.
Table A6: Estimates of second-degree social tie unemployment shocks on respondent economic and political beliefs, preferences, and behavior, by type of respondent-first-degree tie relationship

<table>
<thead>
<tr>
<th></th>
<th>Guess national unemployment rate</th>
<th>National unemployment rate expectation</th>
<th>Own unemployment expectation</th>
<th>Want more unemployment insurance</th>
<th>Government support for the poor</th>
<th>Support non-market-based stimulus</th>
<th>Intend to vote for left party in 2011</th>
<th>Voted for left party in 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second-degree unemployment shock share</td>
<td>-1.519 (1.191)</td>
<td>-0.648 (1.172)</td>
<td>2.538 (4.533)</td>
<td>-15.009** (7.469)</td>
<td>-2.476 (7.875)</td>
<td>3.868 (7.309)</td>
<td>-8.057 (8.450)</td>
<td>-29.954* (17.370)</td>
</tr>
<tr>
<td>First-degree familial tie share</td>
<td>-0.020 (0.017)</td>
<td>-0.010 (0.015)</td>
<td>-0.144** (0.066)</td>
<td>-0.519*** (0.139)</td>
<td>-0.121 (0.138)</td>
<td>0.186 (0.191)</td>
<td>-0.290* (0.168)</td>
<td>-0.644** (0.286)</td>
</tr>
<tr>
<td>First-degree vocational tie share</td>
<td>-0.023 (0.016)</td>
<td>-0.011 (0.014)</td>
<td>-0.231*** (0.063)</td>
<td>-0.550*** (0.133)</td>
<td>-0.174 (0.128)</td>
<td>0.142 (0.178)</td>
<td>-0.264* (0.158)</td>
<td>-0.501* (0.272)</td>
</tr>
<tr>
<td>First-degree educational tie share</td>
<td>-0.022 (0.017)</td>
<td>-0.011 (0.014)</td>
<td>-0.204*** (0.062)</td>
<td>-0.540*** (0.135)</td>
<td>-0.125 (0.134)</td>
<td>0.082 (0.167)</td>
<td>-0.250 (0.169)</td>
<td>-0.526* (0.276)</td>
</tr>
<tr>
<td>Second-degree unemployment shock share × First-degree familial tie share</td>
<td>1.652 (1.194)</td>
<td>0.831 (1.169)</td>
<td>-1.652 (4.481)</td>
<td>14.941** (7.426)</td>
<td>2.573 (7.994)</td>
<td>8.805 (7.449)</td>
<td>32.403* (8.427)</td>
<td>(17.290)</td>
</tr>
<tr>
<td>Second-degree unemployment shock share × First-degree vocational tie share</td>
<td>1.787 (1.183)</td>
<td>0.977 (1.177)</td>
<td>-2.170 (4.557)</td>
<td>16.574** (7.338)</td>
<td>2.753 (7.782)</td>
<td>8.871 (7.170)</td>
<td>28.791* (8.178)</td>
<td>(16.857)</td>
</tr>
<tr>
<td>Second-degree unemployment shock share × First-degree educational tie share</td>
<td>2.077* (1.174)</td>
<td>1.124 (1.150)</td>
<td>-0.888 (4.438)</td>
<td>16.025** (7.259)</td>
<td>2.275 (7.766)</td>
<td>8.513 (7.210)</td>
<td>31.258* (8.513)</td>
<td>(16.829)</td>
</tr>
<tr>
<td>Outcome mean</td>
<td>0.085</td>
<td>0.076</td>
<td>0.174 (0.032)</td>
<td>0.320 (0.467)</td>
<td>0.387 (0.487)</td>
<td>0.402 (0.490)</td>
<td>0.439 (0.496)</td>
<td>0.507 (0.500)</td>
</tr>
<tr>
<td>Outcome std. dev.</td>
<td>0.055</td>
<td>0.050</td>
<td>0.302</td>
<td>0.467 (0.023)</td>
<td>0.487 (0.023)</td>
<td>0.402 (0.025)</td>
<td>0.439 (0.023)</td>
<td>0.507 (0.022)</td>
</tr>
<tr>
<td>Unemployment shocks mean</td>
<td>0.022</td>
<td>0.022</td>
<td>0.023</td>
<td>0.015 (0.015)</td>
<td>0.015 (0.015)</td>
<td>0.018 (0.015)</td>
<td>0.015 (0.015)</td>
<td>0.171 (0.013)</td>
</tr>
<tr>
<td>Unemployment shocks std. dev.</td>
<td>0.014</td>
<td>0.014</td>
<td>0.015</td>
<td>0.015 (0.015)</td>
<td>0.015 (0.015)</td>
<td>0.018 (0.015)</td>
<td>0.015 (0.015)</td>
<td>0.171 (0.013)</td>
</tr>
<tr>
<td>First-degree familial tie share mean</td>
<td>0.182</td>
<td>0.187</td>
<td>0.186</td>
<td>0.186 (0.186)</td>
<td>0.186 (0.186)</td>
<td>0.197 (0.186)</td>
<td>0.186 (0.186)</td>
<td>0.413 (0.115)</td>
</tr>
<tr>
<td>First-degree educational tie share mean</td>
<td>0.403</td>
<td>0.404</td>
<td>0.403</td>
<td>0.403 (0.403)</td>
<td>0.403 (0.403)</td>
<td>0.404 (0.403)</td>
<td>0.403 (0.403)</td>
<td>0.413 (0.413)</td>
</tr>
</tbody>
</table>

F-test: Shock × familial = Shock × educational (p-value) 0.007 (2010) 0.178 (2010) 0.274 (2012) 0.302 (2012) 0.824 (2012) 0.092 (2013) 0.602 (2013) 0.631 (2011)
F-test: Shock × educational = Shock × vocational (p-value) 0.057 (2010) 0.438 (2010) 0.117 (2012) 0.677 (2012) 0.250 (2012) 0.416 (2013) 0.639 (2013) 0.280 (2011)

Notes: All specifications are estimated using OLS, and include respondent-level industry × year, occupation × year, education × year, and parish × year fixed effects. Standard errors are clustered by respondent municipality. * p < 0.1, ** p < 0.05, *** p < 0.01.
Table A7: Estimates of second-degree social tie unemployment shocks on respondent economic and political beliefs, preferences, and behavior, by type of first-degree-second-degree tie relationship

<table>
<thead>
<tr>
<th></th>
<th>Guess National unemployment rate</th>
<th>National unemployment rate expectation</th>
<th>Own unemployment expectation</th>
<th>Want more unemployment insurance</th>
<th>Government support the poor</th>
<th>Support non-market-based stimulus</th>
<th>Intend to vote for left party in 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second-degree familial tie share</td>
<td>-0.049 (0.030)</td>
<td>-0.043 (0.037)</td>
<td>0.182 (0.131)</td>
<td>-0.703*** (0.189)</td>
<td>-0.103 (0.233)</td>
<td>-0.347 (0.359)</td>
<td>-0.626** (0.290)</td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td>(0.034)</td>
<td>(0.123)</td>
<td>(0.190)</td>
<td>(0.211)</td>
<td>(0.345)</td>
<td>(0.285)</td>
</tr>
<tr>
<td></td>
<td>-0.072** (0.027)</td>
<td>-0.073** (0.034)</td>
<td>-0.054 (0.128)</td>
<td>-0.737*** (0.194)</td>
<td>-0.104 (0.218)</td>
<td>-0.544 (0.339)</td>
<td>-0.518* (0.280)</td>
</tr>
<tr>
<td></td>
<td>-0.5321* (2.753)</td>
<td>7.217** (3.515)</td>
<td>-42.184*** (12.519)</td>
<td>20.866 (17.966)</td>
<td>24.302 (19.710)</td>
<td>51.939 (31.674)</td>
<td>10.240 (24.672)</td>
</tr>
<tr>
<td></td>
<td>Observations</td>
<td>13,000</td>
<td>8,667</td>
<td>17,816</td>
<td>17,816</td>
<td>17,816</td>
<td>4,816</td>
</tr>
<tr>
<td></td>
<td>Outcome range</td>
<td>[0.1]</td>
<td>[0.1]</td>
<td>[0.1]</td>
<td>[0.1]</td>
<td>[0.1]</td>
<td>[0.1]</td>
</tr>
<tr>
<td></td>
<td>Outcome mean</td>
<td>0.085</td>
<td>0.076</td>
<td>0.174</td>
<td>0.320</td>
<td>0.387</td>
<td>0.402</td>
</tr>
<tr>
<td></td>
<td>Outcome std. dev.</td>
<td>0.055</td>
<td>0.050</td>
<td>0.302</td>
<td>0.467</td>
<td>0.487</td>
<td>0.490</td>
</tr>
<tr>
<td>Unemployment shocks mean</td>
<td>0.022</td>
<td>0.022</td>
<td>0.023</td>
<td>0.023</td>
<td>0.023</td>
<td>0.025</td>
<td>0.023</td>
</tr>
<tr>
<td>Unemployment shocks std. dev.</td>
<td>0.014</td>
<td>0.014</td>
<td>0.015</td>
<td>0.015</td>
<td>0.015</td>
<td>0.015</td>
<td>0.015</td>
</tr>
<tr>
<td>Second-degree educational tie share mean</td>
<td>0.035</td>
<td>0.035</td>
<td>0.035</td>
<td>0.035</td>
<td>0.035</td>
<td>0.035</td>
<td>0.035</td>
</tr>
<tr>
<td>Second-degree educational tie share mean</td>
<td>0.333</td>
<td>0.334</td>
<td>0.332</td>
<td>0.332</td>
<td>0.332</td>
<td>0.328</td>
<td>0.332</td>
</tr>
<tr>
<td>Second-degree vocational tie share mean</td>
<td>0.654</td>
<td>0.653</td>
<td>0.654</td>
<td>0.654</td>
<td>0.654</td>
<td>0.654</td>
<td>0.654</td>
</tr>
</tbody>
</table>

Notes: All specifications are estimated using OLS, and include respondent-level industry × year, occupation × year, education × year, and parish × year fixed effects. Standard errors are clustered by respondent municipality. * p < 0.1, ** p < 0.05, *** p < 0.01.