



## **Anti-Austerity in the Euro Crisis: Modeling Protest With Online-Mobile-Social Media Usage, Users, and Content**

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This study examined which factors were related to increased protest activity in European Union member countries from 2007 through 2012. Of particular interest to this study were growing unemployed youth populations and the widespread adoption of online, mobile, and social media, and where these factors converged in relation to off-line protest activities. Analyses indicated that certain forms of emerging media (most notably SMS activity levels) were, indeed, related to greater sociopolitical instability, and this effect was augmented where there were higher levels of youth unemployment rates. Separate data collection and algorithmic sorting of more than 3 million tweets from 2012 shed additional light on networked topics of discussion and users who were active in communicating online about the euro crisis and austerity. Altogether, results suggest that actual measures of usage, users, and content of emerging media contexts are important to the cultivation and sustainability of protest in pan-national social movements.

*Keywords: euro crisis, emerging media, unemployed youth, social movements, network analysis*

Networked citizen politics, characterized by decentralization, swarm-like action and an intensive use of information and communication technologies have been playing an increasing role in worldwide protests and movements, often overtaking and circumventing the actions of governments, parliaments, political parties, labour unions, non-governmental organizations, mass media and all kinds of formal democratic institutions. (Peña-López, Congosto, & Aragón, 2014, p. 189)

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With this line of reasoning as a commonplace contemporary backdrop, this study offers multiple perspectives in investigating the reactionary sociopolitical unrest that accompanied the economic crisis that shook the European Union from 2007 through 2012. In so doing, it examines online, mobile, and social media in terms of usage, users, and content among a body of relevant national factors, including youth unemployment, that may have acted as explanatory or co-contributing factors to social movements in the euro crisis context.

### **Introduction to the Euro Crisis and Anti-Austerity Protests**

Shortly after the Great Recession and its implications became clearer in 2008, a number of European Union (EU) governments took relatively drastic economic measures in an attempt to protect the longer-term futures of their respective countries (Arpaia & Curc, 2010). These actions primarily involved enacting policies that focused on cutting government jobs, adjusting pension laws, and lowering salaries and interest rates (Gow, 2009). Tens of thousands of people around the eurozone, especially youth populations, felt the impact of these new economic measures in the form of reduced employment opportunities and fewer social and economic safety nets (Arpaia & Curc, 2010). The public reaction broadly coalesced, in many cases through and on social media, into mass demonstrations in off-line settings such as public squares, streets, and open spaces to demand more political rights and to protest against inflation, unemployment, and alleged government corruption (Peña-López et al., 2014).

Generally speaking, these protest movements started in Ireland and Greece in 2008 and continued in varying intensity for years. Other notable protests included those that began in Spain in 2011 as part of the 15M movement—later dubbing participants the *indignados* and also mentioned frequently with the Twitter hashtag (a public identification keyword) *#spanishrevolution*, among other associated hashtags that invited public attention from other locations (Poggoli, 2011). The related Occupy movement eventually spread to more than 25 EU countries after starting in New York in September 2011 as a response to perceived corruption and destructive greed on Wall Street (Gabbatt, Townsend, & O'Carroll, 2011). European anti-austerity protests reached a dramatic pitch on October 15, 2011, when many EU activists mobilized around similar concerns and goals (Kimball, 2011). In the following months, numerous other EU countries such as Slovenia, Bulgaria, and Romania experienced widespread protests against government corruption and unemployment (Petkova, 2013), and at points throughout this six-year time frame, the future of the eurozone and its common currency, the euro, was in doubt.

The study reported here enters this arena with a cross-methodological approach to better understand the topic of the euro crisis and the public reaction that took shape on streets and in cities across the EU. This study presents results in two parts that uniquely contribute to understanding the intersection of emerging media uses and users, media diffusion, and media content as these connect to off-line protest activity. The first empirical component (RQ1 and RQ2) examined broad, macro-level trends in the EU by looking at aggregated national data in overall, year-by-year, and regression analyses with interaction terms. The second empirical component (RQ3) took a corpus of just over 3 million tweets about the euro crisis and algorithmically sorted users and trends in content where Twitter serves broadly as an example of digital media usage in the context of the anti-austerity movement.

### **Social Movements and Online-Mobile-Social Media**

Social movements and their origins, particularly with regard to media, are often understood in somewhat amorphous or simplified terms. Many scholars define social movements by what they do—for example, as “collective organized actions to bring about or resist change by means of various historically conditioned strategies” (West & Blumberg, 1991, p. 4). Such social movements seek to form what is called a collective identity as their members are “involved in conflictual relations with clearly identified opponents; are linked by dense informal networks; [and they] share a distinct collective identity” (Della Porta & Diani, 2006, p. 20). Thus, social movements, particularly those based on public protest, often emerge as a reaction against some “repressive conditions” that are found in a political or social system, and they aim at mobilizing the broader public around a goal to create a favorable change (Tilly, 1978).

Previous research in this area has found that activists are contemporarily engaged, at least in part, by relying on mobile devices with online capabilities and applications for social network sites (SNSs) that easily serve as channels for information sharing and coordination (Gil de Zúñiga, Veenstra, Vraga, & Shah, 2010; Valenzuela, Kim, & Gil de Zúñiga, 2011). Additional research (McCurdy, 2012) has found that embracing social media and online-enabled mobile phones reduces the time and effort invested on channels that activists cannot readily reach, such as mainstream media outlets, state funding, or even broad social support. By making use of emerging media technologies, ranging from a combination of social media and short message services (SMSs) to mobile devices, many groups are now organized through online interfaces because of the speed, relative freedom, and ease of doing so. In some cases, this creates what has been called “pressure from below” (Juris, 2005, p. 341) that circumvents traditional hierarchies of power, including mainstream and corporate media systems.

In recent years, social network sites have been shown to fulfill an important role in aiding activists in their movements (Zhuo, Wellman, & Yu, 2011). In this regard, online—and mobile—social activism is an especially relevant concept that needs to be further elaborated for purposes of this study. Broadly speaking, Internet use has been a very effective platform for activism and democratic demand (Nisbet, Stoycheff, & Pearce, 2012), and SNSs in particular have attracted more people worldwide to join in public debates on political and societal issues (Peña-López et al., 2014; Segerberg & Bennett, 2011). Social media can also enhance the structural connections among different activists and issues discussed online, and, further, Livingston and Asmolov (2010) argue that social media channels have already become a standard component of the tools used by activists within social movements to connect with one another in what is termed *connective action*, especially in contentious politics.

Connective action refers to “typically far more individualized and technologically organized sets of processes that result in action without the requirement of collective identity framing or the levels of organizational resources required to respond effectively to opportunities” (Bennett & Segerberg, 2012, p. 750). In fact, Milan and Hintz (2013) regard connective action as an organized civil society because of the intended goals and mutual concerns, yet there are also personalized content and approaches that are shared through digital media technologies. In the case of the EU crisis, protesters from different EU countries might not have had identical ideological motives or orientations, but they were “mobilized around personal lifestyle values” (Bennett, 2012) that manifest differently across cultural norms. Yet due

to the relatively weak ties linking protesters, these lifestyle values and choices allow protesters to be more involved in collective action aimed at various causes, such as anticorruption, unemployment, and economic inequality issues.

### **Networking Grassroots for Institutional Change**

Numerous scholars have described how activists who are proficient in the use of online, social, and mobile communication have the ability to organize protests with simplified online tools, particularly including SNSs, that can act as wide-reaching forms of alternative media (Anduiza, Cristancho, & Sabucedo, 2014; Lievrouw, 2011). Indeed, transnational protest movements, as decentralized networked organizations known to have loose connections and a nonhierarchical structure (Graber, Bimber, Bennett, Davis, & Norris, 2004), are often at the forefront in using online tools and mobile technologies to reach more engaged users and spread their messages to broader audiences (Tarrow, 2005). As such, it is pertinent to consider previous studies that have examined the linkage between civic engagement, political participation, and digital media use.

In this area, Groshek (2009, 2010) found evidence that Internet diffusion, even in countries with diverse cultural backgrounds, has a positive and significant relationship in predicting sociopolitical instability and related institutionalized democratic growth. Likewise, in two separate studies of cross-national samples, Nisbet, Stoycheff, and Pearce (2012) and Stoycheff and Nisbet (2014) reached similar conclusions regarding democratic attitudes as they related to Internet penetration and use. Focusing on SNS use specifically, Aday, Farrell, Lynch, Sides, Kelly, and Zuckerman (2010) studied how online media had "real consequences for contentious politics" (p. 5) in the example of Iran after the 2009 general election and how social media during the Arab Spring events in Egypt proved to be important in the way "citizens made individual decisions about participating in protests, the logistics of protest, and the likelihood of success" (Tufekci & Wilson, 2012, p. 364).

Focusing more specifically on social media content, Segerberg and Bennett (2011) found in their study of Twitter use during the 2009 United Nations Climate Summit in Copenhagen that with its organizing mechanisms, Twitter encompasses "networked protest spaces [which] constitute negotiated spheres of individual and collective agency" (p. 201). In addition, Twitter has been shown to be useful not only in organizing protest movements but also for nonprofit organizations that use it for three main purposes: information, community, and action. In relation to the latter, it is believed that Twitter has an important function in enhancing public engagement (Lovejoy & Saxton, 2012), which can also help in understanding the nature of contemporary political mobilization.

### **Contentious Politics and Youth in the (Socially Mediated) Euro Crisis Context**

Finally, with regard to the euro crisis protests, activists have been shown to actively connect through social media channels precisely to exchange views and work as watchdogs to monitor their societies (Aday et al., 2010). During times of economic crises, media coverage becomes more intensified and more focused on the hardship people undergo (Fogarty, 2005); and as need for orientation increases, people seek more information from media channels during such times to address the uncertainties and

worries they might experience (Groshek, 2011). With the confluence of these two factors—greater need for orientation stemming from the crisis itself and rapidly increasing SNS embeddedness in daily life—Burgess and Green (2009) described how social media have come to constitute the fabric of the online public sphere by enhancing the possibility for news exposure, deliberative democracy, and social contention with off-line mobilization being closely related (Kim, Chen, & Gil de Zúñiga, 2013).

Since the global financial crisis began to take hold in late 2007 and early 2008, Europe has experienced an ongoing series of protests across much of its geography, which has continued to the present. The majority of these anti-austerity protests have been outwardly understood as a reaction to broader EU austerity policies (Ponticelli & Voth, 2011) to cut government spending and reduce the national debt-to-income ratio of member states, which in several nations had reached over 300% (Inman, 2013). Though it is not possible here to describe in detail all the protests that have taken place in this time frame, in many cases these actions have been attributed to unemployed youth populations or those sympathetic to others who are lacking in material support or ideological representation (Hooghe, 2012).

The notion of youth actors being central agents of change within pan-national contexts is certainly familiar—one can easily look to the Arab Spring (Howard & Hussain, 2013) and elsewhere (McCurdy, 2012; Nisbet et al., 2012) for examples. Large youth populations, specifically those ages 15 to 24, have historically been associated with social and political upheaval, particularly in instances of injustices or a seeming misappropriation of resources (Al-Rawi, 2014; Ginges, 2005). The euro crisis has been a protracted experience, spanning more than half a decade, which has been particularly harsh on the employability for youth populations of numerous European countries. Telecommunication systems have likewise undergone a transformation such that online and SNS access, namely through data-enabled mobile phones, is available for a marginal cost, and adoption rates have increased exponentially, particularly among youth populations (Bilbao-Osorio, Dutta, & Lanvin, 2013).

### **Research Questions**

In this circumstance where youth populations lack social, political, and economic structures that meet their basic needs—yet have widespread access to media that bring together online, social, and mobile communicative capacities—there is a greater likelihood of youth-oriented social movements that may openly clash with governments (Ang, Dinar, & Lucas, 2012). In short, economic crisis itself provides an impetus for mass protest, and those movements have a logical and theoretical connection to increased technological interconnectivity. Thus, the vectors of youth unemployment and emerging media in the wake of faltering economic performance jointly form the basis of this study's first empirical component, which is to examine the factors that can be linked to the anti-austerity protests that swelled across Europe in recent years. Our research questions, then, begin with the following:

*RQ1: Has increased sociopolitical instability in EU member states during the euro crisis been predicted by increases in (a) youth unemployment and (b) SMS activity, mobile phone adoption, or Internet diffusion?*

*RQ2: Is there an interaction between youth unemployment and SMS activity, mobile phone adoption, or Internet diffusion such that sociopolitical instability was augmented jointly by both youth unemployment and certain forms of media use?*

Apart from these broad, macro-level cross-national objectives, at another level of analysis, the second empirical component of this study sought to connect content and users on Twitter as these existed in larger network structures of concepts and social ties that were relevant to anti-austerity protests. By some accounts (Marin & Wellman, 2011), participation in online social networks influences the rationality of individual actors who, in forming a collective and mutually sharing information, seek to ensure their own self-interest. The final research question, therefore, explicitly examines what was being said and which users were most prominent on Twitter as additional vantage points from which to understand the nature and impact of emerging media in cultivating anti-austerity protests.

*RQ3: What do content indicators show about (a) topics and (b) users active in communicating on Twitter about austerity and the euro crisis?*

### **Methods**

A combined data set for 27 current EU member countries (all except Malta; European Union, 2014) from 2007 to 2012 was compiled from a number of data archives. Once collected, each data stream was added to a master file to produce a comprehensive data set from multiple agencies. Banks' Cross-National Time-Series (CNTS) database was the source of the sociopolitical instability variable. This key dependent variable is a weighted measure of assassinations, general strikes, guerrilla warfare, government crises, purges, riots, revolutions, and antigovernment demonstrations. In the few cases of missing data per year by country, mean imputation was substituted.

The 2013 International Telecommunication Union database provided figures for the independent variables of mobile phones per 100 citizens, percentage of citizens with Internet access, and total number of text (SMS) messages sent (see also Statista, 2014). The World Development Indicators project maintained by the World Bank provided figures for youth (15–24 years old) unemployment rates, which acted as another independent variable, as well as measures of gross national income per capita and urban population by percent of total population, which acted as control variables in regression models. Finally, the democracy measures introduced as control variables were drawn from the Polity IV database, and employed the Polity 2 measure with a range of –10 (*perfect autocracy*) to +10 (*perfect democracy*).

Although this list of variables is, of course, not exhaustive, it incorporates as many germane data streams that were readily available through 2012 at the time of data collection. These data also avoid issues of multicollinearity, which proved problematic in extensive pretesting when trying to expand the model to include additional independent and control variables.

To test relationships between these variables, regression models were adapted to the Beck and Katz (1995) "standard" for analyzing panel data. Time and region fixed effects were applied, as were one-year lags in the predictor variables, and then modeled with the operator `xtpcse` in the statistical software

program STATA. These regression models were also based on natural log-log transformations of all independent and dependent variables (see Beck & Katz, 1995), which converted coefficients observed here into percentages of one another rather than raw units.

### ***SNS Content Data Retrieval***

Data on the euro crisis included tweets that mentioned the keywords "austerity," "euro," and "crisis" from the last two months of 2012. There were 3,065,474 tweets collected from the streaming Twitter application programming interface using the Twitter Content and Analysis Toolkit (TCAT) developed at University of Amsterdam (Borra & Rieder, 2014). Though the TCAT does not claim to capture all tweets that are shared, it does report a high level of representativeness of Twitter content more broadly speaking (Gerlitz & Reider, 2013).

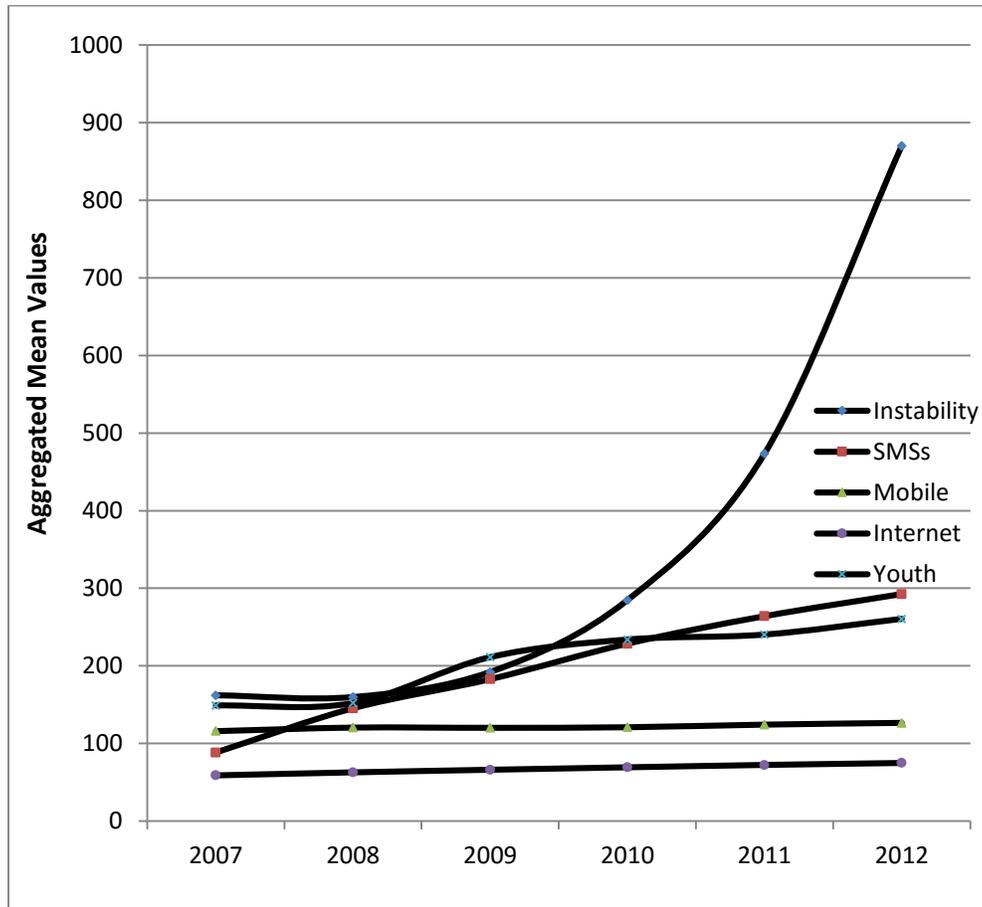
Through this data collection system, this study quantitatively content-analyzes the text corpus and identifies the most prominent hashtags and their associated terms (Groshek & Al-Rawi, 2013) as well as sorting and graphing the most influential users. In short, the TCAT system creates network files suitable for the application of several algorithms in the software program Gephi that first spatialize network structures, then create size and color nodes based on specific features, such as centrality and communities of users and groups. Sortable data files of computed network statistics are also produced as output.

### **Findings**

The first research question asked whether increased sociopolitical instability in EU member states during the euro crisis had been predicted by increases in (a) youth unemployment and (b) SMS activity, mobile phone adoption, or Internet diffusion. Before advancing to statistical analyses, a visual representation is useful for identifying trends in eurozone countries over this time period. Figure 1 demonstrates linear patterns across mean levels of sociopolitical instability, youth unemployment, SMS activity, mobile phone adoption, and Internet diffusion.<sup>1</sup> Considered jointly, plotting the average values of the dependent and independent variables identifies not only broad patterns of social trends but relative changes over time.

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<sup>1</sup> Analysis of variance (ANOVA) indicated the overall increase in average youth unemployment in all countries by 2012 was statistically significant ( $F(5, 71.79) = 10.75, p < 0.001$ , equal variances not assumed). ANOVA, however, did not find differences in sociopolitical instability to be statistically significant when modeling all years ( $F(5, 70.26) = 1.37, p > 0.05$ , equal variances not assumed).



**Figure 1. Overview showing mean levels of sociopolitical instability, SMS activity, mobile phone adoption, Internet diffusion, and youth unemployment for EU countries from 2007 to 2012.**

Note. Mobile and Internet figures are per 100 people, SMS activity is scaled by 10 million, youth unemployment is based on rates per 1,000 and sociopolitical instability is transformed by a factor of 100 for comparability.

Beyond Figure 1 and base comparisons of averages over time, the concepts of unemployed youth and sociopolitical instability brought forward in RQ1a were next directly measured with a pairwise correlation. Though the overall correlation for all countries and all years was reasonably moderate ( $r = 0.50$ ,  $p < 0.001$ ), it is worth reporting that the correlation went from almost nonexistent and nonsignificant in 2007 ( $r = 0.05$ ,  $p = 0.79$ ) to reasonably strong and significant by 2012 ( $r = 0.63$ ,  $p < 0.01$ ). Moreover, when examined with the Beck and Katz (1995) linear regression model with panel corrected standard errors (PCSEs) and lagged predictors, there is additional evidence that increases in unemployed youth populations were related to more sociopolitical instability ( $B = 0.99$ ,  $p < 0.01$ ). The complete model is summarized in Table 1.

**Table 1. Regression Model for Sociopolitical Instability Across Eurozone Countries from 2007 to 2012.**

Variables	B	SE
Total number of SMSs	0.7613909***	0.1269073
Mobile phones adoption	0.8052811	1.302258
Internet diffusion	-3.157712**	1.010661
Democracy level	-9.349723**	3.085629
Gross national income per capita	1.648457***	0.4940246
Youth unemployment rate	0.9943661**	0.3658033
Urbanism	-1.200074	1.778604
Constant	12.17899	9.125199

*Note.* All variables are log-transformed (ln), and independent variables are lagged one year. Coefficients are unstandardized and derived from panel corrected standard errors with pairwise selection.  $N = 125$ .  $R^2 = 0.32$ .

\*\*  $p < .01$ . \*\*\*  $p \leq .001$ .

Next, RQ1b asked the extent to which—if at all—increased mobile phone, SMS activity, and Internet diffusion predicted increased sociopolitical instability. Analyses start again here with the visualization offered in Figure 1, where it is clear that technological diffusion in terms of mobile phone and Internet diffusion is relatively unchanged during this time period.<sup>2</sup> Given that SMS activity does appear to be growing year by year, and those differences approach statistical significance,<sup>3</sup> it seems there are noticeable variations from adoption to use. Along these lines, there are no statistically significant dyadic yearly correlations between mobile diffusion, SMS activity, and Internet penetration.

Closer examination of RQ1b reveals that none of these media measures correlated with sociopolitical instability when looking at the data set across all countries and all years (though for SMSs sent,  $r = 0.13$ ,  $p = .12$ , and for Internet diffusion,  $r = -0.13$ ,  $p = .09$ ). When analyzed on a yearly basis, just SMSs sent were moderately correlated with instability in 2009 ( $r = 0.45$ ,  $p < 0.05$ ); the only other relationship not due to chance was between Internet diffusion and sociopolitical instability in 2012, and that correlation was reasonably weak and negative ( $r = -0.38$ ,  $p < 0.05$ ). On the surface, these findings suggest something about emerging media technologies in mature institutionalized democracies and their uses, as these may vary against popularized conceptions of media and social movements elsewhere, notably the Arab Spring.

<sup>2</sup> Mobile phone adoption per 100 citizens showed an increase from 2007 to 2012, but the difference was not statistically significant, ANOVA ( $F(5, 161) = 1.03$ ,  $p = 0.40$ ). Internet diffusion increased over time with statistically significant ANOVA ( $F(5, 161) = 4.27$ ,  $p \leq .001$ ).

<sup>3</sup> For SMS activity, ANOVA approached statistical significance ( $F(5, 65.52) = 1.98$ ,  $p = 0.09$ , equal variances not assumed) across years.

Some similar patterns were evident when modeling sociopolitical instability using linear, lagged regression with correlated panels and corrected standard errors, but in this analysis SMS activity positively predicted sociopolitical instability ( $B = 0.77, p < 0.001$ ). Mobile phone diffusion was nonsignificant at the  $p < .05$  threshold, and Internet diffusion was found to be a negative and statistically significant predictor ( $B = -3.15, p < .01$ ) overall. Of the control variables, increased democracy was negatively related to instability ( $B = -9.35, p < .01$ ), and higher income per capita levels were positive ( $B = 1.65, p \leq .001$ ) and statistically significant. The main findings are that, despite limited correlational evidence, a more detailed estimation using a tested procedure for modeling panel regressions found evidence that SMS activity as well as unemployed youth positively contributed to increased levels of sociopolitical instability. In addition, another media factor—increased Internet diffusion—was observed to have an inverse relationship with instability.

To examine these findings in more depth and to identify specific points in time when variables and events were significant, separate regressions were modeled for each year in the study. These regressions by and large confirmed the findings of the overall PCSE model with lagged predictors. Summarized in Table 2, these year-by-year regression models make it clear that SMS activity was the most potent independent variable in relation to sociopolitical instability, with statistically significant relationships in 2010, 2011, 2012 and significance was approached ( $p < .10$ ) in 2009. The only other independent variable that achieved similar significance in yearly analyses was Internet diffusion in 2008 ( $B = -4.77, p < .05$ ) and 2010 ( $B = -5.67, p < .10$ ), which were negative coefficients.

**Table 2. Unstandardized Regression Coefficients for SMS Activity, Mobile Phone Adoption, Internet Diffusion, and Youth Unemployment in Predicting Sociopolitical Instability for Eurozone Countries from 2007 to 2012.**

	2007	2008	2009	2010	2011	2012
Youth Unemployment	-0.88 (SE = 1.71)	-0.66 (SE = 1.16)	1.84 (SE = 1.28)	0.93 (SE = 1.31)	2.00 (SE = 1.27)	0.60 (SE = 1.40)
SMS (Text) Activity	0.16 (SE = 0.41)	0.22 (SE = 0.29)	0.58 <sup>#</sup> (SE = 0.32)	0.72* (SE = 0.33)	0.73* (SE = 0.32)	1.07** (SE = 0.37)
Mobile Phone Adoption	-3.09 (SE = 3.25)	5.15 (SE = 3.18)	4.64 (SE = 3.58)	-0.28 (SE = 3.57)	-2.93 (SE = 3.42)	-2.01 (SE = 3.60)
Internet Diffusion	0.39 (SE = 3.25)	-4.77* (SE = 2.30)	-2.53 (SE = 2.90)	-5.67 <sup>#</sup> (SE = 3.19)	-5.91 (SE = 4.20)	-5.74 (SE = 5.55)

Note. <sup>#</sup> $p \leq .10$ , \* $p \leq .05$ , \*\* $p \leq .01$ .

Taken together, these analyses confirm the importance of mobile media uses in the form of SMS activity, because it positively and consistently predicted sociopolitical instability. It is less clear at this point, however, whether youth unemployment was a co-contributing factor to increased protest activity. Thus, this study posed RQ2 to determine whether there is an interaction between youth unemployment and SMS activity, mobile phone adoption, or Internet diffusion such that sociopolitical instability was augmented jointly by *both* youth unemployment and certain forms of media use. Given the previous findings, an interaction term was created by multiplying unemployed youth figures with the SMS activity variable, which was first centered and then squared to avoid multicollinearity.

The results of this model—also derived from the recommended Beck and Katz (1995) linear, lagged regression with correlated panels and corrected standard errors—mirror the findings of previously estimated models but also add a statistically significant effect of youth unemployment and SMS activity ( $B = 0.32, p < .001$ ). As summarized in Table 3, all other variables that were significant in the previous overall PCSE model maintain similar significance with the same directional relationships, importantly including SMS activity ( $B = 0.72, p < .001$ ) and youth unemployment ( $B = 0.67, p < .07$ ) as stand-alone factors. In other words, the interaction term did not cancel out the effect of each individual variable, and thereby it adds an additional level of explanatory power and confirms that there was a confluence of youth unemployment and SMS activity variables in cultivating anti-austerity protests during the euro crisis.

**Table 3. Regression Model With Interaction Term of SMS Activity and Youth Unemployment for Sociopolitical Instability Across Eurozone Countries from 2007 to 2012.**

Variables	B	SE
Total number SMSs	0.7232756***	0.0950767
Mobile phones	0.3598161	1.221356
Internet diffusion	-3.360059***	0.9992747
Democracy level	-10.31231***	2.839268
Gross national income per capita	1.815405***	0.4763496
Youth unemployment rate	0.6733913 <sup>#</sup>	0.3691695
Urbanism	-0.9260254	1.767588
SMS activity x youth unemployment	0.3233508***	0.0881908
Constant	11.60327	9.297717

*Note.* All variables are log-transformed (ln) and independent variables are lagged one year. Coefficients are unstandardized and derived from panel corrected standard errors with pairwise selection.  $N = 125$ .  $R^2 = 0.36$ . <sup>#</sup> $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p \leq .001$ .

Following these macro-level analyses, this study now turns to its next empirical component, represented by RQ3, which presented the question of what content indicators show about (a) topics and (b) users active in tweeting about austerity and the euro crisis. Twitter content provided the basis for our purposes here, which effectively situate Twitter content as an example of online, mobile, and social media

content and users speaking on this topic. Specifically considering the mobile aspect of these analyses, recent statistics from Twitter (Lunden, 2013) have shown that 75% of users access Twitter from their mobile device. Though the content analyzed in this study cannot be directly linked to mobile phones in every instance, and thus a closer tie to SMS activity, there is a strong bias toward Twitter being used on mobile rather than fixed devices, and interpretation of this data is informed by this background.

Considering the content of topics (RQ3a) being discussed in tweets about the euro crisis, a concept map of co-occurring hashtags was developed using the open-source software program Gephi to better understand which terms were most prominent and how those keyword mentions were related to other concepts. This undirected graph (because co-hashtags are necessarily reciprocal) was spatialized using the OpenOrd layout algorithm, which was developed to distinguish clusters. In this case, there were 3,065,474 tweets about the euro crisis summarized into 336 hashtag nodes with 2,247 edges connecting these nodes.

The size of each node was calculated with the eigenvector centrality algorithm, which is a computation often used to identify contacts within networks, somewhat famously by Google (Brin & Page, 1998). Unlike other metrics (namely degree), eigenvector calculations take into account the weights of other contacts and "can also be seen as a weighted sum of not only direct connections but indirect connections of every length" (Bonacich, 2007, p. 555). Color was applied to nodes using a modularity algorithm, which is useful for detecting communities or subgroups of frequent interactions within networks (Newman, 2006).

Figure 2a illustrates the mix and interconnection of topics related to the euro crisis. In general, this concept map provides a level of understanding about *what* was being communicated in this public space and how those conceptual interactions occurred, without specific coordination or hierarchy, by Twitter users. Apart from the static representation shared in this figure, a dynamic online interface of this graph has been generated and posted to [http://www.betweetness.org/eurocrisis\\_cohash\\_new/](http://www.betweetness.org/eurocrisis_cohash_new/). In the interactive version of this graph, readers can examine communities of topics and how those hashtags were connected to each other by highlighting specific nodes and their respective orientation to other hashtags through keyword connections and communities.

Beyond the visual representation in Figure 2a, it is also useful to textually notate the most important concepts in this corpus. Therefore, the top 20 hashtags as ranked by the eigenvector centrality algorithm were as follows: (1) crisis, (2) euro, (3) eu, (4) europe, (5) news, (6) austerity, (7) usa, (8) spain, (9) uk, (10) israel, (11) economy, (12) us, (13) france, (14) greece, (15) germany, (16) syria, (17) italy, (18) business, (19) africa, (20) ows. Taken together with this list, the static and dynamic concept maps for this analysis provide insights into not only the topics of conversation on Twitter about the euro crisis but also how the communities of concepts were formed about one another.



In the figures it can be clearly observed that there are five primary clusters, signified further by color. The highest-ranked node by eigenvector centrality is "crisis," and that exists most closely within a community of other hashtags that mention "españa," "fb," "mexico," "economia," "jobs," and "socialmedia." The next most important concept node was "euro," and that cluster included hashtags that mentioned the "eu" and many other continental European nations as well as "austerity" and "news," among others, including "economy," "rt" (retweet), "ff" (follow Friday [to identify users worth following]). This concept community was spatialized in intermingled proximity with another cluster that was anchored by "europe," but in a much more international mix of co-hashtags. These terms included "usa," "israel," "un," "uk," "syria," "africa," "gaza," "ows," "climate," and "humanrights." The remaining two primary clusters were about "egypt" (co-mentioning only one other node, "morsi") and "tcot" (top conservatives on Twitter), which was also a space for "gop," "teaparty," "tlot," and "p2" (progressives 2.0).

Although this graph makes it relatively efficient to visually sort prominent keyword hashtags and interrelationships between concepts in a large volume of data, it does not provide specifics on how users were connecting with one another. RQ3b therefore examines content indicators from tweets about austerity and the euro crisis to clarify which users were especially active in this arena as well as those that are mentioning and being mentioned by others most regularly.

In the case of examining Twitter users, similar techniques were applied using Gephi to import and lay out a visual representation of these users that was ordered along somewhat different parameters. Perhaps most importantly, this user graph is directional, which means that certain users can mention another user many times but might never be mentioned by that specific user at all. This directedness is unlike co-word occurrences that are always and uniformly reciprocal—either words (or hashtags) appear jointly in a tweet or they do not—and this registers a different baseline for understanding and arranging communicative spaces.

Considering user mentions in this study, there were a total of 1,522,650 users tweeting about the euro crisis, which were summarized into 410 nodes (users) and 227 directed edges (co-mentions). Although this model does not include every single user who tweeted—or who was mentioned in a tweet about the euro crisis—it does incorporate all users who were mentioned 275 times at minimum. This threshold can be thought of as reasonably low (mentioned in fewer than 0.01% of all units) given that there were more than 3 million tweets in the corpus.

It is important to reiterate that not every user who was mentioned in this data set necessarily was active in tweeting. For example, famed economist and Columbia University professor Joseph Stiglitz was mentioned @joestiglitz by other Twitter users at the minimum level of 275 times, though this account never actually tweeted into this data set. It is somewhat interesting that Stiglitz was not alone; 209 of the most mentioned 409 users did not send out a single tweet. This sort of "ghost influence" is one of the reasons why it is crucial in big data and network analysis to rely on metrics that go beyond simple measures of influence such as mentions, tweet activity, and favoriting.

The visualization presented here was spatialized with the Yifan Hu multilevel algorithm, which is a force-directed process that is designed to reduce complexity and locate nodes through which connections

converge and flow. With that same idea in mind, the size of the nodes was determined with the betweenness centrality algorithm, which measures how often a node appears on the shortest path between nodes in the network. Identifying these “most-between” users is, in this instance, a means to ascertain which users are acting as gatekeepers within this euro crisis corpus of tweets. As with the previous topic-based model, the community detection modularity algorithm was applied to add color to this graph, and the coloration is complementary to the sizing.

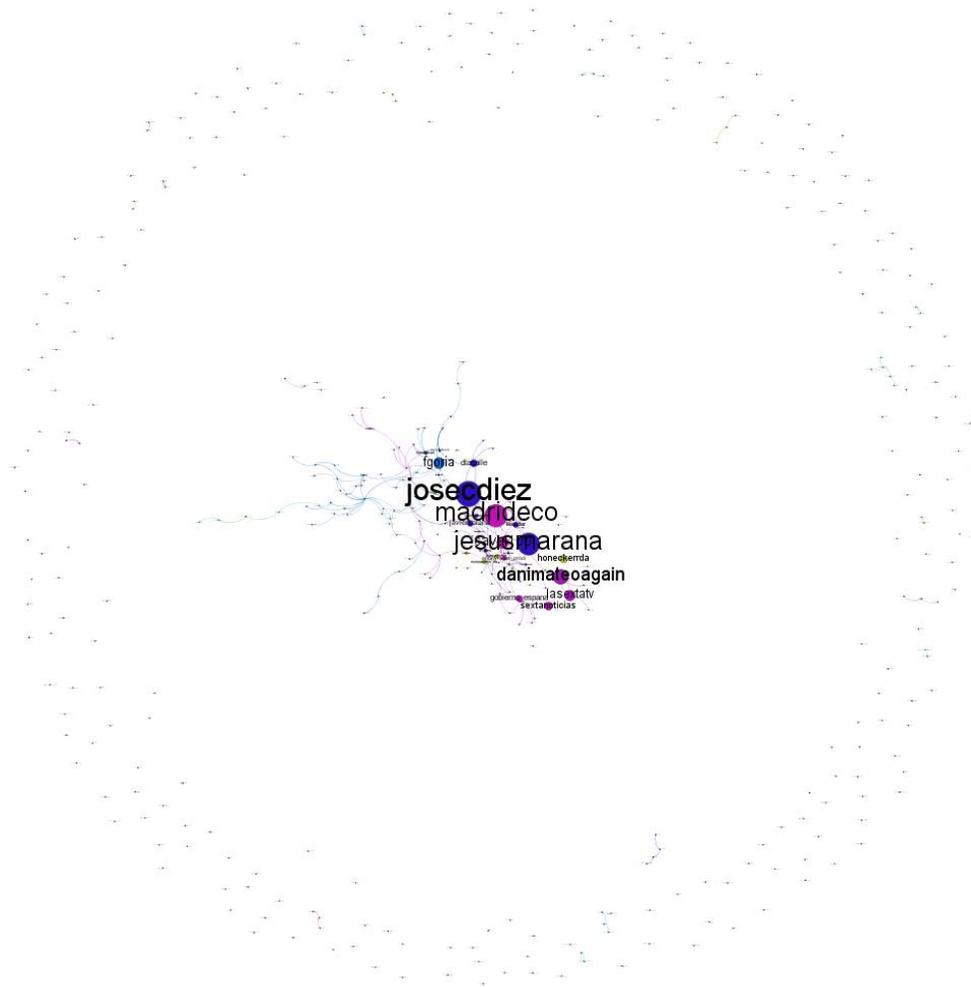
More specifically, looking not only at the size of each node but also to which nodes of other (or similar) colors informs an understanding of the extent to which certain users are mentioning, and being mentioned by, users from unique communities. Altogether, this concept map, visualized in Figure 2b, sizes influential user nodes by how frequently they cross in- and out-group boundaries in spreading and receiving mentions in messages. In addition to this static graph, a dynamic version has been uploaded to [http://www.betweenness.org/eurocrisis\\_users\\_rev/](http://www.betweenness.org/eurocrisis_users_rev/) to allow readers to easily and quickly examine specific linkages, zoom in and out, and to efficiently search and cross-reference users mentioned within the corpus on Twitter. In these visualizations, *who* is pointing to whom has been derived from a matrix of co-mentions and sorted algorithmically to provide a determination of influence from within the corpus.

Interpreting this figure makes it reasonably clear that the most “between” users are an eclectic mix of individuals and organizations. There are current and former European politicians,<sup>4</sup> but most of the users acting as gatekeepers within this discursive space are also gatekeepers outside of Twitter—many are journalists, editors, or news organizations of some kind. Although no CEOs or business leaders are presented prominently, there is what seems to be a parody account for the Spanish government (no longer active) and an organization of economists who are speaking out against the euro crisis. Also represented are professors and counterculture groups that might otherwise be marginalized in mainstream media coverage but that are nonetheless influential in terms of mentioning others and likewise being mentioned by others on the topic of the euro crisis on Twitter.

The 20 most influential users as ranked by the betweenness centrality algorithm are listed below with a brief description of their occupation or organizational activities: (1) josecdiez—professor, (2) madrivedco—organization of economists against the crisis, (3) jesumarana—journalist, (4) danimateoagain—comedian/actor, (5) caval100—professor, (6) fgoria—journalist, (7) lasextatv—broadcast TV station, (8) sextanoticias—updates for lasextatv, (9) honeckerrda—politician (deceased), (10) dlacalle—author and investor, (11) gobierno\_espana—Spanish government (since deleted), (12) javiersolana—politician, (13) iescolar—journalist, (14) anonymous\_prodi—anarchist/hacker group, (15) europapress\_es—news agency, (16) epeconomia—economics section of Europa Press, (17) thestalwart—editor, (18) el\_pais—newspaper, (19) cincodiascom—newspaper, (20) zerohedge—alternative economic blog.

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<sup>4</sup> Including an account for now-deceased Erich Honecker (1994), who led East Germany from 1971 until 1989.



**Figure 2b: Co-mentions among 1,522,650 users tweeting about the euro crisis summarized into 409 nodes (users) and 227 directed edges (co-mentions).**

*Note. Spatialization: Yifan Hu multilevel (w/Noverlap); size: betweenness centrality; color: modularity.*

Apart from these users, who acted as the main hubs in the explicit sharing of content to other users, it is worthwhile to observe that these gatekeeping actors are in the distinct minority in this data set. Indeed, this relatively small cluster of influential users is encircled by many users that have few, if any, connections to the more mentioned users reported here. There are a number of reasons for this insulated connection, from no outbound mentions of others to no tweets and only mentions by others, to

self-referential mentions in retweeting. However, it is important to observe that only 50 users had a betweenness centrality score greater than zero, which suggests there were relatively sparse community clusters of users, and only a few key users acting as gatekeepers between them.

These findings altogether suggest an information flow that was not necessarily hierarchical and exclusionary, but it also does not neatly represent a very densely interconnected free-form flow of information between stakeholders. User interaction in the euro crisis conversation on Twitter was nonetheless directed by a relatively small number of users, mostly from within a community of Spanish journalists and media organizations, which ultimately signals that open communicative spaces can morph into less even and integrative spaces along parameters constructed by de facto user behavior and interaction.

### **Conclusions**

Previous research has suggested that unemployed youth are making a rational choice that is in their own best interests when they choose to engage in protest activity. To that point, Rüdiger and Karyotis wrote,

Protest behaviour has in the past mainly involved younger people; lack of obligations linked to family and occupation could make young cohorts [under thirty] more likely to be involved. Engaging in protests such as demonstrations involves a degree of physical activity that may make it less likely for older cohorts, above fifty or sixty, to take part. (2013, p. 495)

Along these lines, a number of studies have suggested that a combination of unemployed youth and widespread proliferation of online, social, and mobile media platforms have increased the propensity for protest behavior, particularly among youth populations (Ang et al., 2012; Howard & Hussain, 2013).

In the study reported here, the unemployed-yet-rational-and-media-saturated youth proposition was formally tested by examining how both factors of youth unemployment and emerging media diffusion related to sociopolitical instability. From analyses based on several robust regression model specifications, there is ample reason to accept that general idea in the euro crisis context. All else equal, positive relationships were observed between lagged unemployed youth and instability (RQ1a) along with lagged SMS activity and instability (RQ1b) as well an interaction between those factors and instability (RQ2).

Although this study finds instability to be a product of several social, political, and media factors, it is worth considering that previous studies—particularly comparative work by Norris (2008)—have conceptualized sociopolitical instability as an indicator of strong democracy and suggested that an increase in media access, notably Internet access, contributes to better democracy. Our contentions here are not incompatible with that formulation, and other work (Groshek, 2011) has shown in time-ordered models that media can stimulate institutionalized democracy directly and indirectly through augmenting sociopolitical instability. In this light, all of the countries considered in this study were already highly developed democracies (indeed, the average democracy level of 9.59 was a nearly perfect +10 on the Polity scale), and therefore this study expands this line of research beyond using digital media for the

purpose of regime change to incremental policy changes where democratic institutions were already established and largely functional. Here, relatively more democratic countries were shown to be more stable than those EU countries marginally less democratic, indicating certain ceiling effects (Groshek, 2009, 2011).

Likewise, another important and useful contribution of this particular study is the non-effect of mobile phone diffusion and the seemingly negative relationship between Internet diffusion and sociopolitical instability. Both of these findings are suggestive of relational and structural conditions in relation to protest movement. For example, although France is one of the countries with lower levels of mobile phones per 100 citizens, it also consistently has some of the highest number of SMSs sent year over year—and it is a country with relatively higher levels of sociopolitical instability. These findings suggest that actual indicators of media uses, rather than just diffusion, are important metrics to include, as diffusion rates can be prone to saturation, as in the case of mobile phones, or stabilization, as with fixed Internet service (Neumayer & Stald, 2014). In the EU context, fixed Internet service is a much more prevalent commodity in Northern European countries. As an example, Bulgaria is among the EU countries with more than 120 mobile phones per 100 citizens, but it lags relative to other nations with regard to Internet access; and the inverse is true of countries such as the Netherlands, which lead in terms of Internet diffusion but are fairly middling with regard to mobile phones and SMSs.

Thus, there are structural factors related to overall economic development and the diffusion of fixed Internet access—notably in nations that are more stable than others—that provide logical interpretations of the seemingly negative relationship between fixed Internet access and sociopolitical instability (Ang et al., 2012; Eurobarometer, 2012; Howard & Hussain, 2013). Altogether, this study adds to a growing body of evidence that suggests that it is not just online media, or mobile media, or social media as these are diffused but crucially in how they are used, and how frequently they are engaged for political rather than other purposes (Gil de Zúñiga, Jung, & Valenzuela, 2012; Gil de Zúñiga et al., 2010) with certain types of content being shaped and shared by influential users.

Following from these macro, content, and structural standpoints, this study identified a connection from adoption and uses to content and users within social media channels such that “social movement scholars could use information about online activities to anticipate offline activism in the same way in which, for example, seismologists use tremors to anticipate volcanic eruptions” (Vasi & Suh, 2013, p. 7). Although limitations of course exist in this particular study—from data availability to sampling only Twitter—and while it does not engage at a level of forecasting protest from media data, it does recognize such potentialities and invites consideration from methodological, theoretical, and ethical arenas of network analyses and predictive research scenarios in the euro crisis and pan-national movements more broadly.

Ultimately, this study has demonstrated that, in the case of the euro crisis, unemployed youth populations (RQ1a) and emerging media (RQ1b) have had a substantial and statistically significant and interactive-type (RQ2) impact on protest behavior. And although social media content may not always be conducive to building cohesion-forming consensus, it has been shown to be regularly successful at cultivating oppositional movements (Breuer & Groshek, 2014), and the results here suggest those

movements can be incremental and policy oriented. Coupled with the findings observed here, in algorithmically analyzing the 3 million-plus tweets from late 2012, there seems to be good reason to believe that content (RQ3a) circulated on social network sites can support social movements for particular causes outside of regime change. In addition, that statistical and visual evidence signals that users (RQ3b) can connect around issues in ways that allow potentially marginalized voices not only to be heard, but to centrally interconnect across communities of opinion, so that they can both participate in and direct the flow of information on specific topics.

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