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Getting connected: An empirical investigation of the relationship between social capital and philanthropy among online volunteers

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Abstract

The concept of social capital has attracted much attention from researchers and policy makers, largely due to links with positive social outcomes and philanthropic acts such as volunteering and donations. However, a rapid growth in internet technologies and social media networks has fundamentally affected the formation of social capital, as well as the way in which it potentially associates with prosocial behaviors. This study uses unique data from a survey of online volunteers to explore the interrelationships between social capital and a mix of self-reported and observed philanthropic activities in both online and offline settings. Our results show that while social capital levels associate strongly with offline donations, there are key differences in the relationships between social capital and volunteering in online and offline settings. Using a 2SLS regression analysis in order to control for endogeneity, we also infer a number of causal relationships between social capital and philanthropy.

Keywords: Social Capital; Volunteering; Donations; Online; Offline

1. Introduction

The concept of social capital has been met with significant attention due to strong theoretical and empirical associations with levels of civic engagement in communities (Putnam, 1993). However, authors such as Robert Putnam have famously highlighted a decline of social capital levels in the US and other Western societies since the 1960s. This decline is evidenced by diminishing voter turnouts, reduced membership of clubs and societies and lower levels of volunteering, with possible reasons including the waning influence of the church and trade unionism, greater involvement of women in the labor force and ageing populations (Putnam, 1995).

Since the publication of Putnam's seminal works, rapid technological developments have further impacted upon the way in which interpersonal relationships are formed and maintained in online settings, with ambiguous consequences for the formation of social capital. On one hand, it can be argued that the internet serves as a complement to offline interactions and may therefore enhance levels of social capital (Ahmad *et al*., 2016). Conversely, use of the internet as a leisure activity has been argued to paradoxically lead to declining interactions between household members and shrinking social circles (Kraut *et al*., 1998).

Along similar lines, it has been argued that support for prosocial causes via online channels tends to require very little in the way of time commitment or involvement (Guo & Saxton, 2018). Such practices have been dubbed as 'slacktivism', implying that supporters of online causes might not also be active in offline environments (Ihm, 2017). However, empirical evidence on the extent of 'slacktivism' is also somewhat ambiguous, with Noland (2017) showing that token acts of online support are likely to represent only part of a broader spectrum of social cause engagement activities, meaning that a better term to describe the phenomenon might be 'social media activism'. Such thinking is congruent with Hustinx &

Lammertyn (2003), who note that patterns of volunteering behaviors have evolved over time into a more reflexive style that is characterized by occasional involvement in a diversity of informal settings. Taken together, such fundamental changes to the nature of social capital formation and philanthropic behaviors necessitate a radical re-examination of these relationships. Forming a better understanding of these phenomena is also vitally important for non-profit organizations given the importance of online social capital in contacting diffuse community and grantee stakeholders (Saxton & Guo, 2014).

Despite a well-developed literature exploring the relationship between social capital and philanthropy, as well as the relatively recent growth in sociological studies into online social interaction, there remain a number of key deficiencies and gaps in knowledge that serve to motivate our current study. First, many prior studies are limited by their assumption that social capital can be treated as a singular 'catch-all' concept, or that different forms of social capital can be analyzed independently of others (Patulny & Svendsen, 2007). Second, despite the key differences that exist between offline and online social capital (De Zúñiga *et al*., 2017), there has been a distinct lack of research into the potentially differing relationships they might share with philanthropic behavior in each respective setting (Sessions, 2010). Finally, many existing studies encounter difficulties in the identification of a causal relationship between social capital and altruistic behavior (Warren *et al*., 2015). A confounding issue in this regard is endogeneity (Emrich & Pierdzioch, 2016a), which may bias empirical results if not properly taken into account.

Our study contributes to this body of literature by addressing the primary research question: '*how do individual levels of social capital relate to philanthropic behavior in both online and offline settings?*' We address this research question by undertaking an empirical investigation into offline and online social capital and analyzing their relationship with a mix of self-reported and directly observed philanthropic behaviors among a sample of online

volunteers. Our unique survey dataset consists of a representative sample of registered users for an online volunteering platform known as the Zooniverse, where contributors can undertake data analysis tasks to help research projects organized by a variety of non-profit and academic organizations, including Cancer Research UK, Tate Gallery, Lincoln Park Zoo and Imperial War Museum.

By analyzing data drawn from these online volunteers, our study addresses a number of the aforementioned gaps and deficiencies in the associated literature. First, we take a more comprehensive view compared with many other studies by distinguishing between bridging and bonding social capital in both online and offline settings. Further, few other studies simultaneously investigate the relationship between social capital and online/offline philanthropy, which we achieve through accounting for a mix of self-reported and directly observed volunteering and donations behaviors. Finally, our study employs a two-stage least squares (2SLS) approach with the use of novel instrumental variables in order to make causal inferences and account for potential endogeneity in the relationship between social capital and prosocial behavior. Altogether, the combination of these measures means that our study makes an important contribution to the literature on social capital, as well as the nature of online/offline interactions and behaviors.

2. Social Capital

2.1 Defining social capital

The term 'social capital' refers to an aggregated measure of resources derived from durable networks of 'more-or-less institutionalized' relationships and social structures that members can use in the pursuit of their own interests (Bourdieu, 1985). These internalized norms are appropriable by others as a resource, allowing community members to "extend loans without

fear of non-payment, benefit from private charity, or send their kids to play in the street without concern" (Portes, 1998, p.7). As an extension of this basic notion, social capital is increasingly conceptualized in two distinct forms; bridging and bonding. Bridging social capital refers to the breadth or reach of social ties across a community, while bonding social capital refers to the depth or strength of ties within a more concentrated social group (Woolcock & Narayan, 2000). From a theoretical perspective, it is unclear whether bridging or bonding social capital is more effective in delivering beneficial social outcomes. Granovetter (1973) famously suggests that wider networks of weaker ties (i.e. bridging social capital) can be surprisingly effective way to access information not already possessed by the individual or any of their stronger ties. However, Coffé & Geys (2007) argue that bonding social capital is likely to offer a much more powerful explanation for variations in pro-social behaviors due to the relative ease with links can be formed among homogenous groups. This argument underpins the phenomenon of homophily; the tendency of individuals to form deeper associations with others who are similar to themselves (Mouw, 2006).

More recently, greater attention has been paid to social capital developed in online settings, with a number of studies showing that online interactions and social media use are an effective means by which to build social capital (Bouchillon & Gotlieb, 2017; Perry *et al*., 2018). However, several ambiguities persist in relation to the specific forms of social capital generated by online interaction. On the one hand, online interactions may lead to the creation of relatively diffuse networks consisting of mostly weak ties (Williams, 2007), thus enhancing stocks of bridging rather than bonding social capital. However, various authors have argued that online interactions may serve as an additional channel for engagement with existing contacts, friends or work colleagues (Ellison *et al*., 2007; Huang & Liu, 2017), meaning that most connections in online social networks merely reflect existing offline

relationships (Mayer & Puller, 2008). If this were the case, online interactions would be more likely strengthen social ties and enhance bonding rather than bridging social capital.

2.2 Social Capital and Philanthropy

A number of studies have sought to empirically investigate the relationship between social capital and philanthropy in offline settings, almost all of which make use of survey data and find that both the number and diversity of associational ties are significant predictors of individual levels of volunteering and/or charitable giving (Brown & Ferris, 2007; Dury *et al*., 2014; Herzog & Yang, 2018). The relationship has been shown to persist over time, with evidence from Hossain & Lamb (2017) showing that social capital built through membership of associations in youth and adulthood is a significant predictor of charitable giving among adults.

In terms of studies that have investigated the relationship between prosocial behavior and different forms of social capital, Taniguchi & Marshall (2014) find that bonding social capital offers a more powerful prediction of charitable giving, while bridging social capital may offer a more effective explanation for variations in volunteering. Conversely, Layton & Moreno (2014) find that bridging social capital is an important predictor of both volunteering and secular giving, while bonding social capital is not. At a regional level, Glanville *et al*. (2016) use data from the European Social Survey to show that regional-level bonding social capital (trust) associates positively with both volunteering and charitable donations, while regional-level bridging social capital explains variations in volunteering only.

In contrast to the relatively rich literature exploring the link between offline social capital and philanthropy, comparatively fewer studies have investigated the phenomenon in online settings. More broadly, online social capital and social media use has also been shown to associate positively with various forms of civic engagement, such as participation in political

(Skoric *et al*., 2016) and health communities (Zhang *et al*., 2017). In terms of prosocial behavior specifically, Pénard & Poussing (2010) attempt to model variations in online social capital investment and find a strong association between levels of trust, volunteering and leisure membership, while a zero or negative association is found with membership of offline civic organizations. In a more recent study, Son *et al*. (2016) investigate online citizenship on online social networking sites, finding that social capital is the main motivator of prosocial behaviors online. However, Emrich & Pierdzioch (2016b) have shown that only volunteer-related use of the internet positively correlates with volunteer commitment and that no such relationship is found with more general internet use for leisure purposes.

In a study quite closely related to our, Bosancianu *et al.* (2013) use survey data from Balkan countries to demonstrate evidence of strong associations between social capital and both offline and online pro social behaviors, such as contributing towards open-source projects (Wikipedia, Linux, Firefox etc.). The authors conclude that online prosociality associates more strongly with measures of online social capital, whereas offline social capital is found to associate similarly with both online and offline pro-social behaviors. Our study significantly extends this line of research by investigating similar phenomena in the context of comparatively formal and organized forms of philanthropy (namely volunteering and donations) in both online and offline settings as opposed to focusing on relatively informal pro-social acts such as giving up seats on the bus or helping to carry shopping.

3. Hypothesis Development and Conceptual Framework

Almost by the very nature of its existence, social capital is strongly linked with civic engagement and a number of other outcomes that benefit groups or wider society, including increased turnout among voters (Putnam *et al*., 1994), improvements in health (Rose, 2000) and reductions in crime (Walberg *et al*., 1998). Social capital has also been shown to

associate with philanthropic acts such as volunteering (Wilson, 2000) and charitable donations (Apinunmahakul & Devlin, 2008). Theoretical and empirical evidence therefore overwhelmingly suggests that social capital should associate positively with philanthropic behavior and leads to the formulation of our first formal research hypothesis, namely;

H_1: Higher stocks of social capital associate positively and significantly with levels of philanthropic activity among online volunteers.

Additionally, many existing studies into the relationships between social capital and pro-social behaviors tend to test the relationship exclusively in offline or online settings (e.g. Forbes & Zampelli, 2014; Ellison *et al*., 2014a). Evidence relating to the strength of the relationships between offline social capital and online philanthropy (and vice versa) is less clear. However, a number of studies report evidence of stronger associations between specific types of pro-social behavior and the corresponding form of social capital. For example, religious social capital has been found to associate more strongly with religious rather than secular giving (Yeung, 2004; Wang & Graddy, 2008). On this basis, it seems equally plausible that a similar pattern might be observed between online and offline social capital and philanthropy. On the basis of such evidence, we form the following set of related hypotheses;

H_2: Greater stocks of *offline* social capital associate more strongly and significantly with levels of offline than online philanthropy. More specifically:

> *H_{2a}: Offline social capital associates more strongly with offline than online donations.*
>
> *H_{2b}: Offline social capital associates more strongly with offline than online volunteering.*

H_3: Greater stocks of *online* social capital associate more strongly and significantly with levels of online than offline philanthropy. More specifically:

> *H_{3a}: Online social capital associates more strongly with online than offline donations.*
>
> *H_{3b}: Online social capital associates more strongly with online than offline volunteering.*

Finally, the complexity and apparent asymmetry of the relationships between social capital and philanthropy calls into question the extent to which this relationship can be assumed to be strictly exogenous. An endogenous relationship between dependent and explanatory variables can lead to bias in the results obtained from the analysis of social capital and philanthropy using conventional regression techniques. Endogeneity can occur for several key reasons, one of which being inaccurate measurement or omission of key variables, which is likely to be an issue in this particular case given the difficulties associated with defining and measuring social capital (Durlauf, 2002). Endogeneity can also occur due to issues of simultaneity, whereby there is circular feedback or reverse causation between dependent and explanatory variables. These issues are a particular concern given the possibility that, while philanthropic acts might be positively influenced by social capital levels, the social interactions and bonds formed while doing so might in turn lead to further social capital development (Isham, 2006). In the presence of endogeneity, appropriate analytical techniques need to be employed, such as 2SLS making use of suitable instrumental variables. Taken together, these issues lead to the formulation of our fourth and final hypothesis.

H4: The relationship between social capital and philanthropy is endogenous in both online and offline settings, which will affect the estimation of relationships between these variables if not accounted for.

We present a unified conceptual framework to underpin our analysis in Figure 1. The broad relationship between variables capturing social capital and philanthropy is tested via hypothesis H1, which links the two overarching concepts. Hypotheses H2 and H3 involve testing for the differing strengths of the respective sides of this relationship in offline and online settings; hence why the link between offline social capital and offline volunteering and donations are predicted to be stronger than those between offline social capital and online philanthropy (and vice versa). Finally, hypothesis H4 suggests that the relationships outlined above will be endogenous, at least in part due to the likelihood of reverse causality. This 'feedback' mechanism demonstrated in the conceptual framework reflects the possibility that engaging in philanthropic behavior would in turn lead to enhancements in social capital in both online and offline settings.

[Figure 1 here]

4. Data

We undertake an empirical analysis based upon an online survey and experiment conducted during the Spring/Summer of 2015 with a representative global sample of 1,910 registered contributors to the 'Zooniverse' online volunteering initiative. The Zooniverse platform is home to more than eighty online volunteering projects where contributors help to organize and interpret large datasets which cannot be efficiently analyzed using computer algorithms. The tasks undertaken by volunteers include transcription of handwritten records or the classification of wildlife species appearing in photographs. Such projects represent a new form of civic engagement which taps into the 'wisdom of crowds' (Surowiecki, 2005) by drawing on inputs from numerous volunteers to arrive at consensus-based solutions to

research problems. The outputs from these online volunteering projects have the potential for major societal impacts, from the treatment of disease to wildlife conservation and the modeling of climate change.

The survey and experiment have been designed to measure levels of offline and social capital, as well as the extent to which they related to philanthropic activities either recorded or stated to have occurred in both online and offline settings. Descriptive statistics for this sample of online volunteers can be found in Table 1. These statistics show that, on average, our respondent is white, aged around 44 years, earns a salary of just over $41,000 per annum and has lived in their local area for an average of around 20 years. Around half of our sample is female, while just over half are married and own their own homes. The average number of children per respondent is just under 1, with 53% of respondents having no children. Respondents also tend to be very well educated, typically to degree level or higher, with a significant proportion also holding postgraduate qualifications.

[Table 1 here]

Against this sociodemographic profile, we also present descriptive statistics on four distinct measures of philanthropic behavior recorded in both online and offline settings, which represent the dependent variables in our regression analysis. We use self-reported data on the typical number of hours spent annually engaged in offline volunteering, as well as the self-reported annual monetary amounts donated to offline charities. Our sample of respondents appear to be fairly active in volunteering in offline settings, with a mean of 154 hours spent volunteering per year, a median of 52 hours and around 53% reporting at least some offline voluntary activity annually. Respondents also report mean annual charitable donations of $865 against a median of $119, with around 79% of respondents donating at least some money to offline charities each year. These data on philanthropic activities are supplemented by an observed measure of online volunteering effort based on the average annual number of

recorded hours spent volunteering for online Zooniverse projects; the mean of 16 hours and median of 1 hour per year. Taken together, these data refute the predictions associated with 'slacktivism', given that our sample of online volunteers tend to be more active volunteering in offline compared with online settings.

Finally, we measure individual propensity for online charitable giving by running an online dictator game experiment, which is widely used in the field of behavioral economics as a proxy for altruism. The game asks participants to divide a fixed stock of resources (usually money) between themselves and one or more other parties. Despite the prediction that rational, self-interested participants will choose to keep the entirety of the amount for themselves, a non-trivial proportion of players routinely allocate a proportion of their endowment to other parties (Engel, 2011). In our study, a modified version of the dictator game is used as per Hoffman *et al.* (1996). Participants are told that they will be entered into a prize draw to win $100 (or local equivalent) and are asked how they would wish to divide the money between themselves and a charity of their choice if they were to be randomly selected to receive one of the prizes. Participants are told that the amounts remain entirely confidential and that the odds of winning are in no way related to the proportional amounts retained by the participant or given to charity.

Figure 2 presents histograms of each of the types of philanthropic activity considered by this study. Our measures of online and offline volunteering, as well as self-reported annual offline charitable donations, are all extremely long-tailed, with a disproportionately large amount of effort/money being contributed by a relatively small number of respondents, while a majority are observed to contribute very little or nothing. By comparison, the distribution of the observed amounts given to charity in the dictator game experiment is fractured, with approximately a third of the sample choosing to give away the entire amount (33.32%), another third electing to give nothing (36.03%) and the remainder nominating some form of

split; a majority of whom chose to divide the $100 exactly in half. The average amount given to charity by participants in our sample is $45.26.

[Figure 2 here]

In order to measure social capital at the individual-level, we employ a series of questions from the Internet Social Capital Scale developed by Williams (2006) which is designed to measure bridging and bonding social capital in both online and offline settings. Due to space and time constraints, we presented our survey respondents with a subset of six questions under each heading as opposed to the 10 originally used by Williams, based on the particular questions that were found to associate most strongly with the latent social capital measures in their original study. The distribution of responses to these questions can be seen in Figure 3. Given that there are six questions for each type of social capital with answers expressed on a seven-point Likert scale, the sum of responses under each heading ranges from a minimum of six to a maximum of 42. We also present both the mean response for each of the four categories, along with the mean of responses to each individual question in parentheses.

[Figure 3 here]

5. Method

Our primary method of analysis is OLS regression. However, due to the number and interrelatedness of the responses measuring different elements of social capital, a principal component analysis is undertaken prior to the regression estimations. The results of this approach are summarized in Table 2. Conventional statistical measures, such as Bartlett and KMO test scores, indicate that our dataset is exceptionally well suited to this form of analysis. Four principal components are identified that meet conventional thresholds for explanation of variance in the dataset, the composition of which clearly and distinctly reflect

the respondent's levels of bridging and bonding social capital in both online and offline settings. Cronbach's Alpha values for the items included in each principal component indicate uniformly high levels of internal consistency. A set of factor scores for each of the four principal components are subsequently used as independent variables in a series of OLS regressions. We use this approach in order to test hypotheses H1, H2(a;b) and H3(a;b).

[Table 2 here]

In order to address hypothesis H4, we employ a series of 2SLS regressions in order to control for the endogenous nature of the relationship between social capital and philanthropy. The 2SLS approach depends on the identification of suitable instruments for key endogenous variables that demonstrate two essential characteristics; the instrument must be sufficiently strongly related to the relevant endogenous variable, but must also be uncorrelated with the error term. The latter property essentially requires that the chosen instrument must not be related to the dependent variable other than by indirect correlation via the endogenous variable. In this instance, we propose the use of measures of 'Number of Facebook Friends' (mean = 150; std. deviation = 289) and 'Size of Family Group' (mean = 7; std. deviation = 18) as potential instruments to control for the inherently endogenous relationship between philanthropic behavior and online and offline bridging social capital respectively.

We argue that these instruments are appropriate on both theoretical and empirical grounds. The numbers of contacts, friends, family etc. are appropriate instruments for social capital given that they are likely to relate quite strongly to the size of individual networks and yet are unlikely in themselves to be related to acts of philanthropy and pro-social behavior (Fafchamps & Minten, 2002). Additionally, first stage regression results confirm the strength

of the respective instruments, with F-tests for exclusion rejected with p-values of 0.014 and 0.001 respectively. We are therefore satisfied that the chosen instrumental variables are appropriate tools by which to make causal inference in our estimation of the relationships between social capital and philanthropy.

6. Analysis

6.1. The relationship between social capital and philanthropy (Hypothesis H1)

Table 3 contains results from four OLS regressions which model the relationship between different measures of philanthropic activity (dependent variables) and social capital in both online and offline settings (key independent variables). Owing to the different units of measurement and the long tailed distribution of many key model variables highlighted above, those measured on a continuous scale are expressed in the form of natural logarithms. All of our models also include a set of control variables described previously in Table 1.

[Table 3 here]

Across specifications I-IV, there are a total of 16 coefficient estimates relating social capital to philanthropic behavior, of which 12 are positive (seven significant at the 90% confidence level or above) and four are negative (one is statistically significant). Broadly speaking, we therefore find evidence of a somewhat positive relationship between social capital and philanthropy among our sample of online volunteers. However, there appear to be stark differences in the estimated relationships between volunteering (four out of eight coefficients in specifications II and IV are positive; two of which are significant) and donation behaviors (all eight coefficient estimates in specifications I and III are positive; five of which are significant). Our evidence therefore suggests that social capital levels generally do a better

job of explaining variations in donations behaviors among our sample than volunteering. Overall, our findings offer limited support for hypothesis H_1, although the relationship appears to be somewhat asymmetric between different forms of philanthropic behavior.

6.2 Offline Philanthropy (Hypothesis H2)

Specification I in Table 3 show that all measures of social capital are shown to significantly and positively associate with the level of offline donations, with the relationship appearing to be somewhat stronger for measures of offline than online social capital. This evidence suggests that hypothesis H2a should be accepted. By contrast, Specification II shows no evidence of a significant positive association between offline volunteering and either measure of offline social capital. Instead, we find that offline volunteering associates positively and significantly with online bridging social capital. The evidence therefore suggests that H2b should be rejected and points to a pronounced asymmetry in the relationship between social capital and different types of philanthropic activity undertaken in offline and online settings.

6.3 Online Philanthropy (Hypothesis H3)

Specifications III and IV in Table 3 present similar results to the above in relation to levels of philanthropic activity undertaken in online environments. With respect to online donations, Specification III shows a significant and positive association with levels of online bridging social capital, while no evidence of significant association is found with offline social capital. This evidence suggests that H3a should be accepted. Online volunteering is shown to associate somewhat positively with online bonding social capital in Specification IV, as well as significantly and negatively with offline bridging social capital. On the basis that online social capital appears to be the only form that associates positively with online volunteering,

we tentatively accept hypothesis H3b. However, it is noteworthy that online volunteering is shown to associate negatively and significantly with offline bridging social capital, which suggests that more active online volunteers tend to have a somewhat narrower breadth of offline connections compared with those in the sample that are less active online.

6.3. Accounting for Endogeneity (Hypothesis H4)

In order to address the issue of endogeneity, we outline a further stage of analysis based on the use of 2SLS regressions, the results of which are presented in Tables 4 & 5.

[Tables 4 & 5 here]

In each case, the estimated coefficients for non-endogenous variables remain close to the levels estimated in the OLS regressions presented in Table 3. Focusing on the results in Table 4, we show that none of the estimated coefficients relating to online bridging social capital are found to be statistically significant once the individual's number of Facebook friends is used as an instrument, except in the case of offline donation activity (specification IV). The positive and significant coefficients previously observed in specifications II and III of Table 3 are therefore unlikely to be causal. A possible explanation for this finding is that causality runs in the opposite direction to that which is predicted by the model, such that increased levels of offline volunteering leads individuals to extending the breadth of their online networks.

By contrast, the results presented in Table 5 infer a significant but smaller causal relationship between offline bridging social capital and online philanthropy. The coefficient estimates in Specification III show that higher levels of offline social capital have a positive causal

influence upon levels of online donations. Specification IV implies a negative and statistically significant causal relationship between offline bridging social capital and observed levels of online volunteering, which suggests that heavier contributors to these platforms are driven in part by lower stocks of offline social capital. An interpretation of this finding is that individuals with smaller networks of offline association may look to online environments to undertake philanthropic actions, possibly due to limited opportunities to do so in offline settings.

Altogether, while the use of instrumental variables and 2SLS regression has reduced the number of significant relationships observed between social capital and philanthropy relative to the OLS estimates, we are able to infer causal associations between a number of these variables in both online and offline settings. We therefore suggest that the link between social capital and philanthropic behavior in online and offline settings does appear to be endogenous and that in many cases the estimated relationships significantly change once this endogeneity is accounted for. This leads us to accept research hypothesis H4.

7. Discussion

The generally positive relationship we observe between individual stocks of social capital and philanthropic behavior is consistent with theory and empirical evidence suggesting that individuals with multiple associational ties are more likely to volunteer (Bowman, 2004; Jones, 2006). However, the finding that bridging as opposed to bonding social capital offers a better explanation for variations in philanthropic activity is somewhat at odds with mainstream thinking concerning the theory of homophily. Online interactions might encourage homophily by bringing together people with similar interests (Mandelli, 2002), meaning that prosocial behaviors such as volunteering should associate more closely with

bonding than bridging social capital. The findings from our study essentially arrive at the opposite conclusion, given that we find a generally stronger association between bridging social capital and philanthropy in both offline and online contexts.

Despite the apparent contradiction, our results are not entirely out of line with the results of other recent studies on this topic. For example, Lewis *et al*. (2012) also find little evidence to support the diffusion of tastes between online connections, while online social circles have been shown to involve exposure to more heterogeneous content than offline networks (Hristova *et al*., 2014). In addition, research into online word of mouth communication has shown that the conventional understanding of homophily is not particularly relevant in online contexts (Brown *et al*., 2007). More specifically, Paik & Navarre-Jackson (2011) find no significant difference in volunteering between individuals with low and high levels of social tie diversity. Our findings, alongside those of the aforementioned authors, suggest that the relationship between social capital and prosocial behavior might not be as homophilic as anticipated, particularly when undertaken in an online context.

One of our more surprising results relates to the relationship between social capital and volunteering, which implies that causality does not run the direction predicted by our conceptual framework. One interpretation of this finding is that causality may in fact operate in the opposite direction, such that stocks of online bridging social capital are more likely to grow as a consequence of offline philanthropic behaviors. This interpretation seems consistent with evidence from the literature suggesting that online interactions and behaviors are more strongly linked with 'weak ties' compared with the deeper associations required for bonding social capital (Ellison *et al*., 2014b). Taken together, our finding appears to support the wider literature in concluding that individuals are more likely to seek out and form online relationships as a result of their offline volunteering experiences.

Our results also suggest that individuals with fewer offline ties are more likely to engage in philanthropic activity in online settings, which is a relationship that is relatively underexplored elsewhere in the literature. Our findings are consistent with those of a study by Choi & Kwon (2018), who show that online interactions help individuals, particularly those who feel alienated, to engage in civic participation using informal and everyday channels as opposed to traditional, formal channels of engagement. Conversely, Bosancianu *et al*. (2013) find evidence of a positive association between offline bridging social capital and online pro social behavior, whereas we essentially draw the opposite conclusion. The discrepancy might be due to our measurement of more formal behaviors, such as volunteering and donations, compared with less formal measures such as forwarding e-mails or answering questions online forums measured by Bosancianu and colleagues.

Although our survey respondents also tend to be fairly active in offline settings, our study is limited to an extent given that we use a sample consisting exclusively of data gathered from online volunteers. Future studies may be able to extend the work presented in this paper through the analysis of a sample drawn from a wider population, where differing interrelationships between social capital and philanthropy may be observed. Second, although we are one of very few studies to formally account for the presence of endogeneity in the relationship between social capital and philanthropic behavior, we are limited by only having access to one suitable instrument each for online and offline bridging capital. Subsequent studies would therefore benefit from the identification of additional instrumental variables beyond those that we have used in this research; particularly in relation to bonding social capital.

8. Conclusion

Against a backdrop of changing patterns of social interaction and relationship formation resulting from the growth of online social networking platforms, this study contributes to the literature on social capital by investigating its relationship with philanthropic activity among a sample of online volunteers. Using data from a unique survey and experiment undertaken with 1,910 individual contributors to projects hosted on the Zooniverse platform, we construct factor scores reflecting the strength of individual-level bridging and bonding social capital. We use these measures to model variations in a mix of self-reported and directly observed philanthropic behavior in both online and offline settings.

Our OLS regressions results show that individual stocks of social capital generally relate positively and significantly to philanthropic behaviors. We show that bridging social capital tends to offer a better explanation for variations in philanthropic activity than bonding social capital, which indicates that philanthropic behaviors tend to associate more with the breadth of social ties rather than the depth. When comparing offline and online settings, we show that offline donations relate most strongly to levels of offline social capital, while online donations are more strongly influenced by levels of online social capital.

Our results further demonstrate a degree of asymmetry in the relationship between social capital and volunteering. More specifically, we find that online volunteering associates significantly and negatively with offline social capital levels, while offline volunteering associates significantly and positively with levels of online social capital. This result suggests that individuals who engage more intensively in this form of online volunteering tend to have lower levels of offline bridging social capital. Conversely, more actively engaged offline volunteers are observed to possess greater stocks of online bridging social capital.

Our study also investigates the extent to which these relationships are causal through the use of a 2SLS regression framework where number of Facebook friends and the size of family group are used as instruments for online and offline bridging social capital respectively. While offline social capital behaves largely as expected when explaining variations in offline philanthropic activity, we find evidence of the opposite association with online philanthropy. This implies that individuals with limited offline networks may turn to online volunteering activities in the absence of opportunities to do so in offline settings, while offline volunteering may afford opportunities to expand the breadth of online social networks. Altogether, the findings from our study point to profound changes in the nature, formation and maintenance of social capital in the internet era has impacted upon the way in which individuals engage in philanthropic behaviors.

References

Ahmad, S., Mustafa, M., & Ullah, A. (2016). Association of demographics, motives and intensity of using Social Networking Sites with the formation of bonding and bridging social capital in Pakistan. *Computers in Human Behavior*, 57, 107-114.

Apinunmahakul, A., & Devlin, R. A. (2008). Social networks and private philanthropy. *Journal of Public Economics*, 92(1), 309-328.

Bouchillon, B. C., & Gotlieb, M. R. (2017). Making them count: Facebook sociability for optimizing the accumulation of social capital. *Social Science Computer Review*, 35(3), 299-318.

Bourdieu, P. (1985). The social space and the genesis of groups. *Theory and Society*, 14(6), 723-744.

Bosancianu, C. M., Powell, S., & Bratović, E. (2013). Social Capital and Pro-Social Behavior Online and Offline. *International Journal of Internet Science*, 8(1), 49-68.

Bowman, W. (2004). Confidence in charitable institutions and volunteering. *Nonprofit and Voluntary Sector Quarterly*, 33(2), 247-270.

Brown, J., Broderick, A.J. & Lee, N. (2007). Word of mouth communication within online communities: Conceptualizing the online social network. *Journal of Interactive Marketing*, 21(3), 2-20.

Brown, E., & Ferris, J. M. (2007). Social capital and philanthropy: An analysis of the impact of social capital on individual giving and volunteering. *Nonprofit and Voluntary Sector Quarterly*, 36(1), 85-99.

Choi, Y. T., & Kwon, G. H. (2018). New forms of citizen participation using SNS: an empirical approach. *Quality & Quantity*, 1-17.

Coffé, H., & Geys, B. (2007). Toward an empirical characterization of bridging and bonding social capital. *Nonprofit and Voluntary Sector Quarterly*, 36(1), 121-139.

De Zúñiga, H. G., Barnidge, M., & Scherman, A. (2017). Social media social capital, offline social capital, and citizenship: Exploring asymmetrical social capital effects. *Political Communication*, 34(1), 44-68.

Durlauf, S. N. (2002). On The Empirics of Social Capital. *The Economic Journal*, 112(483), 459-479.

Dury, S., De Donder, L., De Witte, N., Buffel, T., Jacquet, W., & Verté, D. (2014). To Volunteer or Not: The Influence of Individual Characteristics, Resources, and Social Factors on the Likelihood of Volunteering by Older Adults. *Nonprofit and Voluntary Sector Quarterly*, 0899764014556773.

Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The benefits of Facebook "friends:" Social capital and college students' use of online social network sites. *Journal of Computer-Mediated Communication*, 12(4), 1143-1168.

Ellison, N.B., Gray, R., Lampe, C., & Fiore, A.T. (2014a). Social capital and resource requests on Facebook. *New Media & Society*, 16(7), 1104-1121.

Ellison, N.B., Vitak, J., Gray, R., & Lampe, C. (2014b). Cultivating social resources on social network sites: Facebook relationship maintenance behaviors and their role in social capital processes. *Journal of Computer-Mediated Communication*, 19(4), 855-870.

Emrich, E., & Pierdzioch, C. (2016a). The Internet and the Commitment of Volunteers: Empirical Evidence for the Red Cross. *Nonprofit and Voluntary Sector Quarterly*, 45(5), 1013-1030.

Emrich, E., & Pierdzioch, C. (2016b). Volunteering, match quality, and internet use. *Schmollers Jahrbuch*, 136(2), 199-226.

Engel, C. (2011). Dictator games: A meta study. *Experimental Economics*, 14(4), 583-610.

Fafchamps, M., & Minten, B. (2002). Returns to social network capital among traders. *Oxford Economic Papers*, 54(2), 173-206.

Forbes, K.F. & Zampelli, E.M. (2014). Volunteerism: The influences of social, religious, and human capital. *Nonprofit and Voluntary Sector Quarterly*, 43(2), 227-253.

Glanville, J. L., Paxton, P., & Wang, Y. (2016). Social capital and generosity: A multilevel analysis. *Nonprofit and Voluntary Sector Quarterly*, 45(3), 526-547.

Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology*, 78, 1360–1380.

Guo, C., & Saxton, G. D. (2018). Speaking and being heard: How nonprofit advocacy organizations gain attention on social media. *Nonprofit and Voluntary Sector Quarterly*, 47(1), 5-26.

Herzog, P. S., & Yang, S. (2018). Social Networks and Charitable Giving: Trusting, Doing, Asking, and Alter Primacy. *Nonprofit and Voluntary Sector Quarterly*, 47(2), 376-394.

Hoffman, E., McCabe, K., & Smith, V. L. (1996). Social distance and other-regarding behavior in dictator games. *The American Economic Review*, 86(3), 653-660.

Hossain, B., & Lamb, L. (2017). Associational Capital and Adult Charitable Giving: A Canadian Examination. *Nonprofit and Voluntary Sector Quarterly*, 46(5), 963-983.

Hristova, D., Musolesi, M. & Mascolo, C. (2014). Keep your friends close and your Facebook friends closer: A multiplex network approach to the analysis of offline and online social ties. In: *Weblogs and Social Media* (June 2014).

Huang, L. V., & Liu, P. L. (2017). Ties that work: Investigating the relationships among coworker connections, work-related Facebook utility, online social capital, and employee outcomes. *Computers in Human Behavior*, 72, 512-524.

Hustinx, L. & Lammertyn, F. (2003). Collective and reflexive styles of volunteering: A sociological modernization perspective. *VOLUNTAS*, 14(2), 167–187.

Ihm, J. (2017). Classifying and Relating Different Types of Online and Offline Volunteering. *VOLUNTAS*, 28(1), 400-419.

Isham, J., Kolodinsky, J. & Kimberly, G. (2006). The effects of volunteering for nonprofit organizations on social capital formation: Evidence from a statewide survey. *Nonprofit and Voluntary Sector Quarterly*, 35(3), 367-383.

Jones, K. S. (2006). Giving and volunteering as distinct forms of civic engagement: The role of community integration and personal resources in formal helping. *Nonprofit and Voluntary Sector Quarterly*, 35(2), 249-266.

Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukophadhyay, T. & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being? *American Psychologist*, 53(9), 1017.

Layton, M. D., & Moreno, A. (2014). Philanthropy and social capital in Mexico. *International Journal of Nonprofit and Voluntary Sector Marketing*, 19(3), 209-219.

Lewis, K., Gonzalez, M. & Kaufman, J. (2012). Social selection and peer influence in an online social network. *Proceedings of the National Academy of Sciences*, 109(1), 68-72.

Mandelli, A. (2002). Bounded sociability, relationship costs and intangible resources in complex digital networks. *IT & Society*, 1(1), 251-274.

Mayer, A. & Puller, S.L. (2008). The old boy (and girl) network: Social network formation on university campuses. *Journal of Public Economics*, 92, 329–347.

Mouw, T. (2006). Estimating the causal effect of social capital: A review of recent research. *Annual Review of Sociology*, 32, 79-102.

Noland, A. (2017). Social media activists: Analyzing the relationship between online activism and offline attitudes and behaviors. *The Journal of Social Media in Society*, 6(2), 26-55.

Paik, A., & Navarre-Jackson, L. (2011). Social networks, recruitment, and volunteering: Are social capital effects conditional on recruitment? *Nonprofit and Voluntary Sector Quarterly*. 40(3), 476-496.

Patulny, R.V. & Svendsen, G.L.H. (2007). Exploring the social capital grid: bonding, bridging, qualitative, quantitative. *International Journal of Sociology and Social Policy*, 27(1/2), 32-51.

Pénard, T., & Poussing, N. (2010). Internet use and social capital: The strength of virtual ties. *Journal of Economic Issues*, 44(3), 569-595.

Perry, R., Drachen, A., Kearney, A., Kriglstein, S., Nacke, L. E., Sifa, R., Wallner, G. & Johnson, D. (2018). Online-only friends, real-life friends or strangers? Differential associations with passion and social capital in video game play. *Computers in Human Behavior*, 79, 202-210.

Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual Review of Sociology*, 24(1), 1-24.

Putnam, R.D. (1993). The prosperous community. *The American Prospect*, 4(13), 35-42.

Putnam, R.D. (1995). Bowling alone: America's declining social capital. *Journal of Democracy*, 6, 68.

Putnam, R.D., Leonardi, R. & Nanetti, R.Y. (1994). *Making democracy work: Civic traditions in modern Italy*. Princeton University Press.

Rose, R. (2000). How much does social capital add to individual health? *Social Science & Medicine*, 51(9), 1421-1435.

Saxton, G.D., & Guo, C. (2014). Online stakeholder targeting and the acquisition of social media capital. *International Journal of Nonprofit and Voluntary Sector Marketing*, 19, 286-300.

Sessions, L.F. (2010). How offline gatherings affect online communities: When virtual community members 'meetup'. *Information, Communication & Society*, 13(3), 375-395.

Skoric, M. M., Zhu, Q., Goh, D., & Pang, N. (2016). Social media and citizen engagement: A meta-analytic review. *New Media & Society*, 18(9), 1817-1839.

Son, J. E., Lee, S. H., Cho, E. Y., & Kim, H. W. (2016). Examining online citizenship behaviours in social network sites: a social capital perspective. *Behaviour & Information Technology*, 35(9), 730-747.

Surowiecki, J. (2005). *The wisdom of crowds*. Anchor.

Taniguchi, H., & Marshall, G. A. (2014). The effects of social trust and institutional trust on formal volunteering and charitable giving in Japan. *Voluntas: International Journal of Voluntary and Nonprofit Organizations*, 25(1), 150-175.

Walberg, P., McKee, M., Shkolnikov, V., Chenet, L., & Leon, D.A. (1998). Economic change, crime, and mortality crisis in Russia: regional analysis. *British Medical Journal*, 317(7154), 312-318.

Wang, L., & Graddy, E. (2008). Social capital, volunteering, and charitable giving. *Voluntas: International Journal of Voluntary and Nonprofit Organizations*, 19(1), 23-42.

Warren, A. M., Sulaiman, A., & Jaafar, N. I. (2015). Understanding civic engagement behaviour on Facebook from a social capital theory perspective. *Behaviour & Information Technology*, 34(2), 163-175.

Williams, D. (2006). On and off the 'Net: Scales for social capital in an online era. *Journal of Computer-Mediated Communication,* 11(2), 593-628.

Williams, D. (2007). The impact of time online: Social capital and cyberbalkanization, *CyberPsychology & Behavior*, 10(3), 398–406.

Wilson, J. (2000). Volunteering. *Annual Review of Sociology*, 26(1), 215-240.

Woolcock, M., & Narayan, D. (2000). Social capital: Implications for development theory, research, and policy. *The World Bank Research Observer*, 15(2), 225-249.

Yeung, A. B. (2004). An intricate triangle—religiosity, volunteering, and social capital: The European perspective, the case of Finland. *Nonprofit and Voluntary Sector Quarterly*, 33(3), 401-422.

Zhang, X., Liu, S., Chen, X., & Gong, Y. (2017). Social capital, motivations, and knowledge sharing intention in health Q&A communities. *Management Decision*, 55(7), 1536-1557.

Tables and Figures

Table 1: Descriptive Statistics

Variable	Description	Mean	Std Dev	Median	Min	Max
Measures of Volunteer and Donations Activity						
Online Volunteering	Average number of hours (recorded) spent participating in Zooniverse online volunteering projects per year.	16.40	162.19	1.36	0	2,080
Offline Volunteering	Total number of (self-reported) hours spent volunteering during the past year	153.77	271.37	52	0	2,080
Online Donations (Dictator Game)	Proportion of $100 endowment given away (to charity) in online dictator game experiment.	45.42	42.48	50	0	100
Offline Donations	Sum of respondent's annual offline charitable donations in 2015 USD.	864.74	2922.76	118.5	0	50,000
Controls						
Gender (Male)	Dummy variable if respondent indicated their gender to be female.	0.56	-	-	0	1
Age	Respondent's self-reported age in years.	43.87	15.96	44	18	85
Ethnicity (Non-White)	Dummy variable if respondent indicated their ethnicity to be non-white.	0.13	-	-	0	1
Relationship Status (Married)	Dummy variable if respondent indicates that they are married or involved in a relationship.	0.50	-	-	0	1
Income	Respondent's self-reported income in 2015 USD	41,075	62,223	28,455	0	1,200,000
Education Level	Highest educational attainment achieved by the respondent (ISCED Category).	6.59	1.69	7	1	9
Parental Education	Highest educational attainment achieved by either of the respondent's parents (ISCED Category).	5.70	2.10	6	1	9
Homeowner	Dummy variable indicating whether respondent owns their own home.	0.55	-	-	0	1
Paid Work	Number of hours of paid work undertaken by the respondent in a typical week	23.905	20.569	30	0	95
Years in Area	Length of time (in years) respondent has been living in local area.	19.79	15.04	17.5	0	75
Religious Importance	The extent to which religion is important to the respondent's life.	2.82	2.13	2	0	7
Number of children (aged under 12)	Respondent's number of children aged under 12 years.	0.24	0.63	0	0	6
Number of children (aged under 18)	Respondent's number of children aged under 18 years.	0.13	0.42	0	0	4
Number of children (aged 18+)	Respondent's number of children aged over 18 years.	0.60	1.09	0	0	8

Table 2: Principal Component Analysis

Variable	Factor Loading	Mean	Std Dev	Median	Min	Max
Factor 1: Online Bridging Social Capital (Cronbach Alpha = 0.932; Eigenvalue = 7.769; 32.37% of Variance Explained)						
Interacting with people online makes me interested in things that happen outside of my town.	0.86	5.30	1.44	6	1	7
Interacting with people online makes me want to try new things.	0.85	5.22	1.38	5	1	7
Talking with people online makes me curious about other places in the world.	0.86	5.42	1.41	6	1	7
Interacting with people online makes me feel like part of a larger community.	0.83	5.08	1.49	5	1	7
Interacting with people online makes me feel connected to the bigger picture.	0.81	4.98	1.52	5	1	7
Interacting with people online gives me new people to talk to.	0.77	4.93	1.54	5	1	7
Factor 2: Online Bonding Social Capital (Cronbach Alpha = 0.924; Eigenvalue = 4.833; 20.14% of Variance Explained)						
There are several people online I trust to help solve my problems.	0.82	3.42	1.78	3	1	7
There is someone online I can turn to for advice about making very important decisions.	0.85	3.28	1.83	3	1	7
If I needed an emergency loan of $500, I know someone online I could turn to.	0.86	2.56	1.66	2	1	7
The people I interact with online would put their reputation on the line for me.	0.88	2.94	1.66	2	1	7
The people I interact with online would share their last penny with me.	0.88	2.50	1.52	2	1	7
When I feel lonely, there are several people online I can talk to.	0.71	3.86	1.94	4	1	7
Factor 3: Offline Bridging Social Capital (Cronbach Alpha = 0.923; Eigenvalue = 2.663; 11.10% of Variance Explained)						
Interacting with people offline makes me interested in things that happen outside of my town.	0.79	5.26	1.33	6	1	7
Interacting with people offline makes me want to try new things.	0.80	5.44	1.19	6	1	7
Talking with people offline makes me curious about other places in the world.	0.81	5.55	1.25	6	1	7
Interacting with people offline makes me feel like part of a larger community.	0.82	5.27	1.38	6	1	7
Interacting with people offline makes me feel connected to the bigger picture.	0.84	5.09	1.40	5	1	7
Interacting with people offline gives me new people to talk to.	0.80	5.24	1.33	5	1	7
Factor 4: Offline Bonding Social Capital (Cronbach Alpha = 0.878; Eigenvalue = 1.882; 7.84% of Variance Explained)						
There are several people offline I trust to help solve my problems.	0.75	5.39	1.46	6	1	7
There is someone offline I can turn to for advice about making very important decisions.	0.78	5.79	1.33	6	1	7
If I needed an emergency loan of $500, I know someone offline I could turn to.	0.75	5.71	1.51	6	1	7
The people I interact with offline would put their reputation on the line for me.	0.79	5.37	1.35	6	1	7
The people I interact with offline would share their last penny with me.	0.74	4.94	1.56	5	1	7
When I feel lonely, there are several people offline I can talk to.	0.74	5.59	1.45	6	1	7
Kaiser-Meyer-Olkin measure of sampling adequacy = 0.900 Bartlett's test of sphericity = 36,217***						

Table 3: OLS Regression Results

	PHILANTHROPIC ACTIVITY											
	I			II			III			IV		
	Ln(Offline Donations)			Ln(Offline Volunteering)			Ln(Online Donations)			Ln(Online Volunteering)		
Online Bridging Social Capital (Factor Score)	0.122	(0.052)	**	0.124	(0.062)	**	0.102	(0.047)	**	-0.015	(0.028)	
Online Bonding Social Capital (Factor Score)	0.091	(0.052)	*	-0.060	(0.063)		0.063	(0.048)		0.051	(0.030)	*
Offline Bridging Social Capital (Factor Score)	0.275	(0.053)	***	0.027	(0.063)		0.064	(0.046)		-0.067	(0.029)	**
Offline Bonding Social Capital (Factor Score)	0.270	(0.055)	***	-0.064	(0.066)		0.057	(0.049)		0.027	(0.029)	
Gender (Male)	-0.393	(0.107)	***	0.121	(0.132)		-0.237	(0.097)	**	0.099	(0.062)	
Age	0.031	(0.005)	***	-0.003	(0.006)		-0.006	(0.005)		0.006	(0.003)	**
Ethnicity (Non-White)	-0.110	(0.165)		-0.110	(0.193)		-0.100	(0.141)		-0.128	(0.088)	
Relationship Status (Married)	0.500	(0.130)	***	-0.171	(0.156)		0.157	(0.119)		-0.053	(0.071)	
Income	0.194	(0.016)	***	-0.007	(0.016)		0.030	(0.012)	**	-0.006	(0.008)	
Education Level	0.156	(0.036)	***	-0.006	(0.042)		0.047	(0.032)		-0.004	(0.019)	
Parental Education	0.006	(0.027)		0.069	(0.034)	**	-0.023	(0.025)		0.010	(0.015)	
Homeowner	0.489	(0.140)	***	0.147	(0.167)		0.417	(0.125)	***	0.023	(0.075)	
Ln (Paid Work)	0.033	(0.030)		-0.075	(0.037)	**	-0.051	(0.027)	*	-0.003	(0.016)	
Ln (Years in Area)	0.023	(0.063)		0.048	(0.075)		0.106	(0.056)	*	0.010	(0.035)	
Religious Importance	0.111	(0.026)	***	0.072	(0.030)	**	-0.010	(0.023)		-0.029	(0.013)	**
Number of Children Age <12	0.026	(0.091)		0.015	(0.106)		-0.278	(0.086)	***	0.029	(0.046)	
Number of Children Age <18	0.256	(0.119)	**	0.054	(0.152)		0.015	(0.115)		0.053	(0.063)	
Number of Children Age 18+	-0.073	(0.062)		0.080	(0.072)		-0.063	(0.056)		0.002	(0.035)	
Constant Term	-0.891	(0.394)	**	2.401	(0.454)	***	2.631	(0.333)		1.348	(0.213)	***
F-Value	43.80		***	1.260			3.570		***	3.820		***
R-Squared	0.337			0.017			0.044			0.058		

Standard errors in parentheses. Significance level: * = 90%; ** = 95%; *** = 99%.

Additional controls included for respondent country (USA, UK, Canada, Australia, France, Germany, Netherlands, Poland and International). In specification I, additional variables are included to control for variations in the specific online volunteering project towards which the respondent has contributed.

Table 4: 2SLS Regression Results (Online Bridging – Instrument = Facebook Friends)

	PHILANTHROPIC ACTIVITY											
	I			II			III			IV		
	Ln(Offline Donations)			Ln(Offline Volunteering)			Ln(Online Donations)			Ln(Online Volunteering)		
Online Bridging Social Capital (Factor Score)	**1.331**	**(0.710)**	**	**-0.050**	**(0.799)**		**-0.730**	**(0.587)**		**-0.078**	**(0.338)**	
Online Bonding Social Capital (Factor Score)	0.093	(0.058)		-0.060	(0.063)		0.063	(0.050)		0.051	(0.030)	*
Offline Bridging Social Capital (Factor Score)	0.260	(0.063)	***	0.029	(0.063		0.074	(0.054)		-0.066	(0.029)	**
Offline Bonding Social Capital (Factor Score)	0.322	(0.069)	***	-0.072	(0.074)		0.021	(0.060)		0.024	(0.032)	
Gender (Male)	-0.348	(0.126)	***	0.114	(0.135)		-0.268	(0.107)	**	0.096	(0.063)	
Age	0.044	(0.010)	***	-0.005	(0.010)		-0.015	(0.008)	**	0.005	(0.005)	
Ethnicity (Non-White)	-0.104	(0.182)		-0.110	(0.192)		-0.104	(0.152)		-0.129	(0.087)	
Relationship Status (Married)	0.513	(0.145)	***	-0.173	(0.155)		0.148	(0.127)		-0.054	(0.071)	
Income	0.184	(0.019)	***	-0.005	(0.017)		0.037	(0.014)	***	-0.006	(0.008)	
Education Level	0.152	(0.041)	***	-0.006	(0.042)		0.050	(0.034)		-0.004	(0.019)	
Parental Education	-0.013	(0.033)		0.072	(0.036)	**	-0.011	(0.028)		0.010	(0.016)	
Homeowner	0.532	(0.157)	***	0.141	(0.168)		0.387	(0.138)	***	0.021	(0.075)	
Ln (Paid Work)	0.028	(0.034)		-0.075	(0.037)		-0.048	(0.029)	*	-0.002	(0.016)	
Ln (Years in Area)	-0.022	(0.074)		0.054	(0.080)		0.138	(0.065)	**	0.012	(0.037)	
Religious Importance	0.108	(0.029)	***	0.072	(0.030)	**	-0.008	(0.024)		-0.029	(0.013)	**
Number of Children Age <12	0.094	(0.118)		0.005	(0.114)		-0.325	(0.094)		0.026	(0.051)	
Number of Children Age <18	0.271	(0.134)	**	0.052	(0.152)		0.005	(0.125)		0.052	(0.063)	
Number of Children Age 18+	-0.071	(0.070)		0.080	(0.071)		-0.065	(0.058)		0.002	(0.035)	
Constant Term	-1.177	(0.483)		2.442	(0.488)	***	2.827	(0.381)	***	1.357	(0.223)	
Wald Chi2	836.19		***	29.09			74.73		***	116.18		***

Standard errors in parentheses. Significance level: * = 90%; ** = 95%; *** = 99%.

Additional controls included for respondent country (USA, UK, Canada, Australia, France, Germany, Netherlands, Poland and International). In specification I, additional variables are included to control for variations in the specific online volunteering project towards which the respondent has contributed.

Table 5: 2SLS Regression Results (Offline Bridging – Instrument = Size of Family Group)

	PHILANTHROPIC ACTIVITY											
	I			II			III			IV		
	Ln(Offline Donations)			Ln(Offline Volunteering)			Ln(Online Donations)			Ln(Online Volnteering)		
Online Bridging Social Capital (Factor Score)	0.113	(0.057)	**	0.118	(0.063)	*	0.084	(0.066)		-0.011	(0.030)	
Online Bonding Social Capital (Factor Score)	0.091	(0.055)	*	-0.061	(0.064)		0.062	(0.059)		0.052	(0.031)	*
Offline Bridging Social Capital (Factor Score)	**1.027**	**(0.706)**		**0.551**	**(0.414)**		**1.598**	**(0.672)**	***	**-0.428**	**(0.236)**	*
Offline Bonding Social Capital (Factor Score)	0.292	(0.061)	***	-0.049	(0.067)		0.101	(0.068)		0.015	(0.032)	
Gender (Male)	-0.293	(0.145)	**	0.190	(0.142)		-0.033	(0.148)		0.058	(0.069)	
Age	0.030	(0.006)	***	-0.004	(0.006)		-0.008	(0.006)		0.006	(0.003)	**
Ethnicity (Non-White)	-0.187	(0.190)		-0.163	(0.199)		-0.256	(0.200)		-0.095	(0.094)	
Relationship Status (Married)	0.453	(0.141)	***	-0.204	(0.158)		0.062	(0.146)		-0.031	(0.073)	
Income	0.190	(0.017)	***	-0.010	(0.016)		0.022	(0.016)		-0.004	(0.008)	
Education Level	0.088	(0.073)		-0.054	(0.053)		-0.091	(0.070)		0.028	(0.027)	
Parental Education	0.001	(0.029)		0.066	(0.035)	*	-0.032	(0.031)		0.012	(0.015)	
Homeowner	0.353	(0.191)	**	0.052	(0.178)		0.140	(0.192)		0.089	(0.086)	
Ln (Paid Work)	0.035	(0.031)		-0.074	(0.037)	**	-0.047	(0.033)		-0.003	(0.017)	
Ln (Years in Area)	0.078	(0.082)		0.086	(0.083)		0.219	(0.085)	**	-0.016	(0.040)	
Religious Importance	0.095	(0.031)	***	0.061	(0.032)	*	-0.043	(0.032)	***	-0.022	(0.015)	
Number of Children Age <12	0.025	(0.092)		0.015	(0.106)		-0.279	(0.095)		0.030	(0.046)	
Number of Children Age <18	0.253	(0.124)	**	0.051	(0.151)		0.009	(0.141)		0.054	(0.066)	
Number of Children Age 18+	-0.075	(0.065)		0.079	(0.071)		-0.066	(0.064)		0.004	(0.035)	
Constant Term	-0.352	(0.655)		2.777	(0.555)	***	3.731	(0.643)	***	1.074	(0.284)	***
Wald Chi2	945.15		***	38.80		*	62.42		***	108.13		***

Standard errors in parentheses. Significance level: * = 90%; ** = 95%; *** = 99%.

Additional controls included for respondent country (USA, UK, Canada, Australia, France, Germany, Netherlands, Poland and International). In specification I, additional variables are included to control for variations in the specific online volunteering project towards which the respondent has contributed.

Figure 1: Conceptual Framework

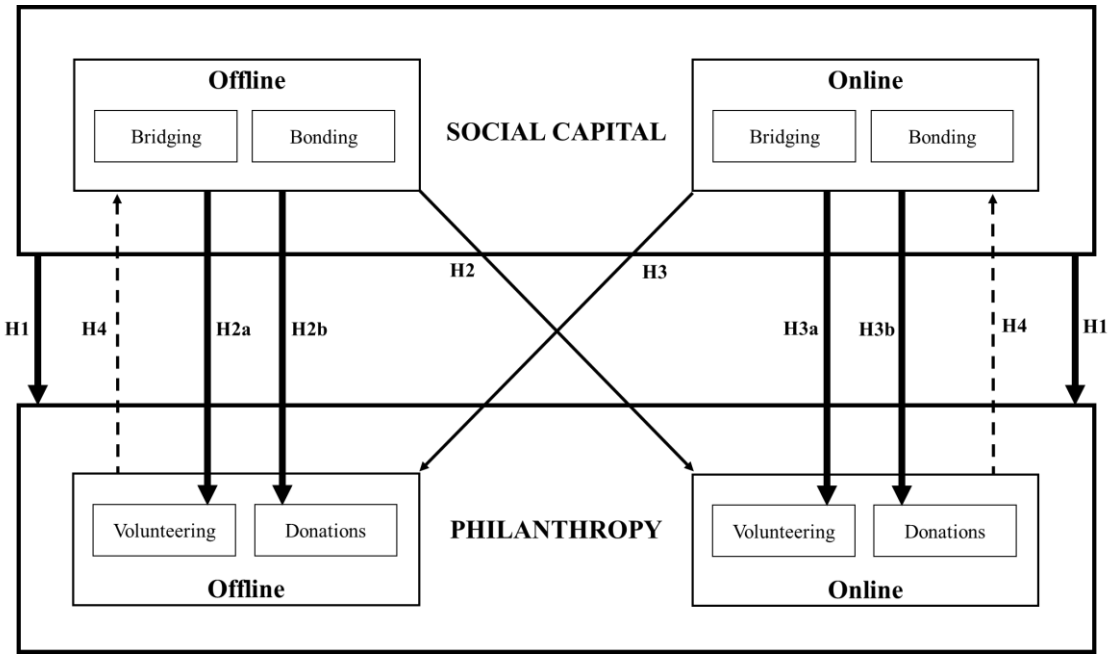
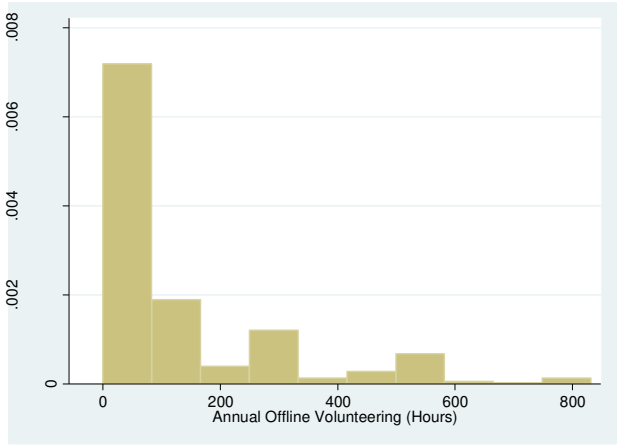
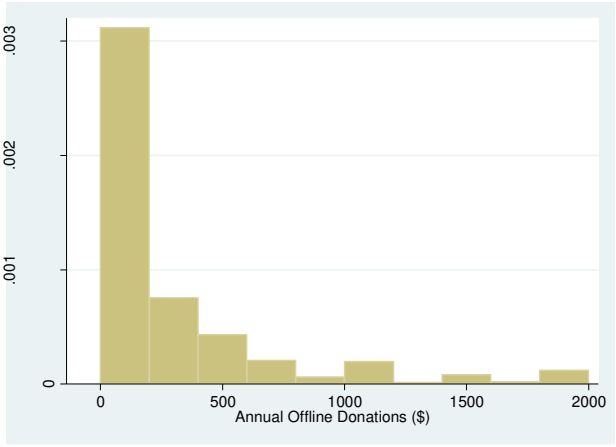


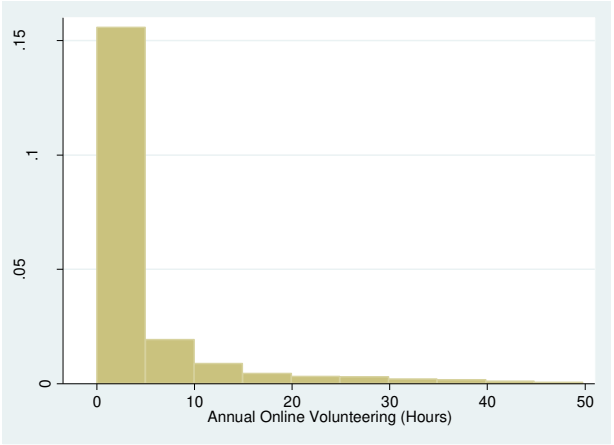
Figure 2: Sample Distributions of Offline and Online Philanthropic Behaviour



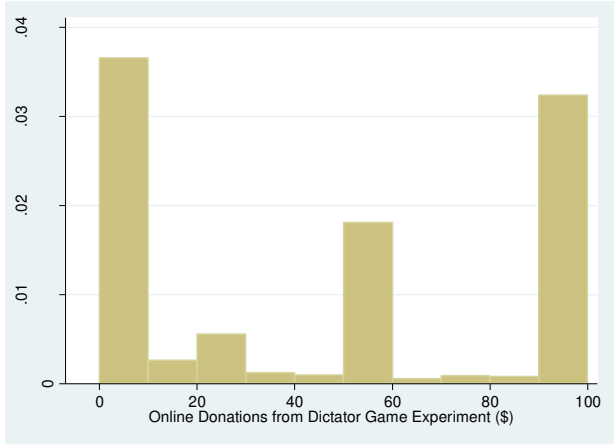
Annual Offline Volunteering (Hours)



Annual Offline Donations ($)

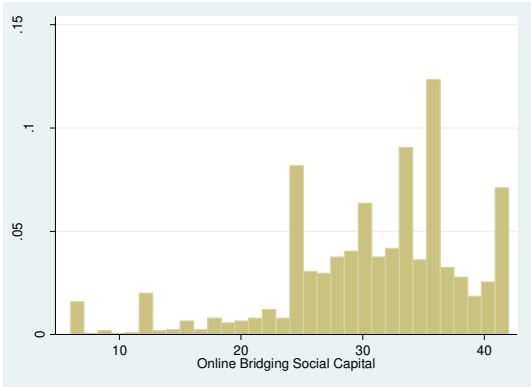


Online Volunteering (Hours)

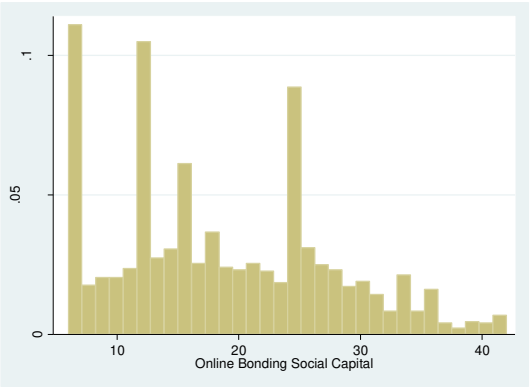


Online Donations from Dictator Game Experiment ($)

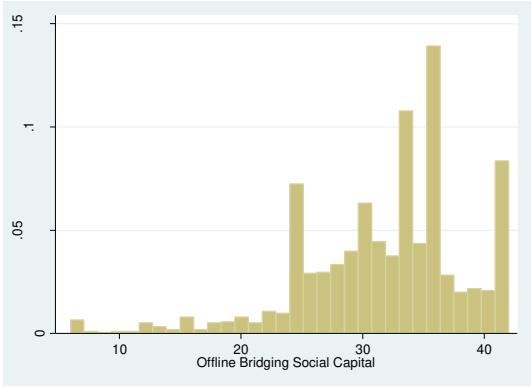
Figure 3: Histograms of Raw Social Capital Measures (Likert Scale)



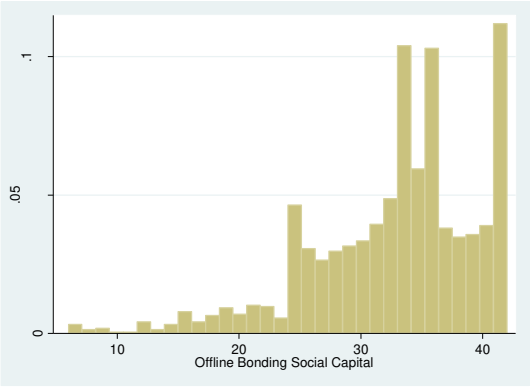
Online Bridging Social Capital
Mean: 30.93 (5.16)



Online Bonding Social Capital
Mean: 18.55 (3.09)



Offline Bridging Social Capital
Mean: 31.84 (5.31)



Offline Bonding Social Capital
Mean: 32.80 (5.47)