

THE IMPACT OF THE INTERNET ON SOCIAL CAPITAL:
BROADBAND ACCESS AND INFLUENCES ON VOTING TURNOUT

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Abstract

The existing scholarship into the study of social capital in the United States and elsewhere has sought to apply standards and methods to measure civic participation in diverse groups of people. Critics of Robert Putnam's 1995 article *Bowling Alone* and the scholarly debate since has focused on the criteria used to calculate social capital as well as the methods used to measure trends in social capital over time. This study seeks to answer Putnam's critics by including variables related to race and economic status, as well as incorporating measures of virtual connectivity through access to reliable, high-speed broadband internet as a newer source of social capital.

This analysis quantifies social capital levels by comparing voter turnout in primary and general elections using detailed voter registration data to economic statistics, demographics, and broadband internet access for all 67 counties in the Commonwealth of Pennsylvania. The results of this analysis identified access to broadband internet as having a positive effect on voter turnout resulting in higher social capital. Additionally, variables representing socioeconomic factors and the public profile of each election were shown to impact voter turnout, illustrating the complexities of measuring social capital. These findings show that metrics tracking the adoption of new technologies as well as traditional measures of economic health and political participation are key to understanding the evolution of social capital in the modern age.

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1. Introduction

It is increasingly clear that the United States is undergoing one of the largest periods of political polarization in its history. Deep divisions separate sections of American society along race, gender, class, and partisan fault lines creating a siege mentality of, “us versus them” in political rhetoric and limiting the public discourse to the point where Americans cannot even agree on the most pressing issues facing the nation, let alone solutions to those problems.^{1 2} Concurrently, faith in American institutions is also declining indicating that Americans trust their fellow citizens and their government less than they have in the last sixty years.³ What is causing this decline? What are the consequences of the deep mistrust growing in American society? Existing research suggests that as these types of societal fissures grow, the effectiveness of governments declines.⁴ As the foundation of the social structures that underpin American institutions continue to crack and groups of American citizens increasingly mistrust one another, a decline in social capital could lead to intensifying political polarization and a more unstable American society.

The term “social capital” has come to describe the networks of connections between individuals and their communities through communal interaction and shared experiences. Just as physical capital (property), human capital (skills and education), and economic capital (wealth) have value that societies need to function, the size and strength

¹ Bradley Jones, “Republicans and Democrats have grown further apart on what the nation’s top priorities should be.” Pew Research Center, <https://www.pewresearch.org/fact-tank/2019/02/05/republicans-and-democrats-have-grown-further-apart-on-what-the-nations-top-priorities-should-be>.

² “Political Polarization in the American Public.” Pew Research Center. <https://www.peoplepress.org/2014/06/1/political-polarization-in-the-american-public>.

³ “Public Trust in Government: 1958-2019.” Pew Research Center. <https://www.peoplepress.org/2019/04/11/public-trust-in-government-1958-2019>.

⁴ Stephen Knack, “Social Capital and the Quality of Government: Evidence from the United States,” The World Bank, 1999.

of networks between the members of a society also provides value. Deeper ties between citizens and their neighbors result in higher levels of trust in shared institutions and societies with higher social capital are more prosperous and stable. Low social capital results in countries with less public trust in law and order, higher economic uncertainty, and inferior government.^{5 6}

In 1995, Robert Putnam outlined a thesis in the *Journal of Democracy* that social capital was declining, leading to weaker interpersonal bonds which manifested in lower political participation and increased partisan acrimony in the United States. Putnam's research revitalized the study of social capital, but also drew criticism from other social scientists on the methods and variables used to measure social capital in the modern age of television, mobile phones, and the internet. The inputs to social capital are varied and sometimes difficult to quantitatively assess resulting in a broad range of methodological approaches to this research topic.

Since Putnam's findings, the world has become even more interconnected with widespread access to high-speed internet, virtual online networks such as Facebook, and multiple avenues for instant forms of remote communication. This analysis uses voting participation data for a period of five years in the Commonwealth of Pennsylvania as a proxy for social capital and compares turnout and registration to socioeconomic factors including the race, income, and the availability of high-speed broadband internet. Results indicate that the public profile of an election, socioeconomic factors and access to high-speed internet significantly affect voter participation and therefore are relevant measures

⁵ Ibid.

⁶ Stephen Knack and Philip Keefer, "Does Social Capital Have an Economic Payoff? A Cross-country Investigation," *The Quarterly Journal of Economics* 112, no. 4 (1997): 1251-1288.

of social capital that should be included in future studies as a key variable. Further, the results identify factors that increase social capital which public policies can encourage in an effort to reverse the damage done to American society by political polarization.

The next section of this paper provides a brief overview of the academic literature starting with Putnam's social capital theories and including scholarly criticisms of his approach, subsequent analysis into social capital theory, and related research on the internet's impact on social capital. The third section outlines the data sources and methods used in the analysis followed by the results in the fourth section. The final section discusses the findings and suggests areas for further research.

2. Literature Review and Theoretical Framework

Robert Putnam's research in *Bowling Alone: The Collapse and Revival of American Community* advanced a hypothesis that claimed declining social capital was leading to less political participation by individuals resulting in social challenges due to lower personal investment in communities nationwide.^{7 8} Putnam's research renewed interest in older debates on the importance of strong social networks in healthy societies and scholarship subsequent to *Bowling Alone* has grappled with Putnam's methodology and conclusions.⁹ Critics of Putnam's work outlined faults in his methodology,¹⁰ his exclusion of political ideology in his analysis,¹¹ and his omission of racial economic

⁷ Robert Putnam, "Bowling Alone: The Strange Disappearance of Civic America." *Journal of Democracy* 6, no. 1 (1995): 65-78.

⁸ Robert Putnam, *Bowling alone: The Collapse and Revival of American Community*. (New York: Simon and Schuster, 2001).

⁹ Emanuele Ferragina, "Social Capital and Equality: Tocqueville's Legacy", no. 515. LIS Working Paper Series, 2009.

¹⁰ Claude S Fischer, "Bowling Alone: What's the Score?," *Social Networks* 27, no. 2 (2005): 155-167.

¹¹ Vicente Navarro, "A Critique of Social Capital." *International Journal of Health Services* 32, no. 3 (2002): 423-432.

factors.¹² Despite these methodological disagreements that continue in academia today, social capital theory is commonly applied in research as a method for evaluating the health of modern societies.¹³ ¹⁴ Nearly twenty years after Putnam's original thesis, scholars continue to analyze factors that contribute towards social capital using *Bowling Alone* as a methodological foundation.¹⁵

The rise of new ways to socialize through the use of the internet and social media websites over the past two decades has led to research examining the effects of these new technologies on social capital. As a source of information, the internet initially replaced traditional news media as a method to foster political discussion and increase civic participation.¹⁶ Research measuring the internet's effect on social capital indicates mixed results depending on the amount of time spent interacting online. Average internet usage resulting in increased participation in social behavior while an extremely heavy online presence results in lower levels of social capital. Further, the impact of internet usage has been shown to supplement an individual's preexisting social capital levels rather than change social capital trends.

When the Internet engages people primarily in asocial activities, then even more than television, its immersiveness can turn people away from community, organizational and political involvement, and domestic life. By contrast, when people use the Internet to communicate and coordinate with friends, relatives, and organizations—near and far—then it is a tool for

¹² Rodney E. Hero, *Racial Diversity and Social Capital: Equality and Community in America*. Cambridge University Press, 2007.

¹³ Pamela Paxton, "Is Social Capital Declining in the United States? A Multiple Indicator Assessment," *American Journal of Sociology* 105, no. 1 (1999): 88-127.

¹⁴ Jenny Onyx and Paul Bullen, "Measuring Social Capital in Five Communities." *The Journal of Applied Behavioral Science* 36, no. 1 (2000): 23-42.

¹⁵ Christy Michele Rhodes, Leslie Cordie, and Michael Wooten. "An Examination of Social Capital Among US Adults: Patterns that Facilitate Social Well-being as Measured by PIAAC." *International Journal of Learning, Teaching and Educational Research* 18, no. 2 (2019).

¹⁶ Dhavan V Shah., Jaeho Cho, William P. Eveland Jr, and Nojin Kwak. "Information and Expression in a Digital Age: Modeling Internet effects on Civic Participation." *Communication Research* 32, no. 5 (2005): 531-565.

building and maintaining social capital. Our research has shown that there are no single Internet effects. In this era of spatially dispersed community, the Internet fills needs for additional interpersonal contact that supplement in-person and telephone contact. At a time of declining organizational participation, the Internet provides tools for those already involved to increase their participation.¹⁷

Narrowly-defined field research conducted a decade ago showed very small social capital benefits from online social media use among college students concluding that time spent online was not an efficient method to increase social capital.¹⁸ However, the reach of social networks through the internet continues to grow and recent research has not conclusively revisited these prior findings. The effect of the internet on social capital in the current era of political polarization, foreign influence in social media, and online “fake news” hoaxes may very well be different today.

While a relationship between economic prosperity and high levels of social capital has been established by existing scholarship, these studies have generally been limited to large aggregated economic indicators rather than smaller economic units that would more closely align with communities.¹⁹ As Paul Whiteley explains:

It is clear that social capital, defined as interpersonal trust, is an important factor in explaining cross-national variations in economic growth ... it is a highly significant predictor of growth in a diverse set of countries, and in the presence of various control variables.²⁰

¹⁷ Barry Wellman, Anabel Quan Haase, James Witte, and Keith Hampton. "Does the Internet Increase, Decrease, or Supplement Social Capital? Social Networks, Participation, and Community Commitment." *American Behavioral Scientist* 45, no. 3 (2001): 436-455.

¹⁸ Sebastián Valenzuela, Namsu Park, and Kerk F. Kee. "Is There Social Capital in a Social Network Site?: Facebook Use and College Students' Life Satisfaction, Trust, and Participation." *Journal of Computer-Mediated Communication* 14, no. 4 (2009): 875-901.

¹⁹ Stephen Knack and Philip Keefer, "Does Social Capital Have an Economic Payoff? A Cross-country Investigation," *The Quarterly Journal of Economics* 112, no. 4 (1997): 1251-1288.

²⁰ Paul Whiteley, "Economic Growth and Social Capital." *Poverty and Exclusion in North and South: Essays on Social Policy and Global Poverty Reduction* (2005): 123.

Since social capital is based on individual networks that are unlikely to span entire nations, it is logical to examine the effects of economic prosperity on social capital in smaller economic units similarly sized to a group of communities. The results of an economic downturn and subsequent social capital decline in a rural Pennsylvania region would be lost in an aggregated analysis of the entire United States, so social capital changes in smaller government units such as counties is a valuable unit of analysis to measure micro-effects. Norbutas and Corten's study of the effects of social media and economic prosperity on social capital in Dutch municipalities showed a positive relationship between all three variables indicating that small unit examination can produce meaningful results.²¹ My analysis replicates this focus on smaller units of analysis by testing on the county level in order identify causal variables in areas similarly sized to an average individuals' social network rather than large areas such as states, regions, or nations.

The Commonwealth of Pennsylvania is a large diverse state with the fifth-highest population in the United States. It includes a large urban area (Philadelphia), medium second- and third-class cities that are geographically dispersed (Pittsburgh, Allentown, Erie), as well as extremely rural areas (Cameron County, Forest County) that are sparsely populated and socially isolated. This allows for a comparative study between urbanized areas and rural counties in a relatively close geographic area. Further, Pennsylvania is traditionally a political swing state with a competitive political environment at all levels of government. Donald Trump's victory in the 2016 Presidential Election was the first Republican victory in Pennsylvania since 1988 and while the Pennsylvania State

²¹ Lukas Norbutas, and Rense Corten. "Network Structure and Economic Prosperity in Municipalities: a Large-Scale Test of Social Capital Theory Using Social Media Data." *Social Networks* 52 (2018): 120-134.

Legislature has Republican majorities in both houses, all statewide executive offices are held by Democrats. Similarly, Pennsylvania's Congressional delegation is evenly split, consisting of 9 Democrats and 9 Republicans. Pennsylvania also provides an intriguing subject for this analysis due to the geography of its political centers. Democratic strongholds are located in urban areas surrounded by bastions of Republican support in adjacent rural counties create an environment where deep red and deep blue counties can share borders and possess similar regional characteristics and economic profiles despite opposite political affiliations. Pennsylvania was chosen as the research area for this analysis due to its geographical dispersion and competitive political environment; two factors that are uncommon throughout the nation within the same state.

This analysis evaluates the effects of race, economic hardship, partisanship, the public profile of different elections, political party registration, and the availability of high-speed broadband internet on overall social capital as measured by voter turnout. By adopting both Putnam's original methodology for measuring social capital and some of his critics' views, this study seeks to quantify the factors that affect voter turnout in each of Pennsylvania's 67 counties for the period 2013 through 2017. This research builds on the social capital theory scholarship of the past 20 years and provides additional insight into the effects of new ways to communicate due to advances in technology.

3. Data and Methods

For this analysis, data was collected from a variety of governmental sources. Voter turnout information and the partisan registration figures of each county were collected from the registered voter file provided by the Pennsylvania Department of

State. Demographic information, median household income, and access to broadband internet for each county was provided by the United States Census Bureau.

Unemployment statistics were collected from the United States Bureau of Labor Statistics. This section details each of these datasets, defines the key variables, and outlines the method of analysis.

Pennsylvania's electronic voter file database is publicly available online for all 67 of the Commonwealth's counties.²² This dataset includes detailed information for all registered voters across Pennsylvania including name, address, age, party affiliation, registration date, and election participation history for the last 25 elections in each county. Pennsylvania is a closed primary state meaning that voters can only vote for candidates within their registered party in primary elections. This analysis limits its scope to voters registered as Democrats and Republicans only; representing 86% of all Pennsylvanians registered to vote. Using this dataset, the participation rate was calculated for every voter then averaged within each county to arrive at the primary and general election turnout percentages for each year and county. To confirm these calculations, turnout percentages were corroborated to the official turnout percentages published by county state election boards where available. Voter turnout by county and by year for primary and general elections are the dependent variables in this analysis. During the period of analysis, turnout in general elections ranged from 13% to 80% while turnout in primary elections ranged from 4% to 49% showing a widely dispersed dataset.

Party registration figures were also calculated using the Pennsylvania voter file. First, a measure of partisanship was calculated to understand how pervasive single-party

²² Available here: <https://www.pavoterservices.pa.gov/pages/purchasepafullvoterexport.aspx>

registration is in each county. For example, approximately 75% of voters in Philadelphia County are registered in the Democratic party, while Washington County is much more evenly divided with Democrats holding less than a 1% registration edge over Republicans. This metric measures which counties are dominated by a single party, but does not differentiate between Republican and Democratic counties. This metric is included to measure the effect of single-party areas, such as urban centers, that may have lower turnout because the result of any given contested election is assumed based on the party's advantage.

Additionally, partisanship is measured as the difference between the percentages of Democratic and Republican registrations. This metric represents the competitiveness for registered voters between the two parties. Swing counties such as Montgomery County have nearly the same number of voters registered to each party making it a much more politically competitive area of state than average and serves as a borderland between safe urban Democratic areas and safe rural Republican regions. It is likely that these areas have higher turnout due to the robustness of the local parties and the presumed competitiveness for votes in these swing districts. In a swing state such as Pennsylvania, party registration does not always correlate with the share of votes each party receives in elections, but the advantage of one political party over the other has shown to impact voter participation rates.²³ In Pennsylvania during the period of this analysis, the average party advantage was 24% signifying that party registration was split 62-38% in the average county.

²³ John Merrifield, "The Institutional and Political Factors that Influence Voter Turnout," *Public Choice* (1993): 657-667.

Each county's socioeconomic information is provided from data collected by the Census Bureau's American Community Survey's (ACS) annual estimates.²⁴ First, the percentage of nonwhite population is used as the chief demographic characteristic in the study. For this analysis, minority population is defined as the percentage of total population that is not "single race - white" as defined by the Census Bureau so the nonwhite proportion of the population includes all multiracial and minority populations. On average, the nonwhite population comprised 9% of Pennsylvanians with a range from 2% to 59% of total population by county. Median household income in each county was also provided by the Census Bureau's ACS responses and this metric served as a control variable for the percentage of nonwhite population. The average median household income during the period of analysis was \$50,850 and income values in this study were quoted in constant 2017-dollar values. Additionally, the ACS provided data related to the percentage of households with an internet subscription and access to a broadband connection by county over the period of analysis. Broadband is the fastest and most reliable form of internet access available to consumers in the United States. The average percentage of households with broadband access across Pennsylvania was 63% during the period of study.

Economic conditions are measured by the average monthly unemployment rate for each county as defined by the United States' Department of Labor's Bureau of Labor and Statistics.²⁵ These unemployment rates are seasonally adjusted for the years 2013 through 2017 and annualized to represent one average rate for each county by year.

²⁴ Available here: <https://www.census.gov/programs-surveys/acs/>

²⁵ Available here: <https://www.bls.gov/data/#unemployment>

During the period of study, average annual employment ranged from 4% to 10% across Pennsylvania’s counties.

Finally, as the type of election has shown to drive voter turnout, a categorical control variable was created to adjust for expected higher turnout elections such as Presidential races. A three-tiered variable was created based on the expected publicity each type of race during the period of study would garner. The Presidential Election in 2016 serves as the most publicized contest followed by the Gubernatorial and Congressional midterm races in 2014. In 2013, 2015, and 2017, only local elections and statewide judgeships were on the ballot resulting in a lower level of publicity and lower expected turnout. Table 1 shows the detail of this variable, called the Election Public Profile Index in this study.

Table 1:
Competitive Index Definitions

Index	Description	Year
0	Contested statewide race and local elections	2013, 2015, 2017
1	Gubernatorial / Congressional midterm election	2014
2	Presidential election	2016

Table 2:
Summary Statistics Used in Time-Series Cross-Sectional Analysis
Pennsylvania Primary and General Elections: 2013 – 2017

Observations: 335
 Groups: 67
 Periods: 5

<i>Dependent Variables</i>				
	Mean	Std Dev	Min	Max
General Election Turnout				
<i>Overall</i>	0.24	0.105	0.044	0.489
<i>Between</i>		0.046	0.155	0.35
<i>Within</i>		0.095	0.094	0.482
Primary Election Turnout				
<i>Overall</i>	0.412	0.183	0.127	.799
<i>Between</i>		0.041	0.338	0.494
<i>Within</i>		0.178	0.173	0.818
<i>Independent Variables</i>				
Nonwhite Population – % of Nonwhite Population				
<i>Overall</i>	0.089	0.091	0.017	0.587
<i>Between</i>		0.091	0.018	0.585
<i>Within</i>		0.008	-0.0001	0.144
Broadband Internet Access – % of Households				
<i>Overall</i>	0.628	0.07	0.45	0.82
<i>Between</i>		0.062	0.45	0.78
<i>Within</i>		0.034	0.532	0.73
Average Unemployment Rate – Yearly Average				
<i>Overall</i>	0.062	0.013	0.036	0.104
<i>Between</i>		0.01	0.042	0.081
<i>Within</i>		0.01	0.044	0.088
Partisan Advantage – % Share of Voters in Majority Party				
<i>Overall</i>	0.232	0.146	0.001	0.751
<i>Between</i>		0.147	0.0106	0.749
<i>Within</i>		0.008	0.201	0.258
Registration Edge – % Difference in Party Registration				
<i>Overall</i>	0.232	0.146	0	0.752
<i>Between</i>		0.113	0.014	0.477
<i>Within</i>		0.093	-0.127	0.652
Median Household Income – In 2017 Dollars (Thous.)				
<i>Overall</i>	50.85	9.65	35.53	92.41
<i>Between</i>		9.58	36.37	87.9
<i>Within</i>		1.59	47.3	55.36
Election Public Profile Index – See Table X				
<i>Overall</i>	0.8	0.981	0	2
<i>Between</i>		0	0.8	0.8
<i>Within</i>		0.981	0	2

This analysis utilizes a generalized least squares (GLS) random-effects linear model to measure the influence of the independent variables on the dependent variables using panel data. A Hausman test was performed to determine the endogeneity of the regressor variables and identified that the model configured for random-effects was superior to a fixed-effects model. The analysis separates primary turnout and general turnout into two dependent variables to identify if independent variables have a different affect depending on the type of election. The number of observations included in the study is equal to contests in 67 counties over 5 years for both types totaling 670 observations evenly split between general elections and primary elections. Variable coefficients generated by the model were considered statistically significant at the $p < 0.05$ level of significance or above. Summary statistics for all variables are shown in Table 2.

4. Results

The results of this analysis found that two of the independent variables, broadband access and the public profile of the election, boosted primary voter turnout, while higher percentages of nonwhite populations and higher median household income decreased participation in primary elections. The results were similar for general elections with broadband access, the election's profile, median household income, and minority populations affecting turnout, however, the average unemployment rate was also significant in the general election model. The remaining independent variables, registration edge and partisan advantage, were not statistically significant in either model.

Table 3:
Linear Panel Model – Time-Series Cross-Sectional
Pennsylvania Primary Elections: 2013 - 2017

Variable	Coefficients
% of Households with Broadband Internet Access	0.175 * (0.082)
% of Nonwhite Population	-0.127 ** (0.046)
Average Unemployment Rate	-0.235 (0.372)
Median Household Income (in Thousands)	-0.003 *** (0.0007)
Election Public Profile Index	0.085 *** (0.005)
Registration Edge	-0.026 (0.028)
Partisan Advantage	0.058 (0.03)
Intercept	0.273 *** (0.058)
Adjusted R-Squared	
<i>Within</i>	0.542
<i>Between</i>	0.458
<i>Overall</i>	0.526
Number of observations	335

Robust standard errors in parentheses

*** p<.001, ** p<.01, *p<.05

Primary Elections

The analysis of primary election turnout shows that four of the seven independent variables have statistically significant effects on primary turnout levels (see Table 3).

Counties with a higher percentage of households with broadband internet access had higher voter participation percentages. This suggests that during primary elections, access to reliable high-speed internet provides an additional incentive to vote, possibly through heightened awareness, digital outreach strategies by campaigns, or both. Reliable access to the internet results in better access to news media and other forms of political outreach. Digital methods of persuasion available on the internet allow candidates to promulgate

their message to wider audiences and get-out-the-vote strategies focused on microtargeting likely voters to encourage them to vote on election day are widely implemented campaign tactics. The model in this analysis suggests that areas of Pennsylvania with a higher percentage of households with broadband access turnout to vote at higher levels likely due to targeting by digital campaign tactics encouraging voter participation that are only possible with reliable high-speed internet.

Based on the results of the model, higher percentages of nonwhite populations decreased voter turnout in primary election. These results are consistent with past research and electoral results showing that minority populations vote at rates smaller than white populations even in minority-majority areas.²⁶ Philadelphia County, encompassing the entirety of the City of Philadelphia, has the highest percentage of nonwhite population at approximately 58% during the period of this study and is the only minority-majority county in the Commonwealth of Pennsylvania. Philadelphia averaged 22.8% turnout during the primary elections ranking 41st of 67 counties across the state. Of the 22 counties with the highest percentage of nonwhite population, only one, Forest County, ranked in the top half of primary voter turnout. By comparison, Elk County had the lowest percentage of nonwhite population and the 10th highest voter turnout at 29.4% in primary elections. Further, of the 22 counties with the lowest nonwhite populations, 18 had above average voter turnout in primary elections. Combined with past research identifying that nonwhite populations vote at lower rates, it logically follows that counties with larger nonwhite populations vote at a lower rate overall which is confirmed by the results of this analysis.

²⁶ Hill, Kim Quaille, and Jan E. Leighley. "Racial diversity, voter turnout, and mobilizing institutions in the United States." *American Politics Quarterly* 27, no. 3 (1999): 275-295.

Pennsylvania counties with higher median household incomes also experienced lower voter turnout. The result of the analysis shows that for every \$5,000 increase in median household income, voter turnout declined by 1.5 percentage points on average. This results in higher income areas such as the Philadelphia suburbs in Chester County and Montgomery County with lower than expected voter turnout. For example, Montgomery County ranks 55th and Chester County ranks 61st in primary participation rates despite possessing some of the highest percentages of households with broadband internet. Lower electoral participation in these counties is unexpected based on the effects of internet access. According to Pew Research, higher income households use the internet at higher rates with richer households spending a greater percentage of time using the internet than poorer household.²⁷ This could suggest that higher income households are less susceptible to voter mobilization strategies or that access to high-speed broadband along with higher disposal income results in different behaviors while using the internet that manifest in lower civic participation rates.

This analysis also showed that the public profile of a given election had a significant impact on voter turnout. The model used a control variable categorizing elections involving Presidential and Gubernatorial contests separately from off-year elections. The results saw higher levels of primary election turnout, on average, due to the perceived importance of those offices driven by higher media profile. While local elections are important, they typically do not garner as much attention in the public's mind as larger statewide and national offices. Results from the model confirmed that the profile of the election has a direct effect on voter turnout.

²⁷ Bernard J. Jansen, "Use of the Internet in Higher-income Households," Washington, DC: Pew Research Center, 2010.

These results support the hypothesis that access to high-speed broadband internet increases voter turnout for primary elections. As society continues to integrate and interact through digital communication, the results from this study confirm that the inclusion of internet access as a measure of potential social capital is well-founded. However, the model's r-squared values indicate that the variables included in the model represent approximately half of the variation seen in the data for primary elections. This suggests that there are factors that motivate voter turnout beyond the variables included in this study and further research is warranted specifically to identify voter motivations for participating in primary elections.

Table 4:
Linear Panel Model – Time-Series Cross-Sectional
Pennsylvania General Elections: 2013 - 2017

Variable	Coefficients
% of Households with Broadband Internet Access	0.1 * (0.081)
% of Nonwhite Population	-0.105 * (0.053)
Average Unemployment Rate	-0.82 * (0.335)
Median Household Income (in Thousands)	-0.002 ** (0.0007)
Election Public Profile Index	0.21 *** (0.004)
Registration Edge	-0.034 (0.027)
Partisan Advantage	-0.027 (0.034)
Intercept	0.414 *** (0.059)
Adjusted R-Squared	
<i>Within</i>	0.919
<i>Between</i>	0.093
<i>Overall</i>	0.878
Number of observations	335

Robust standard errors in parentheses

*** p<.001, ** p<.01, *p<.05

General Elections

The analysis of general election turnout shows that five of the seven independent variables have statistically significant effects on general turnout levels (see Table 4). Similar to the model's results for primary elections, voter participation in general elections was impacted by high-speed internet access, minority populations, median household income, and the public profile of elections. However, the model also indicated that average unemployment rates was also significant. As in the primary model's results, registration edge and partisan advantage were not statistically significant.

Access to high-speed broadband internet increases voter turnout in general elections. Similar to the affects discussed for primary elections, access to reliable internet allows for exposure to digital communication techniques favored by political campaigns. Further, reliable access allows a low information voter to research candidates and races which promotes electoral participation. In general elections where contested races include candidates from two or more parties, internet access allows voters to understand the candidates' positions, endorsements, criticisms, and political history using their computer or smart phone. With access to this information, the model suggests that voters with broadband access are more likely to participate in general elections than voters without access to high-speed internet.

Average unemployment rate is not significant during the analysis of primary elections, but is significant when analyzing general election turnout. In a closed primary state like Pennsylvania, primary voters are more likely to be engaged political partisans whereas general election voters include that group as well as more casual voters who are not necessarily likely to vote consistently. It follows then that economic circumstances,

such as high unemployment in a given county, would lead more of these causal voters to participate in the general election to register their unhappiness with the current economic circumstances. These behaviors are supported by the data by examining turnout percentages for primary and general elections in the same year by county. Of 5 years across 67 counties examined during this analysis, there are only 5 instances out of a population of 335 observations where general turnout was lower than primary turnout by one percent or more. Across all 335 data points, the average net change in turnout between primary turnout and general turnout was an increase of 17% with multiple instances of primary turnout doubling in the general election. These results suggest that economic indicators impact voter turnout, specifically driving turnout in general elections when a broader base of the electorate participates.

As with primary elections, counties with higher household median incomes were less likely to vote with every additional \$5,000 in income resulting in about 2 percentage point reduction in expected voter turnout in general elections. This is borne out by the example of Chester County and Montgomery County, neighboring counties in the Philadelphia suburbs with the highest household incomes in the state. Chester County's average median household income during the analysis period is \$87,906 while Montgomery County's average median household income is 81,295, a difference of \$6,611. During the same period, the difference in Chester and Montgomery's average general turnout was 1.4 percentage points. These results suggest that higher incomes result in lower voter turnout in general elections similar to the effect measured for primary elections.

The conclusions stated about the effects of the percentage of nonwhite population and election public profile variables on primary election turnout are similar for general election turnout. The percentage of minority populations has an almost equal affect for general election turnout as primary election turnout. These results show that minorities vote at lower rates than the white population as expected based on past research. The drivers behind these lower voting patterns are outside the scope of this analysis, but well documented.²⁸ The influence of an election's public profile is even more pronounced on general election turnout than turnout in primary contests. The publicity related to a Presidential Election compared to an off-year election can increase voter turnout up to more than 300% as it did in Franklin County where average voter turnout in off-year election years grew from 23% to 78.8% during the Presidential Election of 2016. For the period of analysis, the average increase in general election turnout from off-year elections is 43.8%, an astounding figure across such a politically competitive state such as Pennsylvania. The difference between turnout in off-year elections and the 2014 Gubernatorial Election was a smaller, but still notable 16.6% increase on average. The perceived importance of these positions heightened by media attention persuade voters to participate in Presidential and Gubernatorial elections. These results show the type of election motivates voters to participate in elections and a general election's public profile is one of the most important drivers of voter turnout.

The modeled results for general election turnout highlight the same findings as discussed in the primary election model. Namely, that access to high-speed internet increases voter turnout making the measurement of internet access a key component of

²⁸ Benny Geys, "Explaining Voter Turnout: A Review of Aggregate-level Research," *Electoral Studies* 25, no. 4 (2006): 637-663.

social capital calculations as society continues to adopt new methods of digital communications. Contrary to the primary election model, the general election model's r-squared value indicates that the independent variables included in the analysis contribute to nearly 90% of the variation seen in general election turnout. This suggests that the general election model includes many of the key components necessary to measure general election voter turnout.

5. Conclusion

The results of this analysis show that access to high-speed broadband internet has a positive impact on voter turnout in both primary and general elections, demonstrating that measures of social capital using new technology are key to understanding communal behaviors. No future research of social capital should omit variables measuring access to reliable high-speed internet. Further, this study has shown that voter participation is heavily influenced by the public profile of the election. This variable could also be related to the availability of high-speed internet as an increasing percentage of the population receive their news online. As the digitization of advertising and political campaign tactics continue to evolve, access to online networks will become paramount in the study of campaign outreach, voter mobilization, and social capital.

Additionally, as access to high-speed internet directly influences voter turnout and social capital, there are public policy implications for these results. Access to broadband internet is crucial to economic development as well as developing healthy social capital in less concentrated population centers. Without public policy devoted to providing broadband to rural counties in Pennsylvania, it is likely that economic opportunity will

decline further weakening social capital in those areas. This process will further divide the ideological gap between Republicans and Democrats who will have access to different levels of modern technology. These findings show that access to broadband has implications for social capital as well as the more well-known economic and political factors. A holistic view on the impacts of access to high-speed broadband internet show the importance of extending this technology as broadly as possible across every segment of society.

Future research into the evolving study of social capital should focus on identifying the partisan variables that contribute to primary election turnout. As shown in the analysis, there are different motivating factors for participation in primary and general elections with the latter accessible to more voters. It is possible that the strength of local party apparatus, wedge issues, candidate quality, and demographics such as gender and age are contributing factors in primary election turnout and further research is needed to identify the impact of those variables. Additional research could also focus on the effectiveness of party organizations to influence turnout. As shown in this analysis, variables related to party registration and partisan advantage were not significant impacts on turnout in primary or general elections. It is unlikely that political parties have no influence on turnout rates, so additional research is needed to identify ways that party organizations impact voter participation.

The modeled results for primary and general election turnout support the hypothesis that access to broadband high-speed internet contributes to increased social capital through higher voting participation rates. The inclusion of a variable related to remote communications is key to understanding the personal networks central to

measuring social capital levels in modern societies. Putnam's work was focused on the decline of in-person group interactions, such as bowling alone, that indicated lower levels of social capital. However, with modern technology an individual could be physically alone while still interacting with a wide network of colleagues, friends, family, and others through the internet. In today's world, it is not an uncommon experience to communicate through text or video with peers around the country and throughout the world. If measures of social capital are restricted to calculating only traditional metrics that are no longer exclusive ways to communicate, finding a decline in social capital is inevitable as conventional methods of interacting become obsolete. As the results of this analysis have shown, only by including newer attributes in the measurement of social capital can we accurately determine trends in social capital and how they impact the health of modern society.

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6. Curriculum Vita

Nick Pisciotano was born in Pittsburgh, Pennsylvania and works as a Data Analytics Manager at the global audit and consulting firm KPMG US, LLP. At KPMG, he leads a team of analysts who focus on helping their clients unlock the power of data through analytical techniques. His work has assisted large and small companies transform their compliance and auditing functions to be more efficient at detecting fraud, waste, and abuse. Nick also serves as the President of the nonprofit West Mifflin Community Foundation which seeks to build stronger civic bonds in his hometown through charitable initiatives and community events. Nick graduated from Washington & Jefferson College with a B.A. in Accounting and a B.A. in History with honors. He is a Certified Public Accountant and a Certified Information Systems Auditor.