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Electoral Turnout and Social Capital

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Abstract: Although social capital is a useful and often used concept in political science to explain political behavior and electoral turnout, its effects are rarely tested because of scarcity of available data. It is hard to find a good measure of social capital not produced by a political process. Moreover, the concept suffers from an unstable definition that makes it difficult to operationalize. In line with a part of the previous literature, we propose a restricted definition of social capital based on its main origin, a person's accumulated social interactions. This enables us to integrate social capital into the rational calculus of voting and state a clear prediction that higher social capital will raise electoral turnout. We test this prediction using data on New Zealand participation in the 2017 national election based on 2013 census characteristics at the finest aggregated level of "meshblock." We measure social capital using a census measure of volunteering rates. Our results are clear and stable: there is a strong positive association between social capital and subsequent electoral turnout.

Keywords: Electoral turnout, social capital, volunteering work, calculus of voting

JEL Classifications: D42

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1 Introduction

Few studies have successfully carried out a suitable direct empirical test of the effects of social capital on electoral turnout (Atkinson and Fowler, 2012, Bwalya and Sukumar, 2018 and Condon 2011). One reason is the difficulty of properly defining the concept of social capital. Though widely used, the concept has various definitions (Portes, 1998) used in different traditions and academic fields (Svendsen and Svendsen, 2009). A second reason is the difficulty of operationalizing the concept. How should social capital be measured? Many empirical studies are based on proxies such as trust. A third reason is the difficulty of establishing a clear causal relationship between social capital and electoral participation because of endogeneity and simultaneity between the two variables. In particular, these concerns arise with studies using individual-level data when the proxy variable used to gauge social capital is a consequence of it, such as trust.

In this paper, we propose a way of resolving the first two issues. First, we propose a restrictive definition of social capital based on part of the previous literature. The definition is based on the social interactions accumulated by a person within his social network. We then apply this definition of social capital to the rational calculus of voting. It affects the costs and benefits of voting in three ways. First, if social interactions -i.e., social capital- heighten individual altruism, it can raise the expected benefit to an individual of an election's outcome to the extent that outcome is expected to benefit others. Second, social interactions reduce the cost people bear to gather information about an election. Third, increased social interaction spreads and reinforces social norms. If voting is a social norm, the social capital of a person increases his extrinsic motivation to vote. All three potential influences of social capital on the calculus of voting are positive, leading to the prediction that social capital fosters participation in elections.

Second, we propose using an alternative way of measuring social capital within finely grained geographical spaces, following the method used by François and Gergaud (2019) to assess civic duty in French cities. Scrutinizing the voter turnout rate for the 2017 New Zealand national legislative election, we observe electoral participation at the census "meshblock" level, the most disaggregated boundary containing an average of 110 people. In this mixed-member proportional voting system, we match the voting turnout rate with traditional factors affecting turnout, and add a measure of social capital - i.e. the thickness of social interactions within the meshblock units – via a census measure of meshblock volunteering rates. We introduce an original measure of social capital based on this volunteering measure. We first carry out a standard OLS estimation of volunteering rates,

knowing its residuals contain other factors than those captured by the measured explanatory variables. We argue that these residuals mainly contain information about people's extrinsic and intrinsic motivations to volunteer, excluding cost and contextual factors of this activity. We thus use the residuals as an adjusted measure of social capital. Various empirical specifications enable us to conclude that subsequent voter turnout is correlated with our (raw) volunteering rate measure and our residual-based (adjusted) measure of social capital; more social capital within a meshblock goes hand in hand with higher voter turnout rates. This result is stable and robust to several checks and changes in our empirical specifications, which makes us confident about the validity of this relationship.

Our work contributes to the scarce literature on the relationship between social capital and voter turnout in two ways. First, we show that it is theoretically possible to integrate social capital within the rational calculus of voting, and to logically predict its positive effect on voter turnout rates. Second, using a suitable empirical strategy, we present clear evidence of a relationship between electoral turnout and social capital.

The rest of the paper is organized as follows. In the next section, we precisely define the concept of social capital based on a part of the previous literature, and apply it to the calculus of voting. Section Three presents our data from the 2013 New Zealand census and 2017 national election. Section Four describes our empirical strategy, particularly how we measure social capital first through volunteering rates, and second by transforming it to eliminate confounding factors. In Section Five, we provide and comment on the estimation results. Finally, we conclude in Section Six.

2 Social Capital and Electoral Turnout

Social capital is a concept that is widely used in the political science literature, and takes various definitions. We need to specify what we mean by social capital before applying it into the rational calculus of voting.

2.1 What is social capital?

Social capital is a concept used in three major social science disciplines: economics, political science and sociology (Svendsen and Svendsen, 2009). In politics, the seminal works are those of Putnam (1993, 1995a, 1995b and 2000). Social capital's definition has become more restricted and operationalized over time, but a side-effect has been a polymorphic definition that varies over time, over disciplines, and over studies (Paldam, 2000). As a result, there remains a lack of consensus on how to define social capital (Bjørnskov, 2006). For

example, Putnam defined social capital as "features of social organization such as trust, norms, and networks, that can improve the efficiency of society" (1993, 167), but Bjørnskov shows that these three main components are "in fact manifestations of three distinct phenomena" (2006, 36). Moreover, a question of endogeneity quickly arises regarding social capital. Is it an outcome of a society's political process, or is it exogenous to those processes? The literature is divided on this question as pointed out by Jackman and Miller (1998).

The operationalization of social capital also brings its own problems. Constraints of measurement and data availability mean that the variables used to capture social capital can increase confusion about its definition. Sometimes, the proxy used for social capital is itself a consequence of social capital, such as trust. For example, Brehm and Rahn (1997) argue that "social capital may be as much a consequence of confidence in institutions as the reverse" (p 1018). As a result, empirical investigations into the effect of social capital are often plagued by endogeneity, such that no causal relation can be established.

Notwithstanding these problems, many studies empirically test a relationship between social capital and some form of political participation (recent examples include Carreras and Bowler, 2019 and Huber and Montag, 2020). They use either aggregate data at the national level or individual data. Both approaches face distinct limitations. As mentioned, aggregated studies use proxies for social capital that are in fact the outcome of social capital. Cross-country studies also have to control for many confounding factors when trying to explain political outcomes of interest to avoid omitted variable bias for their included social capital measure. On the other hand, survey data of individuals are subject to a well-known and documented social desirability bias. This bias results "from the respondent's desire to please the interviewer and to appear to engage in socially desirable behavior," which is especially tempting for behaviours used to measure social capital (Silver et al. 1986, p.613). In particular, survey respondents understand that activities measuring social capital are socially desirable and feel social pressure to report conformity to group norms (Holtgraves 2004).

To the best of our knowledge, only three studies have sought to estimate the influence of social capital on voter turnout specifically. Bwalya and Sukumar (2018) use survey data on membership in civic associations in the African countries of Botswana, Namibia and Zambia to test the influence of social capital on the probability of voter turnout. They find that respondents with higher social capital are more likely to cast a ballot. Atkinson and Fowler (2012) instead exploit a natural experiment to test a causal relationship between social capital and voting. Their experiment relies on the quasi-random timing of saint's days fiestas in Mexican communities. They treat fiestas as producers of social capital given the social

interactions created during the celebrations. Surprisingly, they find a decrease in voter turnout rates in municipalities where elections occur near in time to fiestas. Lastly, Condon (2011) conducts a field experiment in Texas and Arizona within elementary school communities in which social capital interactions are manipulated and subsequent voter turnout rates are measured for the 2008 presidential, senate and state initiative elections. While her results are not stable across specifications, Condon concludes that there is either no significant impact, or a negative impact of social capital on electoral turnout. In sum, the literature testing the relationship between social capital and voter turnout is both scarce and mixed.

Faced with the issues of defining and operationalizing social capital, we adopt a narrower definition that focuses on behaviors that produce social capital as an investment in social relations, as proposed by Lin and coathors (Lin 2002, Lin 2008, and Lin, Cook and Burt 2001). As summarized by Stolle (2007), accumulated social capital in Lin's sense is characterized as the resources embedded in social networks that enhance the flow of information, allow for the possibility of influence, offer social credentials or reputation and emotional reinforcement. Consequently, social capital is the set of social interactions that a person establishes or that are produced and accumulated in a given geographical space or community. We turn next to apply this definition to the decision to vote.

2.2 Social Capital and the Calculus of Voting

Since the initial works of Downs (1957), Tullock (1968) and Riker and Odershook (1968), the calculus of voting rests on the net benefit an individual receives from casting a ballot (R). Traditionally, this net benefit had depended on four elements:

$$R = pB - C + D \quad . \tag{1}$$

First, p is the probability that the individual will be the decisive voter, that is to say the voter who switches the ballot result. B is the benefit the individual gains from the election's outcome being his preferred one. In simplest form, B can measured by the difference in the individual's utility between the most- and second most preferred candidate being elected. As the probability p is very low (Dhillon and Peralta, 2002), the multiplicative term pB is close to zero. Logically, it is thus largely outweighed by the potential voter's cost of voting (C).[1] This voting cost has two components (Blais *et al.*, 2019); information collection about the candidates, their platforms and elections issues (Converse 2000), and the cost of casting a

[1] This comparison between the expected benefit and the cost of voting leads to the conclusion there is a paradox of voting: the theoretical prediction states a very low level of turnout whereas simple observation shows at least average level, see for example Blais (2000) and Mueller (2003).

ballot, such as transportation (Fauvelle-Aymar & François 2018) and time spent at the polling station. Both components of C are mainly opportunity costs (Tollison & Willett, 1973). Preparation and the action of voting takes time that is not spent on other valued activities. The last term D of (1) is the instrinsic or extrinsic satisfaction the individual derives from voting, independent of the election's outcomes or issues. This includes the individual's expressive satisfaction from (1) having his opinion elicited (Kamenica and Brad 2014); (2) the demonstration of partisan preferences to other people or being able to express partisan loyalty (Fiorina 1976); or (3) being able to signal political preferences to candidates and parties (Brennan and Lomasky 1997). More intrinsically, people may also vote because they view it as a civic duty (Hur 2017), though defining "duties" raises a number of theoretical and empirical difficulties in the academic literature (François and Gergaud 2019).

Within this framework, an individual's involvement in a network of social interactions, i.e. his/her social capital, has a triple effect on (1). It affects the two elements of his/her calculus unrelated to the election outcome, namely *C* and *D*, and possibly the expected benefit of the election outcome (pB).

Starting with the last channel, it is possible that social capital may affect altruism according to the social psychology literature (e.g. Rusch 2014). The social interactions that constitute the social capital of a person are mainly implemented in in-groups to which s/he belongs, which can reinforce his/her altruism towards other in-group members. Moreover, in a similar vein to the "contact hypothesis" of Allport (1954), it is possible that social interactions with out-group people also develops more general altruism towards others. Altruism can then affect the calculus of voting as follows. Following the simple presentation of Fowler (2006), the benefit related to an election's outcome has two components: a direct benefit to the voter himself (B_S) and a benefit coming from the average satisfaction (B_O) of *N* other citizens. We can thus re-express pB in (1) as $p(B_S + \gamma NB_O)$, where γ represents the voter's degree of altruism about the benefit of the preferred outcome to other citizens. For a totally selfish citizen, $\gamma = 0$ and we return to the initial expression of (1). Note that the altruistic component (γNB_o) is less affected by the probability of the individual being the decisive voter, because that probability p is proportional to *1/N*, the reciprocal of the electorate size. As a result, $p\gamma NB_o$ is not as close to zero as pB_s, and the expected benefit of a preferred election outcome increases with social capital. In this way, social capital can increase the benefit of voting.

Second, social capital can lower the individual's cost of voting (C). We can assume that with more social interactions people acquire more information at less cost (e.g. Beck *et*

al. 2002, McClurg 2003 and Klofstad 2007), including about upcoming elections. Put differently, through social interactions citizen talk about politics among other things and circulate information that reduces the cost of information gathering.

Third, with social interactions, existing social norms become better known by people and more respected. If electoral participation is a social norm (perhaps because it contributes to the collective good), citizens who vote can receive extrinsic rewards from doing so, independent from the election outcome (Gerber et al. 2008). Individuals with higher social capital may thus receive higher rewards (D) from voting as a social norm, distinct from their (unchanged) reward from voting out of civic duty (François and Gergaud 2019).

Social capital thus may raise the benefits of voting and lower the cost. Thus, our hypothesis is that social capital should have a positive effect on electoral turnout rates. We note that our three channel hypothesis about social capital and turnout is similar to a four channel hypothesis summarized by Condon (2011), without the rational calculus framework.

To test our prediction about the influence of social capital on electoral turnout, we use New Zealand data and apply the methodology developed by François and Gergaud (2019) to proxy for social capital.

3 Data

To test the relationship between social capital and electoral turnout, we use two data sets with universal coverage and a low level of geographical aggregation from New Zealand.

3.1 Volunteering as a Measure of Social Capital

Unusually among countries, the five yearly New Zealand census asks all usually resident individuals 15 years or older about various "unpaid activities" performed over the four weeks prior to the fixed census night. These unpaid activities include housework, looking after children or the ill or disabled in a person's own or other household, and separately, "other helping or voluntary work for or through any organisation, group or marae."[2] It is the final question that we use here. Responses are publicly released at various

[2] A marae is a communal or sacred place that serves religious and social purposes in Polynesian societies.

levels of geographical aggregation, including at the finest level of "meshblock".[3] The average population of a census meshblock is 110 people.[4]

Given our definition of social capital as "the set of social interactions that a person establishes or that are produced in a given geographical space or community", it seems reasonable to take volunteering rates as a measure of such interactions. Put another way, individuals can have rich social interactions without volunteering, but it seems safe to assume that meshblocks with high volunteering rates, all else equal, contain people with higher degrees of social interactions than areas with low rates. Volunteering rates also differ from other measures of 'civic duty', such as blood donation rates (François and Gergaud 2019), in having a larger component of extrinsic rather than intrinsic motivation linked to social interaction with others in the community.

Table 1 provides volunteering rates aggregated to the meshblock level in New Zealand as of the 2013 census, while the right graph of Figure 1 illustrates the distribution of rates. On average, 14% of those 15 or older reported having volunteered in some capacity in the four weeks prior to the census night, and meshblock rates varied from 0% to 60%.

A further advantage of volunteering rates being covered by the New Zealand census, other than full population coverage, is that they can easily be combined with other census demographic characteristics known to be strongly correlated with volunteering. Thornton and Clark (2010) and Clark and Kim (2012), for example, have found variation in New Zealand meshblock volunteering rates to be explained by variation in meshblock household income, age, ethnicity, religion, marital and family status, residential stability, home ownership, and population density. Each of these controls touches on either the opportunity cost of volunteering, unobserved taste for volunteering, or opportunities/ demands for volunteering. Measures for each of these characteristics are also summarized in Table 1.

In this paper, we use two empirical measures of social capital. The first is the raw volunteering rate described above. The second is a modified version of this variable. Following François and Gergaud (2019), we derive from an ancillary regression (described in

[3] The official definition of a meshblock is "the smallest geographic unit for which statistical data is collected and processed by Statistics New Zealand. A meshblock is defined by a geographic area, which can vary in size from part of a city block to a large area of rural land. Each meshblock borders on another to form a network covering all of New Zealand, including coasts and inlets and extending out to the 200-mile economic zone."

[4] See http://archive.stats.govt.nz/Census/2013-census/info-about-2013-census-data/2013-census-definitions-forms/definitions/geographic.aspx for greater detail on the characteristics of census boundaries, or https://en.wikipedia.org/wiki/New_Zealand_census. To preserve individual anonymity, Statistics New Zealand will censor some meshblocks where the total number of respondents is sufficiently low as to risk identification, and uses random rounding up or down of counts in the remaining meshblocks.

Table 1: Descriptive statistics at meshblock level: Main and control variables

Variable	Mean	St. Dev.	Min	Max
Voter turnout rate	0.79	0.10	0.22	1
Volunteering rate	0.14	0.06	0	0.60
Median household income (NZ$)	69,417	28,589	0	1.50e+05
% of individuals with univ. degrees	0.19	0.13	0	0.90
Unemployment rate	0.05	0.04	0	0.35
% of ind. aged 65 and over	0.15	0.11	0	1.05
% Male	0.49	0.05	0.12	0.94
Population density (per square km)	2,375	3,886	0.08	1.96e+05
Population size	135.31	105.35	27.00	1,899
Rural status	0.16	0.37	0	1
Ethnic composition (European is not included):				
Maori (%)	0.13	0.13	0	1
Pacific (%)	0.06	0.11	0	0.93
Asian (%)	0.10	0.13	0	0.96
ME/LA/A (%)	0.01	0.02	0	0.58
Langage composition (English is not included):				
Maori (language)	0.03	0.05	0	0.52
Samoan (language)	0.01	0.04	0	0.39
Other (language)	0.11	0.09	0	0.58
Religious composition (Christian is not included):				
Other religion	0.07	0.09	0	1
No religion	0.44	0.13	0	0.92
Residential Stability (Less than 5 years is not included):				
Residential Stability: 5-14 years (%)	0.32	0.11	0	1.07
Residential Stability: 15-29 years (%)	0.12	0.07	0	0.60
Residential Stability: 30+ years (%)	0.05	0.05	0	0.50
Home ownership rate (%)	0.51	0.18	0	1.11
Family/couple without kids (%)	0.42	0.17	0	1.50
Family/couple with kids (%)	0.41	0.15	0	1.50
Family single with kids (%)	0.18	0.14	0	1

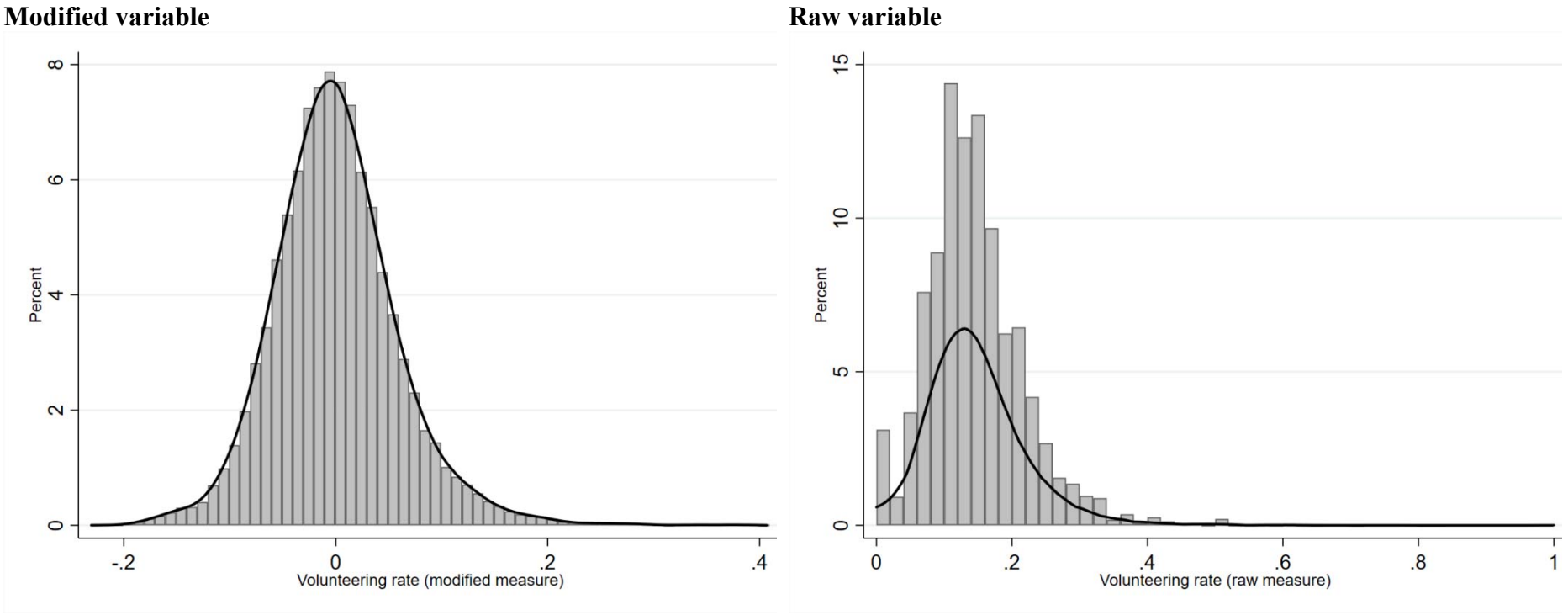
Notes: For a precise description of variables construction and sources, see Appendix 1. "meshblock" is the smallest geographic unit for which statistical data is collected and processed by Statistics New Zealand. Shares for low population meshblocks may exceed 1 due to randomized rounding.

section 4.1) an imputed measure of social capital to capture the pure intrinsic and extrinsic motivation of individuals to volunteer, independent of observables such as income, age, etc.

3.2 The 2017 New Zealand Electoral System

New Zealand replaced its Westminster-style, first past the post (FPP) electoral system with a mixed member proportional (MMP) system in 1996. Similar to the German model, MMP combines elements of FPP and proportional representation (PR). In each electorate, voters each cast two votes: one for the party-affiliated representative they want to represent that electorate in parliament (FPP), and a second for their most preferred political party (PR). As a result of this dual vote system, 71 of the 120 members of parliament (MP's) in the 2017

Figure 1. Distribution of volunteering rates -- raw and modified measures



Notes: The volunteering rate is measured as the proportion of respondents within the meshblock reporting "Other helping or voluntary work for or through any organisation, group or marae" in the previous four weeks over the total who answered. The observation unit is the "meshblock", the smallest geographic unit for which statistical data is collected and processed by Statistics New Zealand. The raw measure of the volunteering rate comes directly from the census, while the modified measure is the residual from the volunteering rate regression presented in Table 2.

national election were directly elected, while 49 "list MP's" were chosen according to the share of the popular vote won by their respective parties.[5]

The 2017 New Zealand general election took place on Saturday 23 September 2017 at the regular three-year term of the 51st New Zealand Parliament. About 3.57 million people were registered to vote for members of the House of Representatives, with 2.63 million (79.8%) turning out. Advance voting represented 1.24 million votes cast before election day. Note that advance voting is integrated into the local number of votes. The incumbent Prime Minister, Bill English, from the center-right National Party led a minority government supported by a coalition containing several small parties. The main Labour opposition party, led by Jacinda Ardern, supported by a coalition of two smaller parties, won the greatest number of MP's and thus the election. Given the frequency of general election, the political and economic contexts, and the absence of important political event before and during the campaign, we can assume that mobilization was at usual New Zealand level for this election.

For the purposes of our empirical work, the MMP system implies that voter turnout rates in any given census area will be affected in part by the characteristics of the local electorate, such as quality of individual candidates, closeness of race, election spending, etc., such that electorate fixed effects are necessary. Nevertheless, while voters may have definite preferences regarding the specific local candidates for direct election, much emphasis in the media and commentary is at the national level, regarding national party leaders or policy platforms. There is thus a relatively low variance in political context between electorates and we can logically assume that these national effects are homogeneous across space.[6]

A second feature of the New Zealand MMP system is that those of indigenous Maori descent may opt to enrol in the "general roll" and vote in their local general electorate (which comprises 64 of the total 71 electorates), or enrol in the "Maori roll" and vote in their broader geographic Maori electorate (7 of the 71 electorates). Slightly less than half of Maori choose the Maori roll.[7] This dual roll system was designed to ensure a minimum threshold of Maori representation in parliament. It implies that every census meshblock in New Zealand maps both to a (smaller) general electorate boundary, and to a (larger) Maori electorate boundary.

[5] The system is described further by the country's Electoral Commission at http://www.elections.org.nz/voting-system/mmp-voting-system.

[6] We discuss this hypothesis further when we introduce electorate political characteristics into our analysis.

[7] It was estimated in 2018 that 250,000 of 600,000 who identify as Maori chose the Maori roll. See https://www.maoritelevision.com/news/politics/general-roll-or-maori-roll-which-one-choose.

Given that 92.5% of enrolled voters are on the general roll, we will map census meshblocks to the general electorates and exclude the Maori electorates from our study.[8]

Beyond data availability, New Zealand's mixed voting system provides an interesting case for analysing political participation. The country's relatively few large constituencies (electorates) with a uninominal vote, are unusual in being coupled with a national constituency for plurinominal votes. This means that political factors are mainly national and therefore constant across electorates. On the other hand, the local socio-demographic characteristics of voters vary significantly within and across electorates. This combination of invariant political and varying socio-demographic characteristics makes the empirical analysis easier and interesting. Controlling for the main political characteristics is feasible using a few variables, as is controlling for factors such as social capital at the local level.

3.3 Voter Turnout Data

Data on voter turnout in the 2017 national election come from the New Zealand Electoral Commission. The Electoral Commission freely provides data on voter turnout rates for the 2017 national election, mapped to the finest census boundary unit of 'meshblock'. It also provides reverse mapping from 2013 census boundaries to 2017 electorate boundaries.[9]

In general, New Zealand has a relatively high voter turnout rate. In the previous 2014 national election, 7% of adults aged 18 or over reported being ineligible to vote, and 4% were eligible but not enrolled, leaving 89% of adults enrolled with the potential to vote.[10] In the September 23rd 2017 national election, of the 3.3 million adults who were enrolled to vote, 79% did so.[11] Table 1 confirms that our meshblock average turnout rate is 79% of enrolled voters, while the full distribution of 2017 meshblock turnout rates is illustrated in Figure 2.

4 Empirical Estimation Strategy

In this section, we describe our empirical estimation strategy, following the approach of François and Gergaud (2019). First, we explain our transformation of the raw volunteering

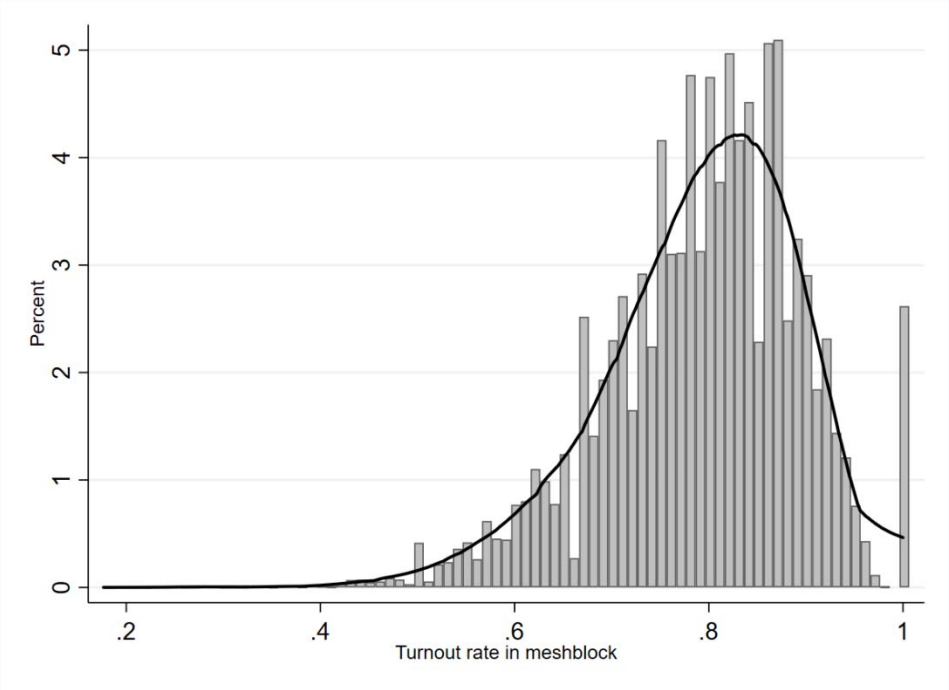
[8] For April 2019 enrolment data on the general and Maori rolls, see the country's Electoral Commission site https://www.elections.org.nz/research-statistics/enrolment-statistics-electorate

[9] Because the New Zealand census adjusts meshblock boundaries over time, in all cases we map back from 2017 or 2018 electorate boundaries to 2013 census boundaries – as these were used for the 2013 census.

[10] See https://www.stats.govt.nz/reports/voting-and-political-participation.

[11] See https://elections.nz/democracy-in-nz/historical-events/2017-general-election/voter-turnout-statistics-for-the-2017-general-election/

Figure 2. The distribution of voter turnout rate for the 2017 legislative elections



Notes: The observation unit is the "meshblock", the smallest geographic unit for which data is collected and processed by Statistics New Zealand.

rate measure to exclude confounding factors and concentrate on social interactions. Second, we describe our estimation strategy regarding voter turnout rates.

4.1 From volunteering rate to measure of social capital

We start by estimating the determinants of meshblock volunteering rates in New Zealand. This is informed by studies of volunteering in New Zealand by Clark and Kim (2012) and Thornton and Clark (2010). Following François and Gergaud (2019)'s methodology, we modify the raw volunteering rate to capture social capital. To do this, we remove from the raw variable observable confounding factors that are not directly related to intrinsic or extrinsic motivations, such as the opportunity cost of the activity and any other environmental factors at work with a potential influence on the decision to volunteer (Clark and Kim, 2012 and Thornton and Clark, 2010). The residual part of the raw variable should contain mainly social capital. Empirically, we regress *Volunteer Rate* as follows:

$$Volunteer\ Rate_m = \alpha + \alpha_W \boldsymbol{W}_m + \alpha_e Y_e + \varepsilon_m^{volunteer\ rate}. \qquad (2)$$

The meshblock level covariates in $\boldsymbol{W}_m$ include median household income, percentage of those 15 and over with university degrees, the unemployment rate, the percentage of the population aged 65 or older, the proportion male, population density, rural/urban status, ethnicity (European, Maori, Pacific, Asian, and Middle Eastern/Latin American/African), language (English, *Te Reo* Maori, Samoan, Other), religious affiliation (Christian, None, Other), residential stability, family composition (couple no children, couple with children, single parent), and home ownership rate. These covariates have been found to be significant previously, working either through the opportunity cost of time, opportunities/demands for volunteers, and proxying for differences in unobserved taste for volunteering (Clark and Kim 2012, and Thornton and Clark, 2010). Finally in (2), Y_e refers to electorate fixed effects (where each electorate contains many meshblocks).

As indicated in Table 2, this preliminary estimation finds that meshblock volunteering rates are falling in household income, population density, population, share with Pacific, Asian or ME/LA/A ethnicity (relative to European), no religion or other religion (relative to Christian), and share of families with single parents (relative to couples without children). Volunteering rates are rising in education, unemployment, rural status, share with Maori ethnicity (relative to European), share speaking *Te Reo* Maori or "Other" Language (relative to English), stability of residential location, homeownership, and share of families who are couples with children (relative to couples without children).

Finally the meshblock-level residuals $\varepsilon_m^{volunteer\ rate}$ from the estimation of (2) yield our measure of social capital, SC_m. We argue that this term should capture each meshblock's residual level of social capital that explains variation in volunteering rates when other controls for taste, opportunity cost and opportunities/demands for volunteers are controlled for. Put differently, we are able to assume that this residual contains intrinsic and extrinsic motivations for taking part in non-market interactions. The distribution of our transformed social capital measure is provided on the left side graph of Figure 1. We observe that our modified measure of social capital follows a normal distribution.

4.2 Empirical model and specifications

Equipped with our social capital measure, we then test whether it can explain variation in voter turnout rates at meshblock level.

$$Turnout\ Rate_m = \alpha + \alpha_{SC} SC_m + \alpha_W \boldsymbol{W}_m + \alpha_e Y_e + \varepsilon_m^{turnout\ rate}. \qquad (3)$$

Table 2. Estimation of volunteering rate

	Coef	(st. err)
Median household income	-0.0001***	(0.00001)
% of individuals with univ. degrees	0.134***	(0.003)
Unemployment rate	0.056***	(0.008)
% of individuals aged 65 +	-0.002	(0.004)
% male	-0.000	(0.006)
Population density (per square km)	-0.0003***	(0.00001)
Population	-0.00002***	(0.000003)
Rural status	0.012***	(0.001)
Maori (%)	0.040***	(0.005)
Pacific (%)	-0.038***	(0.006)
Asian (%)	-0.067***	(0.005)
Melaa (%)	-0.079***	(0.014)
Maori (lang.)	0.209***	(0.011)
Samoan (lang.)	0.021	(0.015)
Other language	0.026***	(0.008)
Other religion	-0.054***	(0.005)
No religion	-0.093***	(0.003)
Residential Stability: 5-14 years(%)	0.039***	(0.003)
Residential Stability: 15-29 years (%)	0.056***	(0.004)
Residential Stability: 30+ years(%)	0.032***	(0.006)
Home ownership (%)	0.062***	(0.003)
Family/couple with kids (%)	0.014***	(0.002)
Family single with kids (%)	-0.014***	(0.003)
Constant	0.108***	(0.005)
Electorate fixed effects	Yes	
Observations	42,365	
R-squared	0.268	

*Note: Standard errors in parentheses are clustered by electorate. *, **, and *** indicate significance at a level of 10%, 5%, and 1%, respectively. The Volunteering Rate is measured as the proportion of respondents within the meshblock reporting "Other helping or voluntary work for or through any organisation, group or marae" in the previous four weeks over the total who answered. The observation unit is the "meshblock," the smallest geographic unit for which statistical data is collected and processed by Statistics New Zealand.*

Here as before, Y_e is a set of broader electorate fixed effects, and $\boldsymbol{W}_m$ is a vector of demographic controls that capture differences in opportunity cost of time to vote, taste for voting, and opportunities/demands to vote. We include either a narrower set of covariates identified as determinants of voter turnout rates at the aggregate level (Blais 2000, Geys 2006a, Geys 2006b and Geys and Cancela 2016), or also add a broader set of covariates previously used for volunteering. We present and comment on both.

The electorate fixed effect Y_e plays an important role in (3), as it captures factors related to local political races and campaign mobilization that could affect voter turnout. Alternatively, we provide specifications where we exclude the fixed effects, and instead include electorate-level characteristics. In particular, we include the amount of election spending in the district, the number of candidates running for parliament, and the fractionalization of the local candidate votes. Election spending is a good proxy for the mobilization made and the resources engaged by the candidates and their respective parties

(Cox and Munger, 1989). The number of candidates has also been found to influence participation rates (Fauvelle-Aymar and François, 2005), though the evidence is mixed. Next, the fractionalization of votes between the local candidates is a good proxy for the closeness of each electorate's outcome (Fauvelle-Aymar and François, 2006).[12] Finally, our control variables - contained in either $\boldsymbol{W}_m$ or electorate characteristics- can be related to the different elements of the calculus of voting as suggested by the previous literature (see in particular Blais 2000, Geys 2006a, and Geys 2006b).

Our data and empirical strategy eliminate two of three sources of endogeneity inherent with the social capital variable. First, all variables dealing with meshblocks characteristics, including the volunteering rate and its social capital construct, come from the 2013 census, and so avoid simultaneity concerns. Second, our dataset covers an exceptionally large set of variables influencing electoral participation. The variables characterize either the meshblock or the electorate, especially through fixed effects. It is thus likely that we avoid omitted variable concerns in our specification. This is reinforced by our method of constructing our social capital variable, which eliminates the main confounding factors potentially contained in our raw measure. In contrast, we do not have an empirical strategy to identify the direction of the causality between social capital and electoral turnout. Our results, using rich and disaggregated data, can only show that both dimensions are significantly correlated.

5 Estimations of turnout rate

The estimation results for voter turnout rates from (3) with electorate fixed effects are displayed in Table 3. For purposes of comparison, we report results both with the original census-sourced volunteering rate, and the modified social capital measure SC_m.

Beginning with our control variables, we find that the 2017 meshblock voter turnout rate is consistently rising in 2013 meshblock median household income, share with university education, share aged 65 or older, population, rural status, share with European ethnicity, homeownership, and share of couples without children. Voter turnout is consistently falling in the share who are unemployed, have no religious affiliation, residential stability greater than five years, speak Samoan or "Other" language, are single parent families, and falling in meshblock population density. These results are stable to using our sparser or fuller sets of covariates, and to using raw volunteering rates or our residual-based social capital measure.

[12] Fractionalization scores are equivalent to one minus the Herfindahl measure of concentration. An electorate with four candidates each with 25% of the vote will score greater fractionalization than an electorate where one of the four candidates has 85% of the vote and the remaining three have 5%.

Table 3: Voter turnout estimates with raw and modified measure of volunteering rate, with electorate fixed effects

	Using raw volunteering rate		Using modified social capital	
	(1a) Baseline specification	(1b) Extended specification	(2a) Baseline specification	(2b) Extended specification
Social capital: raw measure of volunteering rate	0.113***	0.078***		
	(0.017)	(0.010)		
Social capital: modified measure of volunteering rate			0.080***	0.078***
			(0.012)	(0.010)
Median household income	0.001***	0.000***	0.001***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
% of individuals with univ. degrees	0.141***	0.090***	0.155***	0.100***
	(0.012)	(0.009)	(0.011)	(0.009)
Unemployment rate	-0.343***	-0.080***	-0.338***	-0.076***
	(0.020)	(0.013)	(0.019)	(0.013)
% of individuals aged 65 and +	0.160***	0.046***	0.173***	0.045***
	(0.007)	(0.007)	(0.007)	(0.007)
% male	0.003	-0.004	0.002	-0.004
	(0.012)	(0.010)	(0.012)	(0.010)
Population density (per square km)	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Population	0.000**	0.000***	0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Rural status	0.035***	0.026***	0.037***	0.027***
	(0.003)	(0.003)	(0.003)	(0.003)
Maori (%)		-0.156***		-0.153***
		(0.011)		(0.011)
Pacific (%)		-0.127***		-0.130***
		(0.017)		(0.017)
Asian (%)		-0.142***		-0.147***
		(0.013)		(0.013)
ME/LA/A (%)		-0.130***		-0.137***
		(0.024)		(0.024)
		0.025		0.041*

Maori (language)				
		(0.022)		(0.022)
Samoan (language)		-0.100***		-0.098***
		(0.035)		(0.035)
Other language		-0.035**		-0.033**
		(0.015)		(0.015)
Other religion		-0.003		-0.007
		(0.013)		(0.013)
No religion		-0.019***		-0.026***
		(0.006)		(0.007)
Residential Stability: 5-14 years(%)		-0.027***		-0.024***
		(0.006)		(0.006)
Residential Stability: 15-29 years (%)		-0.024***		-0.020***
		(0.007)		(0.007)
Residential Stability: 30+ years(%)		-0.029**		-0.026*
		(0.013)		(0.013)
Home ownership rate (%)		0.093***		0.098***
		(0.006)		(0.006)
Family/couple with kids (%)		-0.005		-0.004
		(0.005)		(0.005)
Family single with kids (%)		-0.043***		-0.044***
		(0.006)		(0.006)
Constant	0.686***	0.788***	0.694***	0.797***
	(0.010)	(0.009)	(0.010)	(0.010)
Electorate fixed effects	Yes	Yes	Yes	Yes
Observations	41,200	40,945	40,945	40,945
R-squared	0.360	0.432	0.361	0.432

*Note: Standard errors in parentheses are clustered by electorate. *, **, and *** indicate significance at a level of 10%, 5%, and 1%, respectively. The observation unit is the "meshblock", the smallest geographic unit for which statistical data is collected and processed by Statistics New Zealand. The raw measure of volunteering rate comes directly from the census, while the modified measure is the residual from the volunteering rate regression presented in Table 2.*

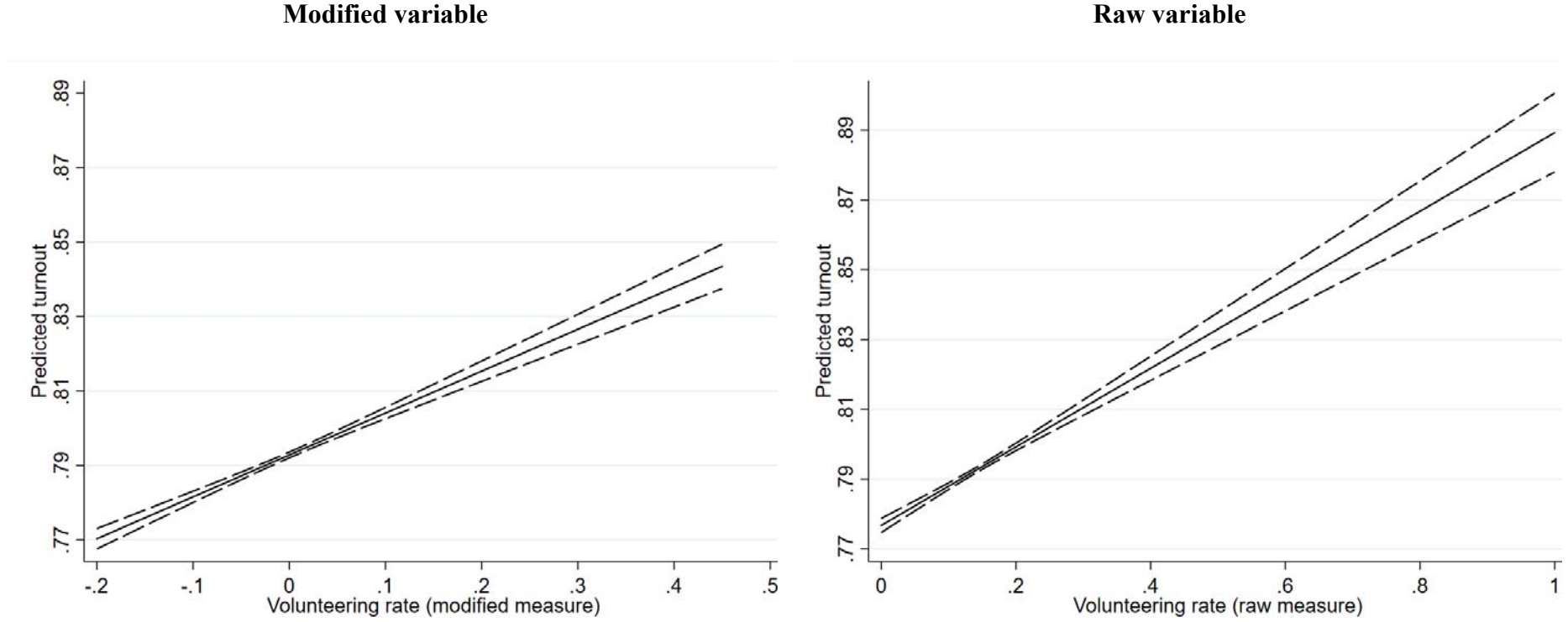
Moving to our key results, we find that voter turnout rates are rising in the meshblock volunteering rate, or in our residual-based social capital measure. In particular, in the extended Model (2) of Table 3, a one percentage point increase in the raw volunteering rate is associated with a 0.078 percentage point increase in the voter turnout rate. The magnitude of the estimated effect is greater if fewer covariates are used (Model 1, a 0.113 percentage point increase), or stable if instead the residual based social capital measure is used with the full list of covariates in Model 4 (again a 0.078 percentage point increase).

Figure 3 illustrates the estimated magnitude of effect of social capital (raw or modified) on predicted turnout rate. The impact on predicted turnout is lower with the modified construct compared to its raw equivalent. From the lowest value of our social capital/volunteering measures to the highest, the predicted turnout increases from approximately 78 to 83 percent. Put differently, the meshblock with the highest measured or constructed level of social capital experiences 5 percentage points more participation than the meshblock with the lowest level. At average turnout (79.3 percent), the marginal impact of an increase of one standard deviation of the modified social capital measure is associated with an increase in participation of 0.04 percentage points.

Moving next to Table 4, we show results from replacing electorate fixed effects with electorate characteristics previously identified as affecting voter turnout rates. Our results are generally stable to this change. In particular, voter turnout rates remain rising in household income, share with university education, share aged 65 or older, rural, European ethnicity, and homeownership. They remain falling in the unemployment rate, population density, and share living in the same residence for 5-14 years, or share of families with a single parent. However, turnout rates are no longer significantly falling in share speaking Samoan or "Other" language, share with no religious affiliation, or share residentially stable for more than 14 years. From the added electorate variables, voter turnout rates are rising in the closeness of voting shares between the local candidates, but surprisingly falling in the national parties' campaign expenditures in the electorate.

Again moving to our key results, voter turnout rates are again rising in either raw volunteering rates, or in residual-constructed social capital, in all specifications of Table 4. The magnitude of effect is similar to the case with electorate fixed effects. In models with extended covariates, a percentage point increase in 2013 raw volunteering rates or social capital is associated with a .077 or .078 percentage point increase in 2017 voter turnout rate, significant at the 1% level.

Figure 3. The impact of social capital (raw or modified measure) on predicted turnout



Notes: The volunteering rate is measured as the proportion of respondents within the meshblock reporting "Other helping or voluntary work for or through any organisation, group or marae" in the previous four weeks over the total who answered. The observation unit is the "meshblock", the smallest geographic unit for which statistical data is collected and processed by Statistics New Zealand. The raw measure of the volunteering rate comes directly from the census, while the modified measure is the residual from the volunteering rate regression presented in Table 2. The predicted turnout is obtained from models 1b (using the raw variable) and 2b (using the modified variable) described in Table 3.

Table 4: Voter turnout estimates with raw and modified measure of volunteering rate, with electorate characteristics

	Using raw volunteering rate		Using modified social capital	
	(3a) Baseline specification	(3b) Extended specification	(4a) Baseline specification	(4b) Extended specification
Social capital: raw measure of volunteering rate	0.163***	0.077***		
	(0.025)	(0.011)		
Social capital: modified measure of volunteering rate			0.079***	0.078***
			(0.012)	(0.010)
Fractionalisation index of electorate	0.296***	0.141***	0.309***	0.144***
	(0.086)	(0.040)	(0.087)	(0.040)
Parties' campaign expenditures in electorate	-0.000***	-0.000**	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Number of candidates running in electorate	0.000	0.001	0.000	0.001
	(0.002)	(0.001)	(0.002)	(0.001)
Median household income	0.001***	0.000***	0.001***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
% of individuals with univ. degrees	0.131***	0.135***	0.143***	0.145***
	(0.018)	(0.009)	(0.018)	(0.009)
Unemployment rate	-0.474***	-0.074***	-0.474***	-0.070***
	(0.036)	(0.016)	(0.036)	(0.016)
% of individuals aged 65 and +	0.167***	0.049***	0.186***	0.048***
	(0.010)	(0.008)	(0.011)	(0.008)
% male	0.016	-0.013	0.017	-0.013
	(0.015)	(0.012)	(0.015)	(0.012)
Population density (per square km)	-0.000**	-0.000*	-0.000**	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Population	0.000	0.000**	-0.000	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Rural status	0.041***	0.023***	0.046***	0.024***
	(0.004)	(0.003)	(0.005)	(0.003)
Maori (%)		-0.148***		-0.146***
		(0.014)		(0.014)
Pacific (%)		-0.134***		-0.137***
		(0.018)		(0.018)
Asian (%)		-0.160***		-0.166***
		(0.013)		(0.014)

ME/LA/A (%)		-0.095**		-0.101**
		(0.038)		(0.038)
Maori (lang.)		0.026		0.042
		(0.027)		(0.027)
Samoan (lang.)		-0.025		-0.025
		(0.055)		(0.056)
Other language		-0.033		-0.033
		(0.025)		(0.025)
Other religion		0.014		0.010
		(0.016)		(0.016)
No religion		-0.006		-0.014
		(0.009)		(0.008)
Residential Stability: 5-14 years(%)		-0.020***		-0.018***
		(0.006)		(0.006)
Residential Stability: 15-29 years (%)		-0.015*		-0.011
		(0.008)		(0.008)
Residential Stability: 30+ years(%)		-0.015		-0.012
		(0.016)		(0.016)
Home owners (%)		0.089***		0.094***
		(0.007)		(0.007)
Family/couple with kids (%)		-0.005		-0.005
		(0.006)		(0.006)
Family single with kids (%)		-0.043***		-0.045***
		(0.007)		(0.007)
Constant	0.551***	0.687***	0.562***	0.695***
	(0.047)	(0.026)	(0.047)	(0.025)
Electorate fixed effects	No	No	No	No
Observations	38,286	38,045	38,045	38,045
R-squared	0.296	0.409	0.291	0.409

*Note: Standard errors in parentheses are clustered by electorate. *, **, and *** indicate significance at a level of 10%, 5%, and 1%, respectively. The observation unit is the "meshblock", the smallest geographic unit for which statistical data is collected and processed by Statistics New Zealand. The raw measure of the volunteering rate comes directly from the census, while the modified measure is the residual from the volunteering rate regression presented in Table 2.*

We perform four robustness checks. First, instead of using electorate characteristics in our various specifications, we run estimations electorate by electorate (which is possible because the number of meshblocks per electorate ranges from 446 to 966). In particular, we run a series of baseline regressions with our raw, then modified, measure of social capital. The 128 estimated coefficients along with their 95% confidence interval are reproduced in Figure 4. Whatever construct we use, results are quite similar. For most electorates, the estimated coefficient is positive and significantly different from zero (at the 5% level) as expected, though the confidence interval is larger when we use the modified variable. Thus, multilevel analysis does not alter the results we get regarding the positive relationship between social capital and turnout rate.

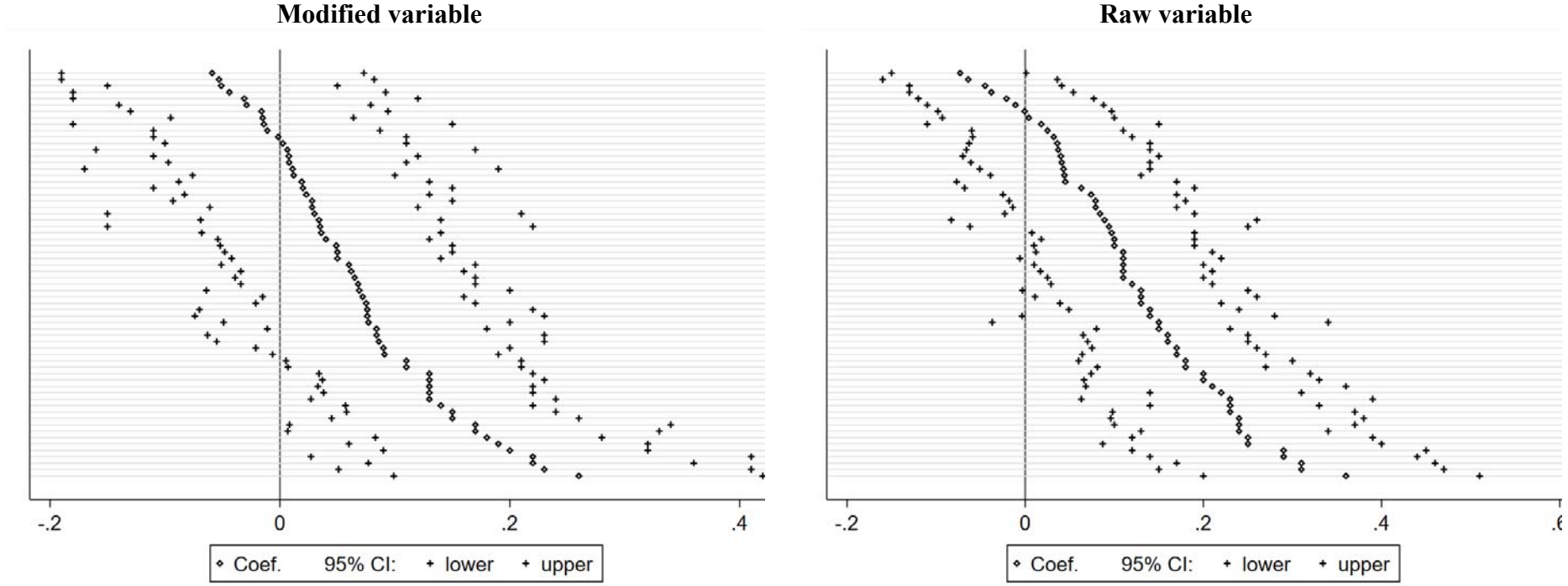
We next perform three additional robustness checks more fully described in Appendices 8.2, 8.3 and 8.4, and Appendix Tables A2 A3 and A4. First, we run regressions identical to those of Table 3 on a restricted sample that excludes all meshblocks with a turnout rate of 100 percent. These 820 different meshblocks account for about 2 percent of the distribution as illustrated in Figure 2. Our concern was that these outlying observations may have an impact on our estimates (a leverage effect). However, results on the full and restricted samples are quite similar (see Appendix 8.2). The new set of estimated coefficients (sign, magnitude and significance) continue to support a strong positive relationship between electoral turnout and social capital.

Next, we repeat our previous specifications without electorate level variables or fixed effects, first to estimate volunteering rates and then voter turnout rates. Our purpose was to check whether our main explanatory variable effect is itself driven by potential confounding factors related to the electorate level. The results are similar in significance and magnitude, particularly in the extended specifications (see Appendix 8.3) and support our conclusion that social capital and turnout are associated without controls for electorate characteristics.

Lastly, we adopt an alternative empirical strategy that treats the volunteering rate in the voter turnout regression as potentially endogenous, and instruments for it using all factors affecting volunteering rates in the initial stage of our earlier analysis. The limitation of this alternative approach is that our instruments may not satisfy the exclusion restriction, i.e. they may affect turnout directly, rather than solely through their effects on volunteering rates. Nonetheless, the results (see Appendix 8.4) again show a positive association between the volunteering rate and voter turnout in the second stage regression.

Based on the consistency of our results, we are confident of the positive relationship we document in this paper between social capital and turnout. The prediction, established by

Figure 4. Coefficients of social capital (raw or modified) – Breakdown by electorate



Notes: The volunteering rate is measured as the proportion of respondents within the meshblock reporting "Other helping or voluntary work for or through any organisation, group or marae" in the previous four weeks over the total who answered. The observation unit is the "meshblock", the smallest geographic unit for which statistical data is collected and processed by Statistics New Zealand. The raw measure of the volunteering rate comes directly from the census, while the modified measure is the residual from the volunteering rate regression presented in Table 2. The coefficient is obtained from models 1a (raw variable) and 2a (modified variable) described in Table 3 applied to the 64 New Zealand electorates.

incorporating social capital into the calculus of voting, is empirically supported using a measure of social capital based on the volunteering rate.

6 Conclusion

In this paper, we have adopted a definition of social capital as the set of social interactions that a person establishes or that are produced in a given geographical space or community. We have applied this definition to predict how social capital could affect the "rational calculus" of whether individuals choose to vote. We identify three theoretical channels through which social capital could increase an individual's net benefit from voting. We then join a heretofore sparse literature that tests whether higher social capital raises voter turnout rates. We conduct this test using fine grained "meshblock" level census data for the full population of New Zealand in 2013, together with meshblock level voter turnout data for all adults enrolled to vote in the 2017 New Zealand national election. Our measure of social capital is either the proportion of individuals aged 15 or over who had volunteered in the four weeks prior to the 2013 census date, or the residuals from a regression of that volunteering rate on covariates previously identified as proxying for the taste, opportunity cost, or demand/ opportunities for volunteering in New Zealand.

We find consistent evidence that both the raw volunteering rate in 2013 and residual-based social capital measure, are significantly positively associated with meshblock voter turnout rates in 2017. This result is robust to the inclusion of few or many covariates, raw volunteering rates or constructed social capital measures, and to the use of electorate level fixed effects, or electorate level measures of campaign spending, closeness of race between candidates, and number of candidates. Across six of eight reasonable specifications, we find that a one percentage point increase in volunteering rates (with a sample mean of 14%) results in a 0.077 to 0.080 percentage point increase in voter turnout (with a sample mean of 79%).

Of the three previous studies we have identified on social capital and voter turnout, our results are consistent with those of Bwalya and Sukumar (2018) in their survey based study in Botswana, Namibia and Zambia, but not consistent with the lack of effect or even negative effect of experiment-based studies by Atkinson and Fowler (2012) in Mexico, or by Condon (2011) for the American states of Arizona and Texas. It has hard to make any firm conclusions based on such a limited evidence base. Tentatively, on the one hand, experiment-based studies can more cleanly identify causation than empirical studies based on census or survey data. On the other hand, experimental or quasi-experimental studies can fail to manipulate the thickness of those types of social interactions that are meaningful to people;

interactions that they would choose for themselves among many alternatives on offer. Both Bwalya and Sukumar's study, and our own, measure the effects of participation in those civic associations or volunteering roles that respondents choose for themselves.

What we can say with confidence is that we have applied an operational definition of social capital to the rational calculus of voting, and consistent with this theory's predictions, found that prior social capital levels at meshblock level for the population of New Zealand are positively associated with subsequent voter turnout rates in that country's national elections.

7 References

Allport, G. W. (1954). The nature of prejudice. Reading, MA: Addison Wesley.

Bwalya, J. C., & Sukumar, P. (2018). The Association between Social Capital and Voting Participation in Three Developing Democracies in Africa. J. Pol. & L., 11, 42.

Beck, P., Dalton, R., Greene, S., & Huckfeldt, R. (2002). The Social Calculus of Voting: Interpersonal, Media, and Organizational Influences on Presidential Choices. American Political Science Review, 96(1), 57-73. doi:10.1017/S0003055402004239

Bjørnskov, C. (2006). The Multiple Facets of Social Capital. European Journal of Political Economy 22 (1), 22-40.

Blais, A. (2000). *To Vote or Not to Vote ? The Merits and Limits of Rational Choice Theory*. Pittsburgh: University of Pittsburgh Press.

Blais, A., Daoust, J-F., Dassonneville, R. & Péloquin-Skulski, G. (2019) What is the cost of voting?, Electoral Studies, 59, 145-157.

Brehm, J., & Rahn, W. (1997). Individual-level evidence for the causes and consequences of social capital. American journal of political science, 41(3), 999-1023.

Brennan, G., & Lomasky, L. E. (1997). Democracy and decision: The pure theory of electoral preference. Cambridge, MA: Cambridge University Press.

Carreras, M., & Bowler, S. (2019). Community Size, Social Capital, and Political Participation in Latin America. Political Behavior, 41(3), 723-745.

Clark, J., & Kim, B. (2012). The effect of neighborhood diversity on volunteering: Evidence from New Zealand. The B.E. Journal of Economic Analysis and Policy, 12, (Topics), Article 5 (47pp).

Condon, M. (2011) "The Effect of Social Capital on Voter Turnout: A Field Experiment in Two Southwestern Cities", paper presented at the Annual Meeting of the American Political Science Association, Seattle.

Converse, P. (2000). Assessing the capacity of mass electorates. Annual Review of Political Science, 3, 331–353.

Cox, G. W., & Munger, M. C. (1989). Closeness, expenditures, and turnout in the 1982 US House elections. American Political Science Review, 83(1), 217-231.

Dhillon, A. and Peralta, S. (2002), Economic theories of voter turnout. The Economic Journal, 112: 332-352.

Downs, A. (1957) *An Economic Theory of Democracy*. New York: Harper and Row.

Fauvelle-Aymar, C. and François, A. (2005) "Campaign, Political Preference and Turnout. An Empirical Study of the 1997 French Legislative Election" French Politics, 3(1): 49-72, avril 2005.

Fauvelle-Aymar, C. and François, A. (2006) "The Impact of Closeness on Turnout: An Empirical Relation Based on a Study of a Two Round Ballot", Public Choice, 127: 469-491

Fauvelle-Aymar, C. and François, A. (2018) "Place of registration and place of residence: The non-linear detrimental impact of transportation cost on electoral participation", Public Choice, 176(3): 405-440.

Fiorina, M. P. (1976). The voting decision: Instrumental and expressive aspects. Journal of Politics, 38(2), 390–413.

François, A. and Gergaud, O. (2019) "Is Civic Duty the Solution to the Paradox of Voting?", *Public Choice*, 180(3-4): 257-283, https://doi.org/10.1007/s11127-018-00635-7

Fowler, J. (2006). Altruism and Turnout. The Journal of Politics, 68(3), 674-683. doi:10.1111/j.1468-2508.2006.00453.x

Gerber, A. S., D. P. Green and C. W. Larimer. 2008. "Social pressure and voter turnout: Evidence from a large-scale field experiment." American Political Science Review 102(01):33–48.

Geys, B. (2006a). Explaining voter turnout: A review of aggregate-level research. Electoral Studies, 25(4), 637–663.

Geys, B. (2006b). 'Rational' theories of voter turnout: A review. Political Studies Review, 4, 16–35.

Geys, B., & Cancela, J. (2016). Explaining voter turnout: A meta-analysis of national and subnational elections. Electoral Studies, 42(june), 264–75.

Holtgraves, T. (2004). Social desirability and self-reports: Testing models of socially desirable responding. Personality and Social Psychology Bulletin, 30(2), 161–172.

Huber, P., & Montag, J. (2019). Homeownership, Political Participation, and Social Capital in Post-Communist Countries and Western Europe. Kyklos, 73(1), 96-119.

Hur, A. (2017) Is there an intrinsic duty to vote? Comparative evidence from East and West Germans, Electoral Studies, 45, 55-62,

Jackman, R. W., & Miller, R. A. (1998). Social capital and politics. Annual review of political science, 1(1), 47-73.

Kamenica, E., & Brad, L. E. (2014). Voters, dictators, and peons: Expressive voting and pivotality. Public Choice, 159(1–2), 159–176.

Klofstad, C. A. 2007. "Talk leads to recruitment: How discussions about politics and current events increase civic participation." Political Research Quarterly 60(2):180.

Lin, N. (2002). Social capital: A theory of social structure and action. Cambridge university press.

Lin, N. (2008). A network theory of social capital. The handbook of social capital, 50(1), 69.

Lin, N., Cook, K. S., & Burt, R. S. (Eds.). (2001). Social capital: Theory and research. Transaction Publishers.

McClurg, S. (2003). Social Networks and Political Participation: The Role of Social Interaction in Explaining Political Participation. Political Research Quarterly, 56(4), 449-464. doi:10.2307/3219806

Paldam, M. (2000). Social capital: one or many? Definition and measurement. Journal of economic surveys, 14(5), 629-653.

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

Putnam, R. D. (1995a). "Bowling Alone: America's Declining Social Capital." Journal of Democracy 6(1), 65-78.

Putnam, R. D. (1995b). Tuning in, tuning out: The strange disappearance of social capital in America. PS: Political science & politics, 28(4), 664-683.

Putnam, R. D. (2000). Bowling Alone: The Collapse and Revival of American Community. Simon & Schuster.

Putnam, R., Leonardi, R., Nanetti, R. (1993) Making Democracy Work: Civic Traditions in Modern Italy. Princeton: Princeton University Press.

Riker, W., & Ordeshook, P. (1968) "A theory of the calculus of voting." *American Political Science Review*, 62, 25–43.

Rusch, H. (2014). The evolutionary interplay of intergroup conflict and altruism in humans: a review of parochial altruism theory and prospects for its extension. Proceedings of the Royal Society of London B: Biological Sciences, 281(1794), 20141539.

Silver, B. D., Anderson, B. A., & Abramson, P. R. (1986). Who overreports voting? The American Political Science Review, 80(2), 613–624.

Stolle, D. (2007). Social capital, in Dalton, R. J., & Klingemann, H. D. (2007). The Oxford handbook of political behavior. Oxford University Press, pp 655-674.

Svendsen, G. T., & Svendsen, G. L. H. (Eds.). (2009). Handbook of social capital: the Troika of sociology, political science and economics. Edward Elgar Publishing.

Thornton, S. and Clark, J. (2010) Does higher social diversity lower people's contributions to public goods? The case of volunteering in New Zealand. New Zealand Economic Papers, 44, 1, 27-60.

Tollison, R. & Willett, T. (1973) "Some simple economics of voting and non-voting.", *Public Choice*, 16, 59–72.

Tullock, G. (1968). *Toward a mathematics of politics*. Ann Arbor: University of Michigan Press.

8 Appendices

8.1 Summary statistics

Table A1: Description of Variables

Variable	Description
Volunteering	2013 Proportion of meshblock reporting "Other Helping or Voluntary Work For or Through any Organisation, Group or Marae" in the previous four weeks. Excludes following unpaid activities outside the household: caring for a child or someone who is ill, elderly, or disabled.
	Construction: "Other Helping…."/(Total Who Answered)
Ethnic Shares	2013 The proportion of meshblock usual residents reporting one of five ethnic identifications: European/Other (where other primarily includes "New Zealander", Maori, Pacific, Asian, and Middle Eastern/Latin American/African. Individuals could select more than one ethnicity, so each ethnic share is calculated as a share of the total reported ethnic affiliations across these five categories, rather than over total people.
	Construction: frequencies were summed across the five categories to create a base of total ethnic affiliations from which shares were calculated. "Other" ethnicities includes very small numbers of North American Inuit or Indian, Mauritian, etc., and is overwhelmingly those reporting "New Zealander." In the 2006 census, 90% of those reporting New Zealander were thought to be European, and so we combine "Other" with European for 2013.
Language Shares	2013. Meshblock usual residents indicated if they could speak either English, Maori, Samoan, or Other languages. Individuals could select more than one language (or none). So language shares are constructed from the baseline of total languages spoken, rather than total people.
Median HH Income	2013 The median household income from all sources for usual residents of meshblock aged 15 or older. Not yet deflated by GDP deflator.
Male	2013. The share of a meshblock's usually resident population that is female.
	Construction: frequency "Male" over "Total People"
Population	2013. Usually resident population of meshblock.
Population Density	2013. Meshblock usually resident population divided by meshblock square kilometers.
Age -- Median 2013.	Median age of meshblock usually resident population.
Age – Share 30-64	2013. Proportion of usually resident population aged 30-64.
Age – Share 65+	2013. Proportion of usually resident population aged 65 or greater.

Variable	Description
Family Type	2013. The share of meshblock families in private dwellings who are couples without children, couples with children, or single parent families.
	Construction: frequencies were summed across the three possible categories to provide a baseline.
Religious Affiliation	2013. The share of each meshblock's usually resident population identifying with one of three categories: Christian, Other Religion, and No Religion. Individuals can affiliate with more than one, so that the base is calculated from total reported affiliations, rather than total people.
	Construction: Other Religion summed frequencies across Buddhist, Hindu, Islam/Muslim, Judaism, Maori Christian, Spiritualist/New Age and Other Religions. Denominator calculated from these affiliations, plus Christian and No Religion affiliations.
Years at Residence	2013. The share of usually resident meshblock individuals who lived at current residence 0-4 years, 5-14 years, 15-29 years, or 30 years or more.
	Construction: each share calculated over the total number of people for whom length of residence is known.
University Degree	2013. The share of each meshblock's usually resident population 15 or over whose highest degree is a bachelor's degree or higher.
	Construction: summed frequencies of "Bachelor's Degree or Level 7 Qualification," "Postgraduate and Honours Degrees," "Masters" and PhD degrees, divided by total people who answered.
Labor Force Status	2013. The share of the usually resident population in each meshblock aged 15 or over in one of four possible categories of labor force status: employed full time, employed part-time, unemployed, or not in labor force.
	Construction: frequencies for four categories summed to provide a baseline from which shares calculated.
Home Ownership Indiv.	2013 The share of usually resident meshblock individuals aged 15 or over who own or partially own their own homes.
	Construction: those reporting owning/partialy owning their own homes divided by total number of individuals who answered.
Home Ownership HH	2013. The share of households owned or partially owned by their usual residents, or held in a family trust.
	Construction: frequencies of households 1) owned/partially owned by residents or 2) held in family trusts, summed and divided by total number of households who provided ownership information.

8.2 Estimations on a restricted sample of meshblocks

In this appendix we present estimates based on a restricted sample that excludes those meshblocks with a turnout rate of 100 percent. These 820 different meshblocks account for about 2 percent of the distribution. In Table A2, which is equivalent to Table 3, we check whether including or excluding such meshblocks has an influence on our results.

[Insert Table A2 here]

Our restricted sample estimates are quite similar to our full-sample estimates, hence we conclude that our main results are not driven by these meshblocks.

8.3 Estimations without fixed effects or electorate characteristics

This appendix presents estimation outcomes with alternative specifications. We exclude electorate fixed effects, or alternatively electorate characteristics, from the regressions previously run for the volunteering rate, and for the turnout rate. The estimates obtained with both baseline and extended covariates are displayed in Appendix Table A3.

[Insert Table A3 here]

We observe that excluding electorate fixed effects or characteristics from the empirical analysis does not change our conclusion. The significance and direction of the effects are not affected. In particular, the sign of our social capital variables in voter turnout regressions have coefficients with an identical positive sign and significance. The magnitudes of the key coefficients differ, but in an extremely limited way. We thus conclude that our main results are not sensitive to introduction or exclusion of variables related to electorate characteristics.

8.4 Estimations with 2SLS

This appendix presents an alternative empirical strategy. Instead of transforming the volunteering rate through its estimation residuals, we use its prediction from the first stage of 2SLS estimation as our social capital variable. In that first stage, we estimate the volunteering rate using as instruments the set of variables previously used in our volunteering regression.

In the second stage, the variables used for voter turnout are identical to those used in our earlier baseline voter turnout specification. The results are given in Appendix Table A4.

[Insert Table A4 around here]

Though we have questions about whether our instruments satisfy the exclusion restriction, persisting with them we again find that our social capital measure is significantly positively associated with voter turnout rates in second stage regressions.

Appendix Table A2. Voter turnout estimates excluding full-turnout meshblocks

	Using raw volunteering rate		Using modified social capital	
	Baseline specification	Extended specification	Baseline specification	Extended specification
Social capital: raw measure of volunteering rate	0.11***	0.069***		
	(0.017)	(0.0092)		
Social capital: modified measure of volunteering rate			0.070***	0.069***
			(0.011)	(0.0092)
Median household income	0.00071***	0.00017***	0.00073***	0.00016***
	(0.000039)	(0.000031)	(0.000040)	(0.000031)
% of individuals with univ. degrees	0.14***	0.091***	0.15***	0.10***
	(0.012)	(0.0093)	(0.011)	(0.0089)
Unemployment rate	-0.35***	-0.086***	-0.34***	-0.082***
	(0.019)	(0.012)	(0.019)	(0.012)
% of individuals aged 65 and +	0.15***	0.040***	0.17***	0.040***
	(0.0076)	(0.0073)	(0.0076)	(0.0073)
% male	-0.0017	-0.0087	-0.0032	-0.0087
	(0.011)	(0.0099)	(0.011)	(0.0099)
Population density (per square km)	-0.0000017***	-0.00000073***	-0.0000019***	-0.00000075***
	(0.00000052)	(0.00000022)	(0.00000058)	(0.00000022)
Population	0.000029***	0.000033***	0.000023***	0.000031***
	(0.0000074)	(0.0000043)	(0.0000076)	(0.0000044)
Rural status	0.030***	0.021***	0.031***	0.021***
	(0.0029)	(0.0026)	(0.0030)	(0.0026)
Maori (%)		-0.15***		-0.15***
		(0.011)		(0.011)
Pacific (%)		-0.13***		-0.13***
		(0.016)		(0.017)
Asian (%)		-0.14***		-0.15***
		(0.012)		(0.012)
ME/LA/A (%)		-0.14***		-0.14***
		(0.022)		(0.022)
Maori (language)		0.030		0.045**
		(0.022)		(0.021)
Samoan (language)		-0.084**		-0.082**

		(0.034)		(0.034)
Other language		-0.034**		-0.032**
		(0.014)		(0.014)
Other religion		-0.0029		-0.0066
		(0.013)		(0.013)
No religion		-0.017***		-0.023***
		(0.0061)		(0.0064)
Residential Stability: 5-14 years(%)		-0.022***		-0.019***
		(0.0055)		(0.0055)
Residential Stability: 15-29 years (%)		-0.019***		-0.015**
		(0.0067)		(0.0066)
Residential Stability: 30+ years(%)		-0.025**		-0.023*
		(0.012)		(0.013)
Home ownership rate (%)		0.096***		0.100***
		(0.0056)		(0.0055)
Family/couple with kids (%)		-0.0038		-0.0028
		(0.0045)		(0.0045)
Family single with kids (%)		-0.038***		-0.039***
		(0.0056)		(0.0056)
Constant	0.69***	0.77***	0.71***	0.78***
	(0.0070)	(0.0093)	(0.0066)	(0.0095)
Electorate fixed effects	Yes	Yes	Yes	Yes
Observations	40368	40125	40125	40125
R-squared	0.37	0.44	0.37	0.44

*Note: Standard errors in parentheses are clustered by electorate. *, **, and *** indicate significance at a level of 10%, 5%, and 1%, respectively. The observation unit is the "meshblock", the smallest geographic unit for which statistical data is collected and processed by Statistics New Zealand. The raw measure is the census volunteering rate, while the modified measure is the residual of its estimation identical to that obtained in Table 2.*

Appendix Table A3. Voter turnout estimates without electorate fixed effects or characteristics

	Using raw volunteering rate		Using modified social capital	
	Baseline specification	Extended specification	Baseline specification	Extended specification
Social capital: raw measure of volunteering rate	0.19***	0.085***		
	(0.026)	(0.011)		
Social capital: modified measure of volunteering rate			0.087***	0.085***
			(0.014)	(0.011)
Median household income	0.00051***	0.00017***	0.00052***	0.00015***
	(0.000068)	(0.000037)	(0.000068)	(0.000037)
% of individuals with univ. degrees	0.15***	0.14***	0.17***	0.16***
	(0.022)	(0.010)	(0.024)	(0.010)
Unemployment rate	-0.48***	-0.063***	-0.48***	-0.059***
	(0.040)	(0.017)	(0.041)	(0.017)
% of individuals aged 65 and +	0.18***	0.053***	0.20***	0.052***
	(0.012)	(0.0086)	(0.013)	(0.0086)
% male	0.024*	-0.011	0.025*	-0.010
	(0.013)	(0.011)	(0.013)	(0.011)
Population density (per square km)	-0.0000023**	-0.00000044*	-0.0000028**	-0.00000047*
	(0.0000011)	(0.00000024)	(0.0000013)	(0.00000024)
Population	-0.0000075	0.000011	-0.000019*	0.0000081
	(0.000010)	(0.0000066)	(0.000011)	(0.0000067)
Rural status	0.040***	0.021***	0.046***	0.023***
	(0.0038)	(0.0027)	(0.0047)	(0.0027)
Maori (%)		-0.15***		-0.15***
		(0.014)		(0.014)
Pacific (%)		-0.14***		-0.14***
		(0.023)		(0.023)
Asian (%)		-0.16***		-0.17***
		(0.014)		(0.014)
ME/LA/A (%)		-0.090**		-0.096**
		(0.041)		(0.041)
Maori (language)		0.041		0.060**
		(0.026)		(0.026)
Samoan (language)		-0.031		-0.030
		(0.060)		(0.060)
Other language		-0.041*		-0.041*

		(0.024)		(0.024)
Other religion		0.0086		0.0046
		(0.016)		(0.016)
No religion		0.0018		-0.0061
		(0.0077)		(0.0073)
Residential Stability: 5-14 years(%)		-0.022***		-0.019***
		(0.0063)		(0.0063)
Residential Stability: 15-29 years (%)		-0.014*		-0.010
		(0.0079)		(0.0079)
Residential Stability: 30+ years(%)		-0.0096		-0.0064
		(0.017)		(0.017)
Home ownership rate (%)		0.089***		0.094***
		(0.0073)		(0.0071)
Family/couple with kids (%)		-0.0067		-0.0063
		(0.0061)		(0.0061)
Family single with kids (%)		-0.043***		-0.045***
		(0.0073)		(0.0072)
Constant	0.68***	0.76***	0.71***	0.77***
	(0.011)	(0.010)	(0.0098)	(0.010)
Electorate fixed effects	No	No	No	No
Observations	41,200	40,945	40,945	40,945
R-squared	0.27	0.40	0.27	0.40

*Note: Standard errors in parentheses are clustered by electorate. *, **, and *** indicate significance at a level of 10%, 5%, and 1%, respectively. The observation unit is the "meshblock", the smallest geographic unit for which statistical data is collected and processed by Statistics New Zealand. The raw measure is the census volunteering rate, while the modified measure is the residual of its estimation similar to that obtained in Table 2, but with the electorate fixed effects excluded from the specification.*

Appendix Table A4. Voter turnout estimated with the method of 2SLS

	1st stage: Volunteering rate	2nd stage: Turnout rate
	Coef. (s.e.)	Coef. (s.e.)
Social capital: predicted volunteering rate		0.38***
		(0.099)
Median household income	-0.00010**	0.00068***
	(0.000040)	(0.000043)
% of individuals with univ. degrees	0.13***	0.12***
	(0.010)	(0.016)
Unemployment rate	0.056***	-0.36***
	(0.012)	(0.019)
% of individuals aged 65 and +	-0.0021	0.15***
	(0.0053)	(0.010)
% male	-0.000012	0.0068
	(0.0078)	(0.012)
Population density (per square km)	-0.00000029*	-0.0000014***
	(0.00000017)	(0.00000051)
Population	-0.000023***	0.000026***
	(0.0000047)	(0.0000066)
Rural status	0.012***	0.031***
	(0.0029)	0.38***
Maori (%)	0.040***	
	(0.011)	
Pacific (%)	-0.038***	
	(0.010)	
Asian (%)	-0.067***	
	(0.0088)	
ME/LA/A (%)	-0.079***	
	(0.019)	
Maori (language)	0.21***	
	(0.026)	
Samoan (language)	0.021	
	(0.021)	
Other language	0.026	
	(0.016)	

Other religion	-0.054***	
	(0.0064)	
No religion	-0.093***	
	(0.0059)	
Residential Stability: 5-14 years(%)	0.039***	
	(0.0047)	
Residential Stability: 15-29 years (%)	0.056***	
	(0.0059)	
Residential Stability: 30+ years(%)	0.032***	
	(0.011)	
Home ownership rate (%)	0.062***	
	(0.0057)	
Family/couple with kids (%)	0.014***	
	(0.0035)	
Family single with kids (%)	-0.014***	
	(0.0039)	
Constant	0.11***	0.65***
	(0.0082)	(0.016)
Electorate fixed effects	Yes	Yes
Observations	40,945	
R-squared	0.27	0.34

*Note: Standard errors in parentheses are clustered by electorate. *, **, and *** indicate significance at a level of 10%, 5%, and 1%, respectively. The volunteering rate is measured as the proportion of respondents within the meshblock reporting "Other helping or voluntary work for or through any organisation, group or marae" in the previous four weeks over the total who answered. The observation unit is the "meshblock", the smallest geographic unit for which statistical data is collected and processed by Statistics New Zealand*.