Pro-social Preferences and the Paradox of Voting*

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Abstract

Why do people vote in large elections? Theoretical arguments to resolve this 'paradox' of voting often build on individuals' pro-social motivations, which make turnout decisions less sensitive to the pivot probability. We use register data covering the entire Norwegian vote-eligible population to test the ensuing hypothesis that the turnout *gap* between more/less pro-social individuals increases with electorate size. Our identification strategy leverages population-size shocks from inter-municipal mobility, while we proxy pro-social motivations via individuals' charitable donations. We show that increasing electorate size widens the turnout gap between more/less pro-social individuals, and that turnout of pro-social individuals responds less to population-size shocks.

Keywords: Calculus of voting, Civic duty, Voter turnout, Altruism, Norway

JEL Classification: D72, D64

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1. Introduction

A key determinant of individual-level voter turnout in the 'calculus of voting' model is the probability that one's vote is pivotal (Downs 1957). As this pivot probability declines rapidly with electorate size (Owen and Grofman 1984), two main extensions to the model have been proposed to resolve the 'paradox' of why many people vote in large-scale elections (Geys 2006). The first extension relates to the concept of civic duty, and was originally formulated in Riker and Ordeshook (1968). Civic duty makes citizens turn out because they derive benefits from complying with the social norm to vote, unrelated to any hopes of influencing the election outcome. The second extension assumes that people derive utility also from how the election outcome affects relevant others (Morton 1991; Fowler 2006; Edlin, Gelman and Kaplan 2007). The gains from winning under such 'instrumental altruism' may outweigh the costs of voting even in large elections despite the small probability of influencing the election outcome.[1]

Both of these extensions to the 'calculus of voting' model posit that turnout among pro-social individuals remains largely unaffected as electorate size increases, whereas self-interested voters would only participate in small-scale elections where the likelihood of swaying the outcome is greater (Riker and Ordeshook 1968; Geys 2006; Andersen, Fiva and Natvik 2014).[2] Consequently, citizens with pro-social motivations would be expected to participate in large-scale elections to a greater extent than self-interested voters (Fowler 2006; Jankowski 2007; Feddersen, Gailmard and Sandroni 2009; Bali, Robison and Winder 2020) because their turnout decision is less sensitive to the likelihood of influencing the election. In this paper, we offer a novel and direct test of the ensuing hypothesis that the turnout 'gap' between

[1]We focus here on models that stress individual voter characteristics. Other common extensions rather look at forces *outside* the individual voter. For instance, considerable attention has been awarded to the role of mobilization efforts by politicians and party organizations (Cox and Munger 1989; Uhlaner 1989; Gerber and Green 2000; Cox, Fiva and King 2024), or the effect of social pressures arising from, for instance, image concerns (DellaVigna et al. 2016) and social interactions (Funk 2010). Note also that turnout decisions based on instrumental benefits would require that election outcomes affect subsequent policies and policy outcomes. Recent empirical work using credible identification strategies suggests that this is indeed the case (e.g., Fiva, Folke and Sørensen 2018; Hyytinen et al. 2018).

[2]Evidence from natural and laboratory experiments strongly suggests a causal relationship between the (perceived) pivot probability and voter turnout (Duffy and Tavits 2008; Bhatti and Hansen 2019; Lyytikäinen and Tukiainen 2019; Allers et al. 2021).

more/less pro-social individuals increases with electorate size (and the associated decline in pivot probability).

Naturally, we are not the first to assess how individuals' pro-social motivations affect voter turnout. Yet, our work differs from previous analyses in three main respects. First, existing evidence based on laboratory experiments (e.g. Feddersen, Gailmard and Sandroni 2009; Fowler 2006) may have limited external validity (Levitt and List 2007), while studies using self-reported survey data (e.g. Jankowski 2007; Bali, Robison and Winder 2020) can lead to biased inferences due to non-response and social desirability issues, mismeasurement, and so on (Karp and Brockington 2005; Dahlgaard et al. 2019). In contrast, our main analysis exploits individual-level turnout data from administrative registers covering the entire eligible voting population in Norway for the 2019 and 2023 local elections. Second, using administrative tax records, we can capture individuals' pro-social motivations via their actual contributions to charitable organizations. Since pro-social motives are often found to play a key role for charitable giving (e.g. Wiepking and Maas 2009; Ottoni-Wilhelm, Vesterlund and Xie 2017; Ottoni-Wilhelm and Vesterlund 2023), donations can serve as a valid behavioral indicator of pro-sociality in our analysis. Finally, our main analysis leverages inter-municipal mobility as a source of individual-level population 'shocks' (while a robustness check exploits municipal mergers). Assuming that such moves are unrelated to individuals' preferences for influencing local election outcomes (Rabe and Taylor 2010; Kronenberg and Carree 2012; Bergman et al. 2024), this allows us to identify whether the impact of eligible population size on voter turnout is moderated by individuals' pro-social motivations (Cantoni and Pons 2022; Geys and Sørensen 2022; Yeandle forthcoming).

Our main results establish a clear pattern. Individuals who move to more populous municipalities become less likely to vote in local elections, while those relocating to smaller municipalities show an increase in electoral participation. Crucially, and consistent with theoretical expectations, this change in voter turnout is conditional on individuals' pro-social motivations (as reflected in their charitable donation behaviour). That is, population shocks have a statistically and substantively more meaningful impact on turnout among non-donors relative to donors. A similar pattern arises when using population shocks arising from munici-

pal mergers for identification purposes. Importantly, a placebo check using the 2017 and 2021 national parliamentary elections – which take place in 19 larger districts that limit the role of municipal electorate size for turnout decisions – shows no similar pattern. This corroborates that our main findings are driven by mobility-induced shifts in the pivot probability (rather than any effect of moving, local contextual factors, or municipality size as such). This interpretation is further validated by auxiliary analyses where we replace population size with a proxy for the pivot probability at the municipality level (based on simulated seat allocations when awarding parties a limited number of additional votes). In line with our main theoretical argument, a higher pivot probability is found to have a substantially smaller positive effect on voter turnout among pro-social voters. Finally, we use data from the Norwegian Election Surveys (2003-2019; N $\approx$ 6000 respondents) to cross-validate our findings using a distinct measure of pro-social motivations (i.e. self-professed civic duty to vote). Our identification strategy in this case exploits the concurrence of municipal and county elections, and the location of municipalities within the more populous counties (Andersen, Fiva and Natvik 2014; Andersen and Sørensen 2022). The results again confirm our main inferences that the turnout gap between more/less pro-social individuals widens with increasing electorate size.

Our analysis first of all adds to the literature on individuals' motivations to participate in large-scale elections, which has been a continuous source of academic debate since at least the works of Downs (1957) and Riker and Ordeshook (1968). More specifically, our findings emphasize the importance of pro-social motives in explaining individual-level turnout decisions in large-scale elections, which also relates to a more specialized literature on the relationship between jurisdiction size and democracy (Dahl and Tufte 1973; Anckar 2008). Second, our work connects to a vibrant scholarship highlighting that individuals might derive utility from being seen to vote by relevant others (Funk 2010), or may turn out to vote for "social image concerns" (DellaVigna et al. 2016, 143; see also Gerber et al. 2016). Such studies draw attention to the pressures to vote arising from individuals' social environment and interactions, which constitute an important complement to our focus on pro-social individuals' (felt) moral obligations and motivations. Finally, our study contributes to the literature on the drivers and consequences of charitable behavior. By showing that donors are more likely to

engage in the act of voting, we provide empirical evidence in line with the common conception that both donations and electoral participation constitute public goods (Bolsen, Ferraro and Miranda 2014; Rogers, Ternovski and Yoeli 2016).

From a more normative perspective, our findings bear relevance to the persistent debate on the democratic advantages of higher electoral participation (Lijphart 1997; Saunders 2012; Oprea, Martin and Brennan 2024). Such 'participatory democracy' arguments have often been used to advocate for smaller political units where citizens perceive a greater likelihood of influencing election outcomes. Our findings support a complementary view whereby political institutions should foster pro-social motivations (rather than personal interests) that can buttress electoral participation even in large jurisdictions. This aligns with social contract philosophers including Rousseau and Rawls, both of whom underscore individuals' moral obligations towards the collective good. It also mirrors Almond and Verba's (1963) classic argument in favour of a balanced civic culture whereby the quality of political participation matters more than its quantity. Our findings indeed offer a normative defense for polities promoting what Almond and Verba (1963) designate as a 'participant political culture', albeit one that also highlights pro-social, rather than purely instrumental, participation.

2. Institutional setting and data

We combine individual-level administrative data collected by Statistics Norway on electoral participation, charitable donations, and municipality of residence. This section presents each of these key variables, while Online Appendix Table A.1 provides descriptive statistics.

2.1 *Electoral participation*

Local elections for the municipal and county councils take place every four years in Norway, and rely on a system of proportional representation to translate votes into seats (Andersen, Fiva and Natvik 2014; Fiva and Halse 2016). Each municipality thereby forms its own electoral district, and voters can cast one or more personal votes after choosing a party list.[3]

[3]Municipal and county council elections are held concurrently, and the municipal elections are generally regarded as more important. The Local Election Surveys from 1995-2019, for instance, show that more people

Elections to the national parliament likewise occur every four years using a proportional electoral system (held midway in the local electoral cycle), but take place in much larger election districts corresponding to the Norwegian counties (Cox et al. 2021). For both local as well as national elections, all eligible citizens are automatically registered to vote.[4] Keeping these voter registration rolls up to date is one of the organizational tasks of municipal governments during elections, alongside the compilation of the final results and reporting them to the Election Directorate through an electronic system.

Since 2013, Statistics Norway collects individual-level information on electoral participation directly from the electronic voting systems. These data cover the *complete* Election Roll for all Norwegian municipalities starting with the 2019 elections (ca. 4.2 million individuals), but cover only 255 out of 428 Norwegian municipalities for the 2017 national elections (ca. 3.2 million individuals). We obtained access to these data for the 2019 and 2023 local elections, as well as the 2017 and 2021 national elections. Throughout our analysis, however, we exclude individuals living in the capital of Oslo. Oslo is unique in being a municipality, county and national election district, and it also operates under a distinct local governance structure (with a parliamentary system rather than an executive board echoing the partisan make-up of the local council as used in most other municipalities; see Vabo 2005; Tovmo 2007).[5] When looking at the 2017 and 2021 national elections, we furthermore exclude all municipalities affected by a 2019 municipal amalgamation wave (which leaves us with a panel

believe the outcome of municipal council elections to have a major effect (23.6% vs. 10.8% for county council elections). Across all surveys during this period (N=17,764), approximately 70.0% of respondents voted in both elections, 8.9% voted only in the municipal elections, and 0.9% voted only in the county elections (the remaining 20.2% abstained).

[4]Eligibility for national elections in Norway is by and large restricted to Norwegian citizens that have reached the age of 18 by the end of the election year. For local elections, the set of eligible voters is extended with citizens of Denmark, Finland, Iceland, or Sweden who are 18 years of age by the end of the election year and registered as residing in Norway. Furthermore, citizens from other countries are eligible to vote in local elections if they turn 18 by the end of the election year and have been registered as residents in Norway for the last three years before Election Day.

[5]Including Oslo in the sample, while controlling for its exceptional status using a dummy variable, leaves our main findings unaffected. Note also that Ålesund municipality underwent a significant border change in 2024 (with elections to the new municipal council in 2023). Since this involves a different type of population size shock than those arising from individual-level mobility (used as our main source of identification; see below), we exclude Ålesund throughout our analysis. Nonetheless, we return to such municipal amalgamations in our robustness checks.

of 189 municipalities). Online Appendix Table A.1 indicates that voter turnout in Norwegian local elections hovers around 68-70%, which is fairly high by international standards.

2.2 *Charitable donations*

Since 2000, the Norwegian tax code permits tax deductions for charitable donations to (a specific set of) non-profit foundations and voluntary organizations. Organizations seeking tax-deductible status must be approved by the national tax authorities, and enter into a public register once approval has been granted. The tax-deductibility scheme covers only organizations with a national or broader scope. Currently, about 500 organizations are included in the register: for instance, 'SOS Children's Villages', 'Plan International', 'Doctors Without Borders', and 'Save the Children'.[6] These organizations are required to submit digital reports about each individual donation to the tax authorities, which includes donors' personal identification number and the contribution level. This digital report allows donations to be directly entered onto individuals' pre-filled tax returns, and the appropriate income tax deduction to be applied. Donations above 500 NOK and below a maximum cap are thereby eligible for a tax deduction.

Our administrative data comprise individuals' annual total tax-deductible donations as derived from their tax records for the period 2008-2017 – i.e. ten years prior to the first election where we observe individuals' electoral turnout. Roughly 64% of these donations are given to international NGOs, approximately 12% to religious organizations,[7] and the remainder to organizations focusing on, for instance, health, culture or education. We use these data to determine individuals' status as a donor or non-donor (which proxies their pro-social motivation; Wiepking and Maas 2009; Ottoni-Wilhelm, Vesterlund and Xie 2017; Ottoni-Wilhelm and Vesterlund 2023). In our main specification, donor status is set to 1 as soon as an individual made at least one charitable donation in this 10-year period (0 otherwise). While we extensively assess the sensitivity of our results to this modeling choice, Online Appendix

[6]Donations to political parties are not tax-deductible and, as such, are *not* included in our dataset. This is important as political donors may have stronger political preferences and interests (Hill and Huber 2017), which we will return to in our robustness checks.

[7]This excludes any church membership fees, which are very uncommon in Norway given that churches receive state funding based on church membership numbers.

Table A.1 indicates that approximately 30% of the sample is thereby identified as a donor. As would be expected, Table A.1 also shows that turnout is considerably higher among donors compared to non-donors, and that donors are older, have higher education and income levels, and are more likely to be female. We return to this below.

2.3 *Municipality of residence and inter-municipal mobility*

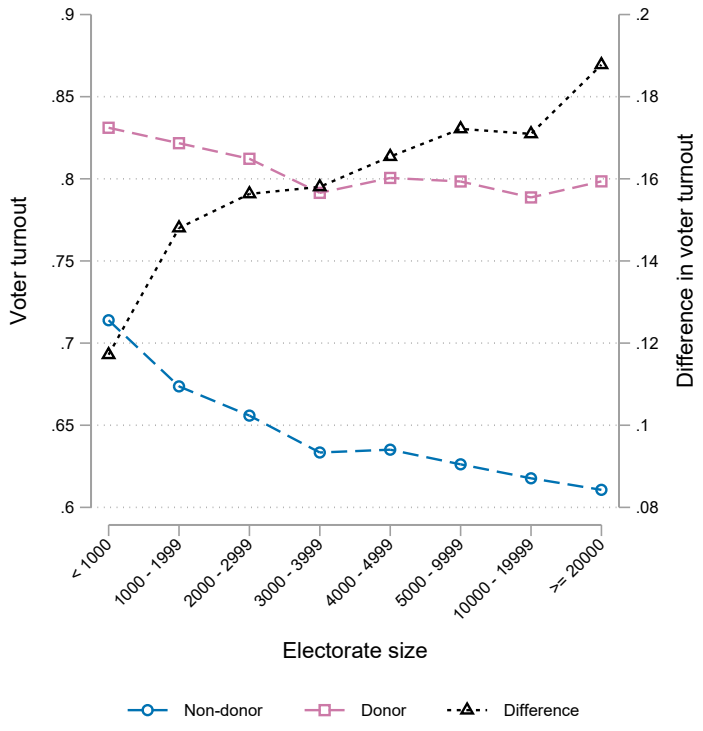
Finally, our dataset includes annual information about individuals' municipality of residence. We use this information to infer whether or not someone moved to another municipality in the four-year period between the 2019 and 2023 local elections (or between the 2017-2021 national elections). Moving to a larger (smaller) municipality exposes the mover to a positive (negative) population 'shock', and we use these shocks to identity how the turnout gap between more or less pro-social individuals is affected by electorate size. This identification strategy based on individual-level mobility is reminiscent of the approach by Cantoni and Pons (2022) as well as Geys and Sørensen (2022) (more details in section 4.1).

Online Appendix Table A.1 illustrates that approximately 7% of the individuals in our sample moved in the four-year period between the 2019 and 2023 local elections. While these movers tend to be younger, have higher education and lower income levels, and are more likely to be male than non-movers, both groups are similarly distributed across small and large municipalities (prior to any move taking place; see Online Appendix Figure A.1). Moreover, Online Appendix Figure A.2 displays a very symmetric distribution of mobility-induced population shocks, which indicates that individuals are almost equally likely to move *in both directions* between small and large(r) municipalities. In Online Appendix Table A.2, we furthermore demonstrate that our sample of movers is balanced on 2019 turnout, donor status and background characteristics across the four quartiles of observed population size shocks. Since this implies that there are no systematic (observable) differences across those who move to smaller/larger municipalities, it alleviates concerns about potential geographical sorting in our data. Taken together, these observations strongly suggest that local electorate size plays no meaningful role in the decisions to move and where to move to (see also section 4.1).

3. Descriptive Analysis

We begin our empirical analysis using all individuals eligible to vote in the 2019 and 2023 local elections, who were 18 years or older in 2008 (N $\approx$ 2.77 million individuals).[8] Using this sample, Figure 1 provides a first descriptive assessment of the differential effect of eligible population size on voter turnout in local elections among donors and non-donors. On the horizontal axis, we categorize municipalities into eight size bins. On the primary vertical axis, we plot the mean turnout level in local elections among donors (hollow squares) and non-donors (hollow circles) living in municipalities of a given size. The secondary vertical axis indicates the difference in voter turnout across donors and non-donors (hollow triangles) in municipalities of a given size.

Figure 1 – Voter turnout in local elections, by donor status and electorate size



Note: On the primary vertical axis, we display the turnout rate among donors (hollow squares) and non-donors (hollow circles) living in municipalities of a given size (ranked along the horizontal axis). The difference in turnout rates across donors and non-donors is presented by hollow triangles using the secondary vertical axis.

[8]This age restriction reflects the fact that we infer pro-social motivations based on donations in the 2008-2017 period, and we only have access to tax records of individuals older than 18 years. In our robustness checks, we explore variations of this time window.

Figure 1 illustrates that the electoral turnout of donors in local elections shows at best a very weakly decreasing pattern as eligible population size increases. In sharp contrast, voter turnout among non-donors falls from just over 70% in the smallest municipalities to just over 60% in the largest municipalities. The turnout gap between donors and non-donors thus rises from just under 12 percentage points to roughly 19 percentage points as eligible population size increases. Online Appendix Figure A.3 displays a very similar pattern when using actual, rather than binned, eligible population levels. Figures 1 and A.3 therefore provide *prima facie* evidence that donors not only have a higher baseline probability of voting, but also display a substantially smaller difference in turnout across electorate sizes. Hence, in line with theoretical expectations set out in the introduction, individuals with stronger pro-social motivations appear less sensitive to the pivot probability when making turnout decisions.[9]

4. Identification strategy and main results

4.1 *Empirical approach*

While informative, the descriptive analysis in the previous section relies on a cross-sectional comparison of individuals in large and small municipalities. To identify the causal effect of electoral size on the turnout decision of donors and non-donors, we would ideally want to expose both these groups to exogenous variation in the size of the electorate. Naturally, we cannot randomly reallocate individuals across municipalities and observe any resulting changes in voter turnout. Nevertheless, individuals' inter-municipal mobility offers two benefits from a methodological perspective (Cantoni and Pons 2022; Geys and Sørensen 2022; Yeandle forthcoming). First, mobility between municipalities of different sizes exposes movers to a positive or negative population shock (Online Appendix Figure A.2). Hence, it generates *within*-individual variation in eligible population size. Second, the decisions to move and where to move to generally stem from life-cycle factors, family circumstances, structural constraints, or employment opportunities (Rabe and Taylor 2010; Kronenberg and Carree

[9]Recent empirical evidence suggests that one vote has the potential to alter the seat allocation across politicians *within* any given party in approximately 10% of Norwegian municipal elections (Fiva, Hagen and Sørensen 2021). We will build on this work in section 5.4 below to validate our main inferences by calculating *between-party* pivot probabilities at the municipality level (as a proxy for the p term in the 'calculus of voting' model; Downs 1957; Geys 2006).

2012; Bergman et al. 2024). Hence, these decisions are *not* driven by any preference individuals may feel to influence local election outcomes. Together with the apparent absence of geographical sorting of movers in our data (see section 2.3), this suggests that exposure to mobility-induced positive or negative population shocks has high internal validity to identify the causal impact of population size on voter turnout (Angrist and Pischke 2008; Cantoni and Pons 2022; Yeandle forthcoming).

Based on the above discussion, we restrict our sample to individuals who moved between the 2019 and 2023 local elections, and estimate the following regression model:

$$V_{imt} = \beta_1 LogPop_{mt} + \beta_2 Donor_i \times LogPop_{mt} + \gamma_i + \theta_t + \epsilon_{imt} \quad (1)$$

where V_{imt} equals 0 if individual i living in municipality m turned out to vote in election year t, 0 otherwise. $LogPop_{mt}$ represents the natural logarithm of the electorate in municipality m in election year t (which can increase or decrease across election years for any individual i due to inter-municipal mobility), and $Donor_i$ is an indicator variable equal to 1 if individual i made at least one charitable donation in the period 2008-2017 (0 otherwise). We also include a full set of individual fixed effects γ_i, which capture all time-invariant aspects of movers (including innate personality characteristics, gender, donor status, and so on; Wooldridge 2010).[10] Finally, θ_t is a dummy for the 2023 election that controls for any time-specific shocks that affect all individuals equally, ϵ_{imt} is an error term, and standard errors are clustered at the municipality level.

The main parameters of interest in equation 1 are β_1 and β_2. The former (β_1) reflects the effect of a change in (logged) electorate size on voter turnout among non-donors, and is expected to be negative. That is, turnout declines with electorate size among less prosocial voters due to, in part, their response to the dwindling pivot probability in larger-scale elections. The latter (β_2) captures how donor status shifts the effect of a change in (logged)

[10]Since $Donor_i$ is a time-invariant variable, it is perfectly collinear with the individual fixed effects γ_i. As such, its main effect cannot be included in Equation 1. Note also that we follow all the 'best practices' for multiplicative interaction models set out in Brambor, Clark and Golder (2006) and Hainmueller, Mummolo and Xu (2019).

electorate size on turnout. This is expected to be positive (though possibly smaller in absolute size than β_1) since electorate size matters less for turnout among pro-social voters.

One potential concern when estimating equation 1 relates to the fact that population size may capture elements beyond the pivot probability that can affect turnout decisions. For instance, since "residents of smaller places are (...) more likely to be mobilized by a political organization or candidate" (Oliver and Ha 2007, 398), elite mobilization models (Cox and Munger 1989; Uhlaner 1989; Cox, Fiva and King 2024) can likewise point towards a negative relationship between turnout and electorate size. Similarly, moving between smaller and larger municipalities may imply moving between high- and low-turnout environments (which could affect individual-level turnout decisions via peer effects; Bhatti, Fieldhouse and Hansen 2020; Bratsberg et al. 2021; Cantoni and Pons 2022), or change individuals' exposure to social pressure and image concerns (Funk 2010; DellaVigna et al. 2016). Observed turnout differences would then be driven by differences in municipality characteristics other than population size, leading to biased inferences. While it is less clear why elite mobilization efforts, peer effects or social pressures would confound the moderating role of pro-sociality (which is our main relationship of interest), we will engage in a number of validation exercises to rule out such confounding factors and alternative explanations.[11]

One might also worry that individuals' mobility and turnout decisions are driven by the same underlying characteristics. This would create a correlation between ϵ_{imt} and $LogPop_{mt}$ as well as V_{imt}, and bias our estimates of β_1 and β_2. Given the inclusion of individual fixed effects in equation 1, this concern is limited to time-varying individual characteristics. For instance, individuals who become parents may move to smaller municipalities *and* increase their interest in local politics and public good provision. To address this, we will verify the robustness of our findings when extending equation 1 with time-varying individual-level controls. Finally, our estimates may become biased if the utility of local public good provision (which affects turnout decisions) depends on municipality size, and certain types of voters are more responsive to such variation. Fortunately, this is unlikely in our setting since Norwegian

[11]Note in this respect that data from the Norwegian Local Election Studies (LES) for the period 2003-2019 show no relationship between 'peer pressure' as a driver of individuals' decision to vote and municipal electorate size.

municipalities operate under the so-called generalist municipality principle ("*Generalistkommuneprinsippet*" in Norwegian). This holds that "all municipalities have the same legal status and the same responsibility for the statutory tasks, *regardless of population*, settlement structure, economy or other characteristics" (Ministry of Digitalisation and Public Governance 2023, 10, emphasis added).

4.2 *Main findings*

Given the binary nature of our dependent variable, we estimate Equation 1 using a linear probability model. Table 1 summarizes the main results, and provides three sets of results. Columns (1) and (2) split the sample of movers into non-donors and donors, respectively, while column (3) directly estimates equation 1 based on the full sample of movers.

Table 1 – Electorate size and voter turnout among movers, conditional on donor status

	(1)	(2)	(3)
	Non-donor	Donor	Full sample
Electorate size (log)	-0.0118	-0.0052	-0.0118
	(0.0024)	(0.0017)	(0.0024)
	[-0.0166, -0.0071]	[-0.0085, -0.0019]	[-0.0165, -0.0070]
Electorate size (log) × Donor			0.0062
			(0.0020)
			[0.0022, 0.0102]
Individual FE	YES	YES	YES
Election year FE	YES	YES	YES
N	271,006	91,278	362,284
Clusters	354	354	354
R-squared	0.72	0.72	0.73

Note: The table provides coefficient estimates from linear probability models with individual-level voter turnout as the dependent variable. The main independent variables are (logged) electorate size, and an indicator variable equal to 1 for donors (0 for non-donors). The sample includes only individuals who moved municipality between the 2019 and 2023 local elections. Columns (1) and (2) estimate effects separately for non-donors and donors, respectively, while column (3) includes the full sample of movers. Standard errors clustered at the municipality level are given in parentheses, and 95% confidence intervals in brackets.

Three key lessons can be drawn from Table 1. First, for non-donors, we observe a statistically significant downward-sloping gradient with (log) electorate size. This confirms that turnout displays a log-linear inverse relationship with electorate size among less pro-social voters ($\beta_1 < 0; p < 0.01$). Second, the marginal effect of (log) electorate size on voter turnout is approximately twice as large among non-donors compared to donors. This confirms that donors are significantly less responsive to the size of the electorate than non-donors

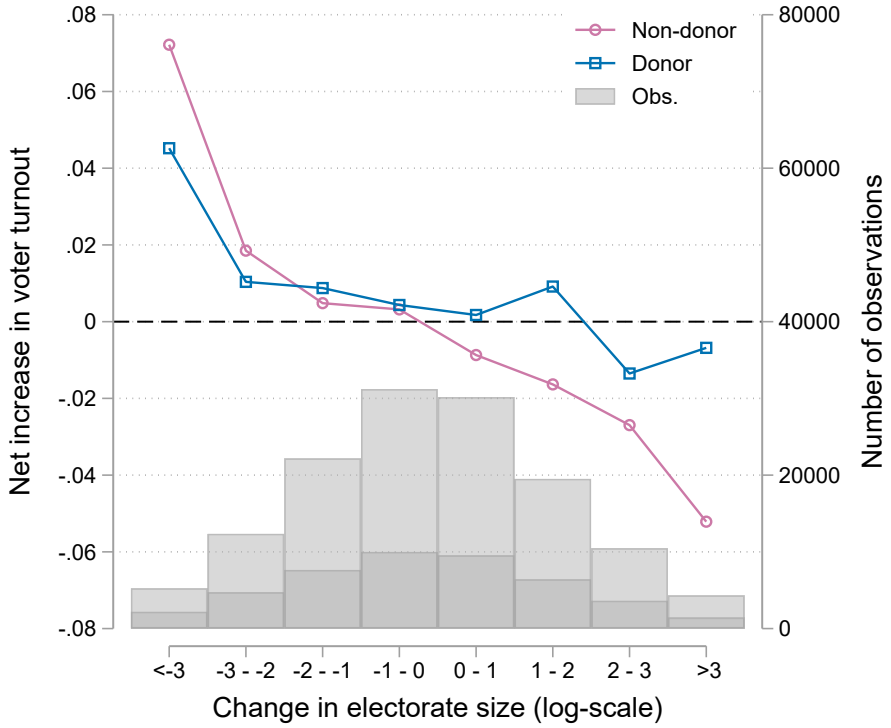
($\beta_2 > 0; p < 0.01$), and that the turnout gap between more and less pro-social individuals grows as the size of the electorate increases. Third, donors are *not* unresponsive to electorate size since $\beta_1 + \beta_2 < 0$ ($p < 0.01$). This is important since it could suggest that civic duty is *not* the key mechanism underlying our findings. Theoretically, turnout due to civic duty should be unrelated to any hopes of influencing the election outcome (Riker and Ordeshook 1968; Geys 2006). In contrast, turnout based on 'instrumental altruism' would not ignore the pivot probability, because it affects the benefit of the election outcome for relevant others (Morton 1991; Fowler 2006; Edlin, Gelman and Kaplan 2007). Still, disentangling these two mechanisms is exceedingly difficult. While we consider this an important avenue for further research, it credibly lies beyond the main aims of our analysis.

To get a better sense of the involved effect sizes, Figure 2 displays the average net change in individual-level voter turnout for all individuals exposed to a given (log) change in electorate size (*using the raw data*). Donors and non-donors are presented as squares and circles, respectively, while the overlayed histograms display the number of observations for each size shock (with light- and dark-grey bars referring to non-donors and donors, respectively). Figure 2 illustrates that a large negative population shock on average increases turnout among non-donors with more than seven percentage points, while a large positive shock on average reduces their turnout with five percentage points. The equivalent numbers for donors are roughly four and one percentage points, respectively.[12]

To rule out that our main effects are driven by other municipality characteristics correlated with both population size and voter turnout, we can use turnout in national rather than local elections as a placebo check. National elections are held in (19) large election districts. Hence, the impact of a single vote on electing a candidate to parliament will be minimal *independent* of whether one lives in a small or large municipality, and individual-level turnout in national elections should thus respond much less to *municipal* electorate sizes. Yet, any confounding effects of moving, local contextual factors, and/or municipality size will continue to affect

[12]Figure 2 also provides suggestive evidence in favour of the linearity and common support assumptions underlying our multiplicative interaction model (Hainmueller, Mummolo and Xu 2019). This is confirmed when estimating equation 1 using the same population bins as in Figure 1 (as suggested by Hainmueller, Mummolo and Xu 2019, 170).

Figure 2 – Net change in voter turnout by population shock and donor status



Note: The figure displays the average net change in individual voter turnout across the 2019 and 2023 local elections (on the primary vertical axis) for all movers exposed to a given (log) change in electorate size (along the horizontal axis). We differentiate donors (hollow squares) from non-donors (hollow circles) based on an individual making at least one charitable donation in the 2008-2017 period. The histograms display the number of movers exposed to population shocks of a given size (on the secondary vertical axis), with light- and dark-grey bars referring to non-donors and donors, respectively.

the estimates of β_1 and β_2 in the same way as for local elections. The lack of statistical significance on our main coefficients of interest in Online Appendix Table A.3 thus helps to increase our confidence that the patterns observed for local elections are not just a statistical artifact or driven by contextual confounders (Cantoni and Pons 2022).

We should also note that our results are robust to controlling for time-varying characteristics of individuals (including their number of children and marital status). This mitigates concerns that our results may be driven by some underlying characteristics that could affect both mobility and turnout decisions. The same conclusion holds when controlling directly for the aggregate turnout levels in the municipalities of origin and destination, which helps rule out potential confounding effects from (changes in) the social context and peer pressure

(Funk 2010; Bhatti, Fieldhouse and Hansen 2020; Bratsberg et al. 2021; Cantoni and Pons 2022). Full details of these results are provided in Online Appendix Table A.4.[13]

5. Robustness and sensitivity checks

In this section, we summarize the key findings of six auxiliary analyses. Full details of these results are provided in the Online Appendix.

5.1 *Operationalization of donor status*

So far, we have assigned donor status to individuals making at least one charitable donation in the 2008-2017 period. In this section, we discuss the results from three alternative operationalizations. First, we set a stricter threshold for donor status that requires individuals to donate *every* year in the 2008-2017 period (rather than 'just' one year). Second, we assign donor status based on making at least one charitable donation in the shorter 2013-2017 period. This is not only closer in time to the elections under analysis, but also expands our sample by including individuals of age 18 and older starting in 2013 (instead of 2008). The results are shown in Columns (1) and (2) of Online Appendix Table A.5. In both cases, our main inferences are unaffected.

Third, we assign donor status based on the share of an individual's income that is donated. This not only ensures that our measure of pro-social behavior reflects meaningful charitable contributions, but also helps account for the potential confounding role of differences in donor's giving capacity (see also section 5.2 below). In Column (1) of Online Appendix Table A.6, donor status equals 1 for individuals whose donation-to-income share is ranked in the top three quartiles among donors (0 for non-donors and those in the bottom donation-to-income quartile). In Column (2) and (3), we instead include the donation-to-income share as a continuous variable or indicator variables for each donation-to-income share quartile (using non-donors as the reference category), respectively. In all cases, the results are consistent with our main findings. Moreover, Column (3) reveals at best minimal differences between

[13]In principle, an individual's electoral behavior may both contribute to, and be affected by, municipality-level participation rates. This so-called 'reflection problem' (Manski 1993) is less problematic in our setting since any municipality is very large compared to the individual's contribution.

donor in distinct donation-to-income quartiles. This implies that the crucial distinction is between donors and non-donors, rather than between different groups of donors.

5.2 *Individual-level determinants of donations*

As mentioned with respect to Table A.1, donors differ in a number of dimensions from non-donors. This may be problematic when estimating equation 1 whenever such characteristics are also correlated with mobility choices and influence electoral participation. For instance, social status variables such as income tend to be correlated with charitable giving (Geys and Sørensen 2024), mobility (DeLuca and Rosen 2022) and electoral participation (Schafer et al. 2022), and could therefore confound the analysis. Similarly, individuals' age and gender might influence both their propensity to donate (e.g., Piper and Schnepf 2008; Roberts and Maxfield 2019) and their participation in elections (Smets and Van Ham 2013). We address this potential concern using a two-stage approach. We first regress individuals' donor status on available background characteristics (i.e. age, gender, income and education), and then use the residuals from this model to assign individuals' status as donor or non-donor. Such residualization effectively clears out the effect of these background variables on donation behaviors. Importantly, the results in Column (3) of Online Appendix Table A.5 show that this leaves our findings unaffected.[14]

5.3 *Excluding donations to religious and lobby organizations*

Certain types of donations may carry at least an element of self-interest, rather than reflecting individuals' pro-social motivations. Contributions to religious organizations, for instance, may reflect involvement in churches and the pursuit of salvation in the after-life (Hrung 2004; Thornton and Helms 2013). Consequently, we test the robustness of our results to a more narrow set of charitable donations that excludes religious organizations. Column (4) in Online Appendix Table A.5 illustrates that this exclusion returns very similar results to those of our baseline approach. Similarly, donations to civic advocacy and lobby organizations may induce

[14]One might still worry about other factors including, for instance, individuals' political interest. While we lack such information in our administrative register data, our robustness checks using individual-level survey data (reported below) highlight that our findings persist when controlling for political interest.

some degree of influence over policies that directly affect the donor, which would reflect a clear self-interest motive. Such donations could also be considered political in nature, which may reflect the stronger political preferences and interests of such donors (Hill and Huber 2017). Nonetheless, excluding donations to such advocacy organizations leaves our findings unaffected (see Column (5) in Online Appendix Table A.5).

5.4 *Municipality-level pivot probabilities*

From a theoretical perspective, the turnout gap between more/less pro-social individuals widens with electorate size due to the differential sensitivity of both groups to the likelihood of influencing the election (Riker and Ordeshook 1968; Geys 2006). As a more direct test of this underlying mechanism, we calculate the pivot probability at the municipality level by iteratively simulating seat allocations for the 2019 local elections while awarding each party running in the election $X = 10, 20, 30$ extra votes. We then count the number of times the simulated and actual seat allocations differ, and divide this by the number of simulations (i.e. the number of parties participating in the election). The result quantifies the likelihood that additional votes for a party alter the seat allocation in a municipality, and we re-estimate equation 1 using this proxy for the pivot probability instead of the municipal population size.[15]

Online Appendix Table A.7 displays the results in a similar structure as Table 1 for three levels of additional votes: i.e. 10 votes in Panel A, 20 votes in Panel B, and 30 votes in Panel C. In all cases, we find that a higher pivot probability statistically significantly increases turnout among non-donors - in line with theoretical expectations. More importantly, however, the effect of the pivot probability is smaller among pro-social voters. Even though the interaction term only approaches statistical significance at the 10% level in Panels B and C, the general tenor and consistency of these findings reinforces that shifts in the pivot probability constitute an important mechanisms behind our main results in Table 1.

[15]Note that the Pearson correlation between the simulated pivot probability and municipal electorate size is always robustly negative (r between -0.25 and $-.41$; all $p < 0.01$), as would be expected.

5.5 *Population shocks due to municipal mergers*

While our main analysis relies on inter-municipal mobility as a source of population shocks at the individual level, an alternative strategy would be to exploit municipal mergers. Although mergers affect more than electorate size (which likely introduces noise to the estimated effects), this strategy ensures that inference is drawn from individuals residing in the *same* place across elections (thus mitigating confounding effects from changes in individuals' direct social environment). Hence, we re-run our main analysis on a sample of individuals living in a municipality involved in a merger process between the municipal elections of 2015 and 2019. We thereby analyze their turnout decision in the elections before (i.e. 2015) and after (i.e. 2019) the merger took place.

The results are summarized in Online Appendix Table A.8. Column (1) includes the entire available sample. Note, however, that the 2015 data collected by Statistics Norway excludes many municipalities with small populations and, when included, the data covers mostly individuals with immigrant backgrounds. As amalgamation-based population shocks are most relevant for smaller municipalities merged into larger units, this sampling restriction severely limits available statistical power in our analysis. Moreover, to address the oversampling of immigrants, we exclude immigrants (in Column (2)) or individuals living in municipalities with more than 30% immigrants in the sample (in Column (3); note that the maximum share of immigrants in Norwegian municipalities was 26.1% in 2016). Despite these data limitations, the estimates across Online Appendix Table A.8 are consistent with those of our main analysis (albeit much less precisely estimated).

5.6 *Norwegian Local Election Surveys and civic duty*

Finally, we assess the generalizability of our main findings to another proxy of individuals' pro-social motivations using data from the Norwegian Local Election Surveys (LES).[16] These surveys – conducted every four years between 2003 and 2019 – include the question: "Some people believe that it is a civic duty to vote in elections, while others think one should only

[16]This auxiliary analysis also verifies the robustness of our results to a distinct data source and a different identification strategy (as discussed in detail below).

vote when the election feels personally important. Which of these views do you agree with the most?" This question specifically contrasts the sense of a felt civic obligation to vote with voting for individualistic reasons, without addressing how voting might influence policy outcomes for the general population. Replicating our main analysis across respondents (dis)agreeing that turnout is a civic duty thus offers an alternative operationalization of individuals' pro-social motivations, which arguably stays closer to the extension of the 'calculus of voting' model formulated in Riker and Ordeshook (1968).

Using both register-controlled and self-reported vote participation information included in the LES dataset, we take inspiration from Andersen, Fiva and Natvik (2014) and Andersen and Sørensen (2022) in defining our dependent variable as the difference between (register-controlled) turnout in local elections and (self-reported) turnout in county council elections. This approach exploits the fact that elections at the municipal and county levels take place at the same time and place, and that the municipalities are located within the more populous counties. As such, the difference in turnout "immediately cleans out any influence from [individual- and location-specific] factors that are common to both elections" (Andersen, Fiva and Natvik 2014, 160). As such, it is reminiscent of a difference-in-differences specification, and allows us to identify the effect of variations in population size independent of any 'common factors' (including elite mobilization efforts) (Andersen, Fiva and Natvik 2014; Andersen and Sørensen 2022, further details in Online Appendix B). The findings – summarized in Online Appendix B – indicate that the turnout decision of respondents feeling no civic duty to vote is very sensitive to the electorate size in their municipality of residence (which is where they cast their ballot). Crucially, and in line with our main findings, this negative turnout-size gradient is significantly weaker among respondents with a higher sense of civic duty to vote. The turnout gap between those agreeing and disagreeing with the civic duty statement thus increases in eligible population size. This once again highlights that pro-social motivations (operationalized in this case as feeling a civic duty to vote) help support high(er) turnout in large-scale elections.[17]

[17]These results persist even when we control for individuals' political interest and a measure of their direct contacts with politicians, as well as the interaction of these variables with (log) electorate size (reported in Columns 2, 4 and 6 of Table B.1). Together with the fact that our model specification cleans out any factors

6. Conclusion

In this paper, we exploited individual-level migration-induced population shocks to test the theoretical proposition that electoral turnout is less sensitive to one's pivot probability among pro-social individuals. Our main results are consistent with this claim. We find that population shocks have a much weaker impact on turnout among more pro-socially motivated individuals, and that the turnout *gap* between more or less pro-social individuals increases with electorate size. Overall, our findings highlight the importance of pro-social motives in buttressing voter turnout in large-scale elections. This not only takes one further step in our understanding of the long-debated 'paradox' of voting (Downs 1957; Riker and Ordeshook 1968; Geys 2006; Andersen, Fiva and Natvik 2014), but is also supportive of long-standing normative appeals to promote pro-social electoral participation (Almond and Verba 1963).

Our findings naturally also suggest a number of avenues for further research. One of these relates to the use of alternative identification strategies that induces population shocks at the individual level, for example building on our approach exploiting municipal mergers. While mergers generally take place in a politically charged environment, they have been used extensively to explore the size-turnout relationship using difference-in-differences frameworks (e.g., Lassen and Serritzlew 2011; Lapointe, Saarimaa and Tukiainen 2018). Our results suggest that mergers may have differential effects on the turnout of more/less pro-social individuals. However, better data is needed to confirm this hypothesis. Another avenue for further inquiry relates to the potential implications of higher pro-social electoral participation in larger polities (Almond and Verba 1963). Our findings indeed suggest that larger jurisdictions could become characterized by the selection of 'better' politicians (Jokela et al. forthcoming; Sørensen 2024), which would provide an important contribution to long-standing debates about the determinants of political selection (for reviews, see Besley 2005; Dal Bó and Finan 2018).

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affecting *both* municipal *and* county elections (see above), the latter finding helps dispel concerns that our main results may simply reflect elite mobilization efforts (Cox and Munger 1989; Uhlaner 1989; Cox, Fiva and King 2024).

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Online Appendix A

Tables

Table A.1 – Summary statistics

	Full Sample		Movers	Non-movers	Donors	Non-donors
	Mean	SD	Mean	Mean	Mean	Mean
Voted 2019 (share)	0.70	0.46	0.49	0.71	0.82	0.64
Voted 2023 (share)	0.68	0.47	0.51	0.69	0.80	0.62
Moved (share)	0.07	0.25	1.00	0.00	0.06	0.07
Donor (share)	0.30	0.46	0.25	0.30	1.00	0.00
Female (share)	0.50	0.50	0.47	0.51	0.57	0.48
Age (in 2019)	53.64	15.04	46.03	54.17	55.94	52.67
High education (share)	0.38	0.49	0.41	0.38	0.51	0.33
Income (NOK)	446,755	468,125	389,814	450,743	509,833	420,236
N (individuals)	2,767,551		181,142	2,586,409	819,112	1,948,439

Note: The table provides summary statistics on voter turnout, inter-municipal mobility, donor status, and background characteristics. Columns (1) and (2) include all individuals eligible to vote in the 2019 and 2023 local elections (except Oslo residents). Columns (3)-(4) and (5)-(6) split the data by, respectively, individuals' inter-municipal mobility (in the four-year period between the 2019 and 2023 local elections) or status as a donor (based on donations in the 2008-2017 period). Age and education is measured in 2019, while income is the average income (in NOK) over the 2008-2017 period.

Table A.2 – Summary statistics by change in electorate size from inter-municipal moving.

	Quartile 1		Quartile 2		Quartile 3		Quartile 4	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Voted 2019 (share)	0.51	0.50	0.47	0.50	0.47	0.50	0.50	0.50
Donor (share)	0.27	0.44	0.25	0.43	0.24	0.43	0.25	0.43
Female (share)	0.46	0.50	0.47	0.50	0.47	0.50	0.47	0.50
Age (in 2019)	46.05	13.66	45.73	13.40	46.11	13.51	46.25	13.75
High education (share)	0.42	0.49	0.40	0.49	0.40	0.49	0.41	0.49
Income (NOK)	400,896	306,344	386,384	278,231	387,161	282,676	384,711	303,524
N (individuals)	45,631		45,395		44,845		45,271	

Note: The table provides summary statistics on individual's voter turnout, donor status and background characteristics by quartiles of the change in (log) electorate size due to moving municipalities between 2019 and 2017. Quartile 1 includes changes in log electorate size between -7.01 to -1.23, Quartile 2 between -1.23 and -.07, Quartile 3 between -.07 and 1.02. Finally, Quartile 4 ranges from 1.02 to 7.55. Age and education is measured in 2019, while income is the average income (in NOK) over the 2008-2017 period.

Table A.3 – Placebo check using turnout in the 2017 and 2021 national elections.

	(1)	(2)	(3)
	Non-donor	Donor	Full sample
Electorate size (log)	-0.0026	-0.0017	-0.0027
	(0.0023)	(0.0020)	(0.0023)
	[-0.0072, 0.0020]	[-0.0056, 0.0022]	[-0.0072, 0.0019]
Electorate size (log) × Donor			0.0011
			(0.0026)
			[-0.0039, 0.0062]
Individual FE	YES	YES	YES
Election year FE	YES	YES	YES
N	77,752	28,840	106,592
Clusters	189	189	189
R-squared	0.73	0.73	0.74

Note: The table provides coefficient estimates for linear probability models with individual-level voter turnout in the 2017 and 2021 national elections as the dependent variable. The main independent variables are municipal (logged) electorate size, and an indicator variable equal to 1 for individuals who donated at least once in the 2008-2017 period (0 for non-donors). The sample includes only individuals who moved municipality between the 2017 and 2021 national elections, excluding municipalities that participated in an amalgamation during the period. Columns (1) and (2) estimate effects separately for non-donors and donors, respectively, while column (3) includes the full sample of movers. Standard errors clustered at the municipality level are given in parenthesis, and 95% confidence intervals in brackets.

Table A.4 – Main results including time-varying controls.

	(1)	(2)	(3)	(4)
Electorate size (log)	-0.0116	-0.0114	-0.0085	-0.0081
	(0.0025)	(0.0025)	(0.0020)	(0.0020)
	[-0.0165, -0.0068]	[-0.0163, -0.0066]	[-0.0124, -0.0046]	[-0.0120, -0.0041]
Electorate size (log) × Donor	0.0062	0.0060	0.0056	0.0055
	(0.0020)	(0.0020)	(0.0020)	(0.0020)
	[0.0023, 0.0102]	[0.0020, 0.0100]	[0.0017, 0.0095]	[0.0016, 0.0094]
No. of children	0.0132			0.0047
	(0.0040)			(0.0041)
	[0.0053, 0.0212]			[-0.0032, 0.0127]
Married		0.0715		0.0708
		(0.0043)		(0.0043)
		[0.0630, 0.0799]		[0.0624, 0.0793]
Divorced		0.0443		0.0435
		(0.0064)		(0.0063)
		[0.0317, 0.0568]		[0.0310, 0.0559]
Municipality-level turnout			0.3913	0.3965
			(0.0476)	(0.0474)
			[0.2977, 0.4850]	[0.3033, 0.4896]
Individual FE	YES	YES	YES	YES
Election year FE	YES	YES	YES	YES
N	362,284	357,336	362,284	357,336
Clusters	354	354	354	354
R-squared	0.73	0.73	0.73	0.73

Note: The table provides coefficient estimates for linear probability models with individual-level voter turnout as the dependent variable. The main independent variables are (logged) electorate size, and an indicator variable equal to 1 for individuals who donated at least once in the 2008-2017 period (0 for donors). In Column (1), we control for an individual's number of children, and in Column (2) for being married and being divorced. In Column (3), we control for the aggregate turnout level in the municipality. Finally, in Column (4), all of the controls are included. Throughout all models, the sample includes only individuals who moved municipality between the 2019 and 2023 local elections. Standard errors clustered at the municipality level are given in parenthesis, and 95% confidence intervals in brackets.

Table A.5 – Robustness checks

	(1) Always-donor	(2) 2013-2017	(3) Residualized	(4) Non-religious	(5) Non-lobby
Electorate size (log)	-0.0110	-0.0114	-0.0108	-0.0115	-0.0117
	(0.0023)	(0.0024)	(0.0024)	(0.0024)	(0.0024)
	[-0.0156, -0.0064]	[-0.0161, -0.0067]	[-0.0154, -0.0061]	[-0.0162, -0.0069]	[-0.0165, -0.0070]
Electorate size (log) × Donor	0.0061	0.0058	0.0054	0.0062	0.0067
	(0.0024)	(0.0021)	(0.0020)	(0.0020)	(0.0021)
	[0.0014, 0.0107]	[0.0016, 0.0100]	[0.0015, 0.0093]	[0.0022, 0.0101]	[0.0027, 0.0108]
Individual FE	YES	YES	YES	YES	YES
Election year FE	YES	YES	YES	YES	YES
N	362,284	361,306	350,048	362,284	362,284
Clusters	354	354	354	354	354
R-squared	0.73	0.73	0.73	0.73	0.73

Note: The table provides coefficient estimates for linear probability models with individual-level voter turnout as the dependent variable. The main independent variables are (logged) electorate size, and an indicator variable equal to 1 for donors (0 for non-donors). In Column (1), donor status equals 1 for individuals who always donated in the 2008-2017 period. In Column (2), donor status equals 1 for individuals who donated at least once in the 2013-2017 period. In Column (3), donor status is corrected for individuals' income, age, gender and education level, and we assign donor status based on a predicted probability of being a donor above 0.5. In Column (4), donor status excludes donations to religious organizations. Finally, in Column (5), donor status excludes donations to civic and advocacy organizations. Throughout all models, the sample includes only individuals who moved municipality between the 2019 and 2023 local elections. Standard errors clustered at the municipality level are given in parenthesis, and 95% confidence intervals in brackets.

Table A.6 – Donations as share of income.

	(1)	(2)	(3)
Electorate size (log)	-0.0113	-0.0106	-0.0119
	(0.0024)	(0.0021)	(0.0025)
	[-0.0160, -0.0067]	[-0.0147, -0.0064]	[-0.0167, -0.0070]
Electorate size (log) × Donor	0.0056		
	(0.0021)		
	[0.0014, 0.0098]		
Electorate size (log) × Donation share		0.2085	
		(0.0987)	
		[0.0144, 0.4025]	
Electorate size (log) × Donation share Q1			0.0062
			(0.0032)
			[-0.0000, 0.0124]
Electorate size (log) × Donation share Q2			0.0067
			(0.0028)
			[0.0012, 0.0121]
Electorate size (log) × Donation share Q3			0.0049
			(0.0036)
			[-0.0021, 0.0119]
Electorate size (log) × Donation share Q4			0.0068
			(0.0032)
			[0.0005, 0.0131]
Individual FE	YES	YES	YES
Election year FE	YES	YES	YES
N	344,138	344,138	344,138
Clusters	354	354	354
R-squared	0.73	0.73	0.73

Note: The table provides coefficient estimates for linear probability models with individual-level voter turnout as the dependent variable. The main independent variables are (logged) electorate size, and an individual's average yearly donation (2008-2017) as share of their average yearly income (2008-2017). In Column (1), donor status equals 1 for individuals whose donation-to-income share is in the top three quartiles among donors, and 0 for non-donors and those in the bottom donation-to-income quartile. In Column (2), we include the donation-to-income share as a continuous variable. In Column (3), we include dummies for each quartile of the donation-to-income share, using non-donors as the reference category. Throughout all models, the sample includes only individuals who moved municipality between the 2019 and 2023 local elections. Individuals with income among the lowest 5% are excluded from the analysis. Standard errors clustered at the municipality level are given in parenthesis, and 95% confidence intervals in brackets.

Table A.7 – Main results using the pivot probability instead of electorate size.

	A: 10 votes			B: 20 votes			C: 30 votes		
	Non-donor	Donor	Full sample	Non-donor	Donor	Full sample	Non-donor	Donor	Full sample
Pivot probability	0.0010	0.0008	0.0010	0.0008	0.0005	0.0008	0.0007	0.0005	0.0007
	(0.0002)	(0.0003)	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
	[0.0006, 0.0014]	[0.0002, 0.0013]	[0.0006, 0.0014]	[0.0006, 0.0011]	[0.0002, 0.0009]	[0.0006, 0.0011]	[0.0005, 0.0010]	[0.0003, 0.0008]	[0.0005, 0.0010]
Pivot probability × Donor			-0.0003			-0.0003			-0.0002
			(0.0003)			(0.0002)			(0.0001)
			[-0.0008, 0.0003]			[-0.0006, 0.0001]			[-0.0005, 0.0001]
Individual FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Election year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	271,006	91,278	362,284	271,006	91,278	362,284	271,006	91,278	362,284
Clusters	354	354	354	354	354	354	354	354	354
R-squared	0.72	0.72	0.73	0.72	0.72	0.73	0.72	0.72	0.73

Note: The table provides coefficient estimates for linear probability models with individual-level voter turnout as the dependent variable. The main independent variables are 'pivot probability' and an indicator variable equal to 1 for donors (0 for non-donors). 'Pivot probability' quantifies the likelihood that additional votes for a party alters the seat allocation in a municipality in the 2019 election. In a given municipality, it is computed by iteratively simulating seat allocations with incremental votes for each party, counting the number of times the simulated and actual seat allocation differs, and dividing by the number of simulations (i.e. the number of parties). In Panel A, we successively add 10 votes to each party; 20 votes in Panel B and 30 votes in Panel C. The sample includes only individuals who moved municipality between the 2019 and 2023 local elections. Columns 1, 4 and 7 estimate effects for non-donors; Columns 2, 5 and 8 for donors, while Column 3, 6 and 9 include the full sample of movers. Standard errors clustered at the municipality level are given in parenthesis, and 95% confidence intervals in brackets.

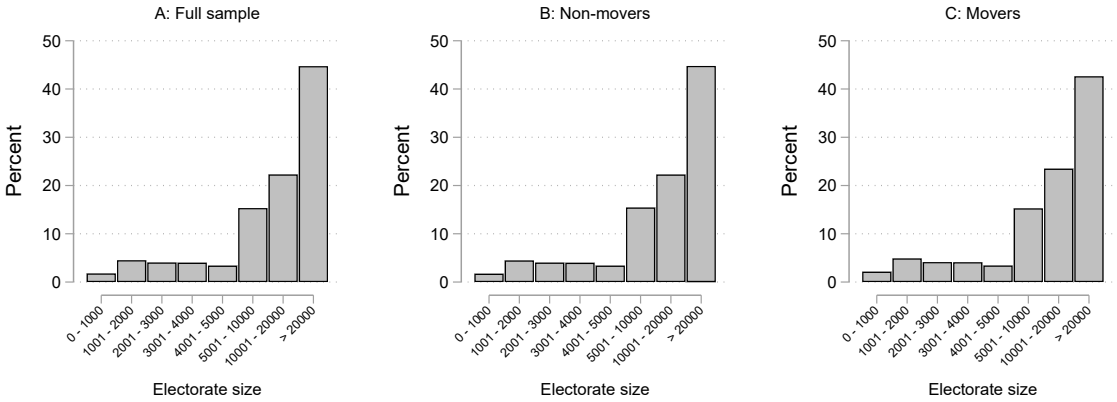
Table A.8 – Main results using municipal mergers.

	(1)	(2)	(3)
	Full sample	Imm share <.3	Excl. imm
Electorate size (log)	-0.0270	-0.0299	-0.0278
	(0.0201)	(0.0240)	(0.0233)
	[-0.0667, 0.0127]	[-0.0789, 0.0192]	[-0.0738, 0.0182]
Electorate size (log) × Donor	0.0151	0.0200	0.0185
	(0.0297)	(0.0341)	(0.0333)
	[-0.0437, 0.0739]	[-0.0497, 0.0898]	[-0.0473, 0.0843]
Individual FE	YES	YES	YES
Election year FE	YES	YES	YES
N	676,582	667,348	572,290
Clusters	136	30	136
R-squared	0.78	0.78	0.76

Note: The table provides coefficient estimates for linear probability models with individual-level voter turnout in the 2015 and 2019 local elections as the dependent variable. The main independent variables are (logged) electorate size, and an indicator variable equal to 1 for individuals who donated at least once in the 2005-2014 period (0 for non-donors). Throughout all models, the sample includes only individuals who live in a municipality participating in an amalgamation between 2017 and 2020 (with ordinary elections to the new municipal council in 2019), excluding movers. In column (1), we include all individuals in this sample. In column (2), we exclude individuals in municipalities where more than 30% of the sample are immigrants. In column (3), we exclude all immigrants. Standard errors clustered at the municipality level are given in parenthesis, and 95% confidence intervals in brackets.

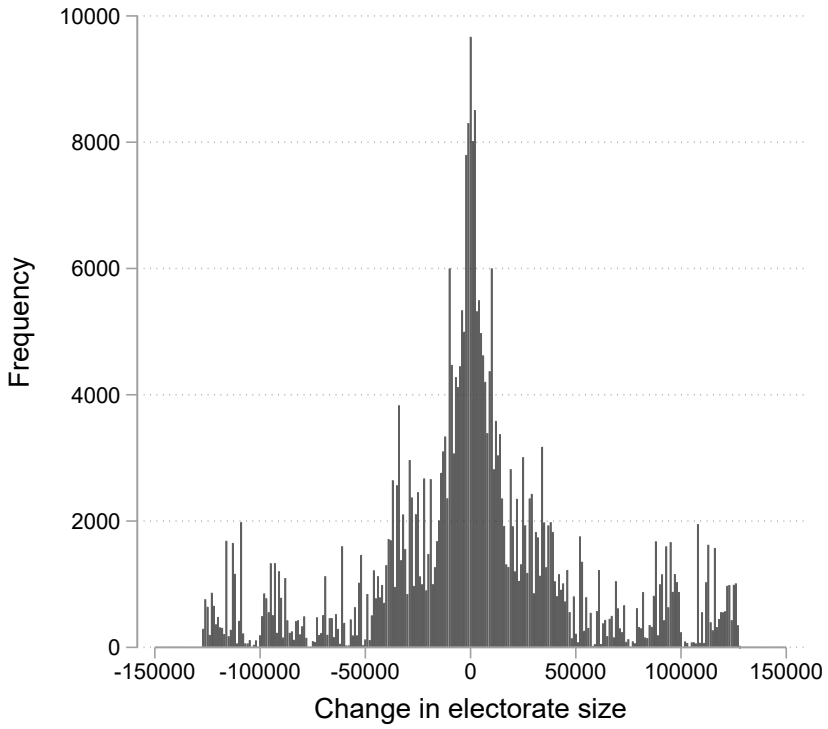
Figures

Figure A.1 – Distribution of Norwegian citizens by municipal electorate size



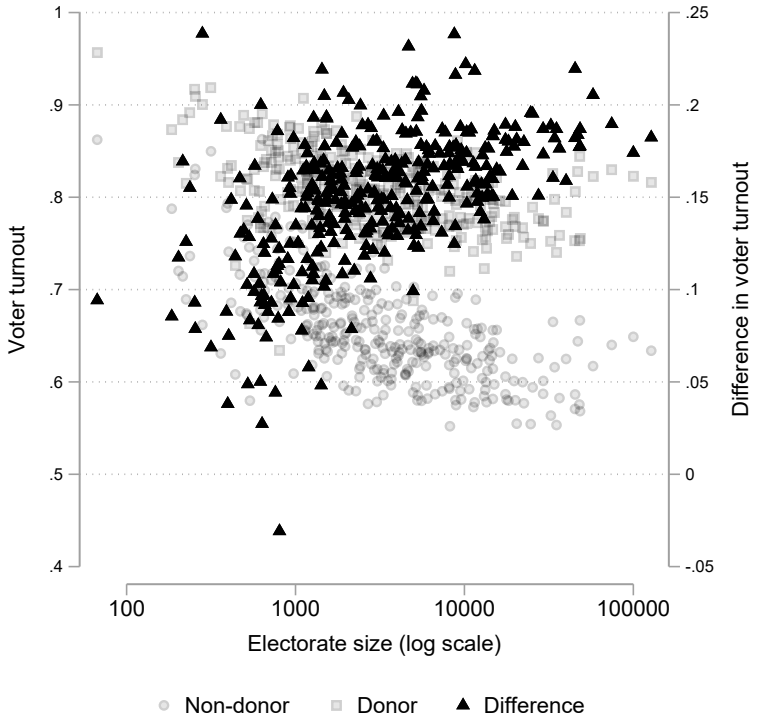
Note: This figure displays the share of Norwegian eligible voters (along the vertical axes) living in municipalities of a given electorate size (along the horizontal axis). Panel A includes the full population of eligible voters in the 2019-2023 local elections (excluding Oslo), while Panels B and C includes only eligible voters who do (or do not) change their municipality of residence between the 2019 and 2023 local elections.

Figure A.2 – Distribution of mobility-induced population shocks



Note: This figure displays the frequency distribution of mobility-induced population shocks experienced by all individuals changing their municipality of residence between the 2019 and 2023 local elections. Positive (negative) numbers imply a move towards a municipality with a larger (smaller) electorate.

Figure A.3 – Turnout by donor status and detailed electorate size



Note: This figure displays the turnout probability among donors (squares) and non-donors (circles) living in municipalities of a given size. We also include the difference in turnout level across donors and non-donors (triangles; secondary vertical axis).

Online Appendix B

We use the Norwegian Local Election Studies (LES) for the period 2003-2019 to analyze the relationship between individuals' sense of civic duty, municipal electorate size, and electoral participation. The Norwegian Agency for Shared Services in Education and Research (SIKT) provides complete documentation in both English and Norwegian for the cumulative LES dataset. SIKT also offers researchers the possibility to download the dataset for analysis and replication.

The LES surveys conducted in 2003, 2007, 2011, 2015, and 2019 include measures of civic duty, self-reported electoral participation, as well as municipality identifiers. The latter allow us to merge the individual-level survey data with information on the eligible population size of the municipalities. For the 2003, 2007 and 2019 elections, the dataset also includes register-controlled electoral participation. Figure B.1 displays the relationship between the size of the municipal eligible population and self-reported as well as validated electoral participation. While self-reported turnout consistently exceeds validated participation (as commonly observed; Dahlgaard et al. 2019), the same inverse relationship between electorate size and turnout clearly materializes for both turnout measures.

A key question in the LES surveys captures respondents' support for voting as a civic duty. The question formulation in 2015 and 2019 was: "Some believe that it is a civic duty to vote in elections, while others think that one should only vote when the election feels important personally. Which of these viewpoints do you agree with the most?" (coded 1 for civic duty, 2 for personal importance, and 3 for 'Not sure, no answer'. A slightly different formulation was used in 2003, 2007 and 2011: "Envision two people discussing different topics. A states: It is a civic duty to vote in elections. B states: One should only vote when the election is seen as important to oneself." Respondents were then asked for their agreement with person A or B (measured on a four-point scale). We recoded the responses from the 2015 and 2019 surveys as 1 when the respondent reported "Civic duty" (0 otherwise). For the 2003, 2007 and 2011 formulations, we coded our measure for civic duty as 1 when respondents completely

or somewhat agreed with person A (0 otherwise). Figure B.2 shows that perceptions on the importance of civic duty appear unrelated to municipal electorate size.

As argued in the introduction of the main text, individuals who believe in voting as a civic responsibility would be expected to cast their ballots regardless of the probability that they can influence the election outcome (Riker and Ordeshook 1968; Geys 2006). Hence, they should be (almost) equally likely to turn out in small- and large-scale elections. Individuals who do not see voting as a civic duty, however, are expected to be (much) more sensitive to changes in the pivot probability induced by distinct electorate sizes. We explore this relationship between electoral participation and population size *conditional on civic duty* by estimating the following linear probability model:

$$V_{imt} - V_{imt}^{C} = \delta_1 LogPop_{mt} + \delta_2 Duty_i \times LogPop_{mt} + \delta_3 Duty_i + \theta_t + \epsilon_{imt} \tag{2}$$

where V_{imt} is register controlled electoral participation of individual i residing in municipality m in election year t. This equals 1 if the individual participated in the municipal and/or the county council elections, and 0 otherwise. Similarly, V_{imt}^{C} equals 1 if individual i self-reported participation in the county council election, and 0 otherwise. As people cast their votes in municipal and county elections at the same time in the same polling station, V_{imt}^{C} credibly picks up all individual- and location specific factors that influence the decision to vote, including gender, age, income, education, pro-social motivations, physical costs of voting, elite mobilization efforts, and so on (Andersen, Fiva and Natvik 2014; Andersen and Sørensen 2022). Hence, specifying $V_{imt} - V_{imt}^{C}$ as the dependent variable "immediately cleans out any influence from factors that are common to both elections" (Andersen, Fiva and Natvik 2014, 160), which is particularly important since LES is a (repeated) cross-sectional dataset. This approach is reminiscent of a difference-in-differences specification, and allows us to identify the effect of variations in population size independent of any 'common factors' (Andersen, Fiva and Natvik 2014; Andersen and Sørensen 2022). Consistent with our specification in the main text, the key independent variables are $LogPop_{mt}$ (which denotes the eligible population size in municipality m in election year t) and $Duty_i$ (which equals 1 if

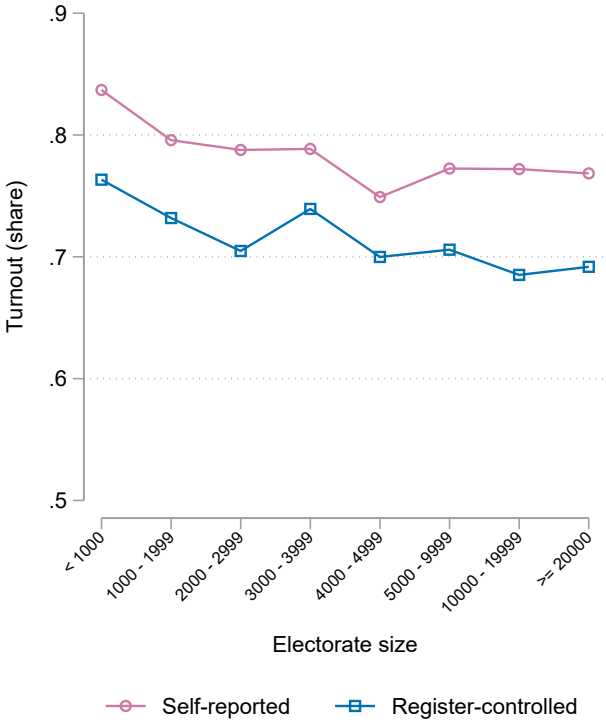
respondent i states that electoral participation is a civic duty, and 0 otherwise). The model also includes election year fixed effects.

The results are summarized in Table B.1. We first of all find that turnout declines significantly with (log) electorate size among respondents who do *not* agree that turnout is a civic duty ($\delta_1 < 0; p < 0.01$). As in our main findings, this negative gradient weakens substantially among those who *agree* that voting is a civic duty ($\delta_2 > 0; p < 0.01$). As a result, we once again observe that the turnout gap between more/less pro-social individuals (now operationalized as having a higher/lower sense of civic duty) grows as the size of the electorate increases. These results hold after controlling for respondents' political interest and a measure of their direct contact with politicians, as well as their interactions with electorate size.[18] This offers an important cross-validation of our results in Figure 1 in the main text.[19]

[18]The exact wording of the question on political interest reads "How interested are you generally in politics?". For direct contact with politicians, the question reads "How important would you say the following sources typically are for you personally for acquiring information about political issues in your municipality? Direct contact with politicians". Both are measured using a five-point scale.

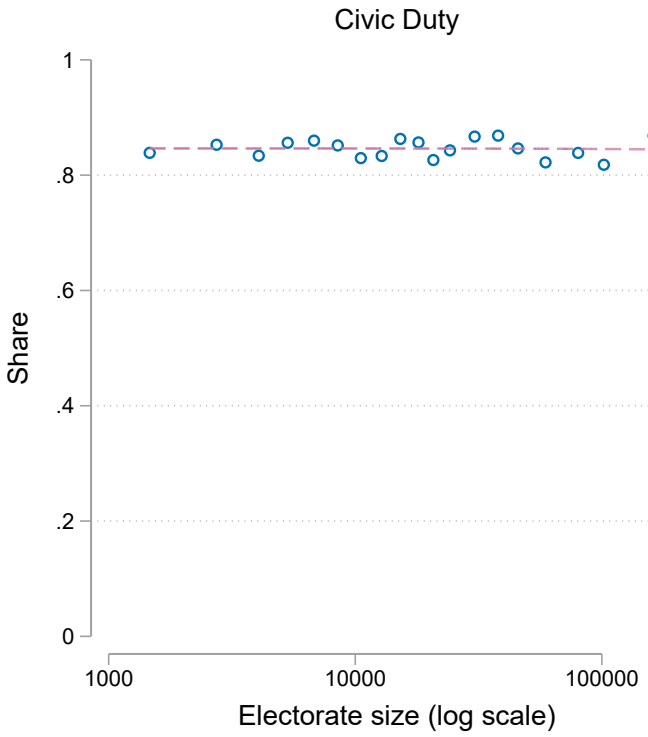
[19]Remember that V^C_{imt} also captures individuals' sense of civic duty to vote, and thus offsets any positive duty effects on turnout in general. Hence, the average effect of $Duty_i$ across all population sizes will be zero (which is confirmed in a specification excluding the interaction term in equation 2). Since we expect the effect of civic duty on participation in municipal council elections (V_{imt}) to increase with municipality population size (i.e. $\delta_2 > 0$), the level effect of the civic duty term in equation 2 (i.e. δ_3) would be expected to become negative (since it captures the civic duty effect on the response variable for a population size close to zero).

Figure B.1 – Self-reported and validated electoral participation



Note: The figure presents the average electoral participation rates in local elections, based on data from the Local Election Studies, grouped by the eligible municipal population size. Circles represent self-reported participation, while triangles reflect participation levels based on validated voter registration records.

Figure B.2 – Voting as a civic duty, by electorate size



Note: The figure displays, on the vertical axis, the share of respondents in the Local Election Studies for the period 2003-2019 who agree that voting is a civic duty. On the horizontal axis, we depict eligible population size bins (measured on a log-scale). Hence, each dot is the share of respondents in a municipality of a given electorate size agreeing that voting is a civic duty.

Table B.1 – Electoral participation and civic duty, conditional on electorate size

	Civic duty= 0		Civic duty= 1		Full sample	
	(1)	(2)	(3)	(4)	(5)	(6)
Electorate size (log)	-0.0251	-0.0354	-0.0083	-0.0009	-0.0245	-0.0402
	(0.0082)	(0.0332)	(0.0037)	(0.0139)	(0.0081)	(0.0161)
	[-0.0411, -0.0090]	[-0.1007, 0.0300]	[-0.0156, -0.0010]	[-0.0283, 0.0265]	[-0.0403, -0.0086]	[-0.0719, -0.0086]
Civic duty= 1					-0.1551	-0.3394
					(0.0686)	(0.1059)
					[-0.2898, -0.0204]	[-0.5476, -0.1312]
Electorate size × Civic duty					0.0160	0.0382
					(0.0071)	(0.0115)
					[0.0020, 0.0300]	[0.0156, 0.0608]
Election year FE	YES	YES	YES	YES	YES	YES
Controls	NO	YES	NO	YES	NO	YES
N	1,082	438	5,919	2,795	7,001	3,233
Clusters	375	251	481	420	483	425
R-squared	0.014	0.042	0.003	0.003	0.005	0.008

Note: The table provides coefficient estimates for linear probability models with the difference between register-controlled voter turnout in local elections (available in 2003, 2007 and 2019) and self-reported turnout in the county council elections as the dependent variable (following, among others, Andersen, Fiva and Natvik 2014; Andersen and Sørensen 2022). The main independent variables are (log) electorate size, and an indicator variable equal to 1 for respondents agreeing that voting is a civic duty (0 otherwise). Columns 2, 4 and 6 additionally include controls for respondents' political interest and direct contacts with politicians, as well as their interactions with (log) electorate size. The question on political interest reads "How interested are you generally in politics?". The question on direct contacts with politicians reads "How important would you say the following sources typically are for you personally for acquiring information about political issues in your municipality? Direct contact with politicians". Note that the question on direct contacts with politicians is not available in the 2019 election, which therefore reduces the available sample size. Standard errors clustered at the municipality level are given in parentheses, and 95% confidence intervals in brackets.