

SOCIAL PRESSURE, NETWORK TOPOLOGY, AND THE PERSISTENCE OF THE VOTING NORM

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Abstract

This study presents the results of an agent-based simulation of the effects of social pressure and network topology on the persistence of the voting norm. It aims to examine how variations in network topology and the degree of reduction of social influence shape the persistence of intended turnout. The decision rule for an agent/voter is an extended calculus of voting by Riker and Ordeshook, considering social pressure and the mechanism of internalisation of the sense of civic duty. The model includes networks generated using the Watts-Strogatz algorithm, which differ in rewiring probability. The model assumes two phases of voting norm spreading: a mobilisation phase (full social pressure), in which intended turnout increases, and a reduction phase (pressure fully or partially suppressed), in which turnout decreases and then stabilises at a level appropriate to the network. In the mobilisation phase, differences in intended turnout between the studied networks mainly depend on the structure of connections between individuals, and in the reduction phase, on the degree of suppression of social pressure. Even a small social influence can lead to a dynamic increase in intended turnout and maintain it at a relatively high level if the network is highly clustered and contains few random edges.

Keywords: *Voting norm; Intended turnout, Social networks, Watts-Strogatz algorithm, Agent-based model*

INTRODUCTION

The results of empirical studies indicate links between social pressure and electoral participation. Social influence on the decision to vote occurs in both face-to-face social networks (Gerber et al., 2008; Lindgren et al., 2025; Ternovski, 2024) and online networks (Bond et al., 2012; Haenschen, 2016). High contagion of the voting norm is usually observed in households, where most of the mobilisation signal is transmitted to other household members (Blais et al., 2019; Fieldhouse & Cutts, 2012; Nickerson, 2008). Research further indicates the importance of the influence of the immediate neighbourhood and a narrow circle of friends (Blais et al., 2019; Gerber et al., 2008; Rogers et al., 2017).

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The social environment can impact the decision to vote not only in the short term. Indeed, it turns out that even a singular mobilisation appeal (e.g. door-to-door canvassing or political direct mail) can not only increase a voter's propensity to participate in the next election, but also initiate a process of perpetuation of the voting norm, which then manifests itself (at least for some time) in the voter's habitual voting behaviour (Coppock & Green, 2016; Gerber et al., 2003; Green & Shachar, 2000). What explains the persistence of turnout? Why does participating in one election increase the probability that an individual will also vote in subsequent elections? Why is it that in communities where a high voter turnout is currently observed, it is likely to remain at similar levels well into the future? Donald Green and Ron Shachar (2000), for example, emphasised the importance of consuetude in voting and the evolution of civic identity. They proposed an explanation at the individual level, similar to Samuel Abrams, Torben Iversen and David Soskice (2011), who included informal social networks in their analysis. They found that voting and its persistence can result not only from a formed psychological habit but also from rational compliance with the pressures of the immediate environment.

An alternative explanation to the individualist approaches has been put forward by Georgia Kernell and Peter Lamberson (2023). According to their model, turnout inertia is a product of the structure of the social network: the level of turnout is determined at a point of stable equilibrium arising from interactions in the network. Between the equilibria denoting low and high turnout lie tipping points; crossing them pushes the system towards higher or lower turnout. Each stable equilibrium corresponds to a basin of attraction, a region of initial conditions from which the dynamics return to a given equilibrium. It attenuates minor perturbations, which ensures the persistence of turnout in subsequent elections, while at the same time making it possible for prominent differences in participation rates to become perpetuated in similar communities for years.

Kernell and Lamberson built an analytical model based on game theory and social network analysis that accounts for general relationships between network topology and intended turnout, rather than simulating the system from the bottom up, agent by agent, in contrast to James Fowler's (2005) agent-based model, which embeds agents in the Watts-Strogatz small-world network (Watts & Strogatz, 1998). The Fowler model makes it possible to observe how local interactions and imitation lead to turnout cascades and under what conditions the scale of these cascades increases. The agent-based approach enables the identification of the conditions under which

local incentives trigger network-wide changes. It complements the analytical approach by focusing on the specific structure of the relationship between agents and the relationships between the features of this structure and the functioning of the system².

In this study, I refer to the agent-based approach. Despite a growing body of research on social influence and voter turnout, relatively little attention has been paid to the structural conditions under which a voting norm, once diffused through a network, persists or decays over time. Existing analytical models, such as those of Kernell and Lamberson (2023), characterise stable intended turnout equilibria as a function of network topology and social interactions; however, they do not provide an agent-based simulation of voting norm diffusion and decay. Agent-based models, in turn, have largely focused either on cascade dynamics or on the formation of turnout intentions, leaving norm persistence under conditions of declining social pressure comparatively understudied (e.g. Fieldhouse et al., 2016; Fowler, 2005). This article addresses that gap by focusing on the joint role of social pressure and network topology in persisting the voting norm. The aim of this article is to examine how variations in network topology and the degree of reduction of social influence shape the persistence of intended turnout in an agent-based simulation. The following research questions were formulated: (1) Will the voting norm persist in the network once the incentives that led to its creation are weakened or reduced altogether? (2) How do the structural properties of the network affect the persistence of the norm? The starting point of my analysis was the calculus of voting by William Riker and Peter Ordeshook (1968), into which I introduced factors that measure social influence. Based on the concretised Riker and Ordeshook model, I built an agent-based model by embedding agents/voters in networks generated using the Watts-Strogatz algorithm with different rewiring probabilities.

2 THEORETICAL BACKGROUND

Anthony Downs (1957) assumed that rational voters focus solely on political and economic goals when deciding to vote. Such voters seek to maximise the expected utility of voting, guided by narrowly conceived self-interest. They decide to go to the polling station and cast a vote only if the expected benefits of voting outweigh the costs. Voting benefits represent

² Regarding the impact of social networks on political participation, see also: Amaro de Matos and Barros (2004), Fowler and Smirnov (2005), Rolfe (2005), Siegel (2009), Fosco, Laruelle and Sánchez (2011) and Fieldhouse, Lessard-Phillips and Edmonds (2016).

the difference in the expected utilities of the policies of the two candidates. Voters compare the policies they expect the candidates to implement and assess how individual policy proposals can affect their own lives and the chances that a given candidate will win and deliver on their promises. The costs of voting, on the other hand, are mainly the time and effort that voters have to spend not only on election day to go to the polling station and cast their vote, but also to acquire and assimilate information about the parties and candidates beforehand. The direct cost of participating in elections is usually incomparably lower than the cost of obtaining information.

The analysis of the Downsian model leads to the conclusion that a rational voter should abstain from voting. The reason for this is the very low probability of casting a decisive vote, which means that the costs of voting usually exceed the expected benefits. However, this conclusion, remains at odds with the observed level of voter turnout: in fact, many citizens in democratic countries participate in elections. This tension between the individual-level prediction of abstention and the empirically observed participation in elections is referred to in the literature as the “paradox of voting” (Aldrich, 1993).

William Riker and Peter Ordeshook (1968) proposed one approach that provides a basis for a partial resolution of the paradox of voting³. They first formalised the Downsian model and then introduced a sense of civic duty into the model – a type of consumption benefit independent of the probability of casting a decisive vote. They obtained a model expressed by the following equation:

$$R = PB - C + D, \quad (1)$$

Where: R is the expected utility of voting; B is the personal benefit that a voter may obtain in the event of a preferred election outcome; P is the probability of casting a decisive vote; C is the cost of voting; and D is the sense of civic duty.

Individuals with a sufficiently strong sense of civic duty will vote without regard to the benefits and costs and the probability of casting a deciding vote. Voting is therefore not, in Riker and Ordeshook’s view, a purely instrumental act, as is the case in the Downsian model. Indeed, Riker and Ordeshook’s voters may care more about obtaining consumption benefits,

³ Keith Dowding (2005) succinctly discusses attempts by rational choice writers to explain the electoral participation of a significant proportion of citizens in democratic states. See also Geys (2006) and Mueller (2003).

such as the satisfaction of reaffirming loyalty to the political system or the satisfaction of acting in accordance with the voting ethic, than about their preferred candidate's victory (see Goldfarb & Sigelman, 2010). In Riker and Ordeshook's model, the sense of civic duty can be interpreted as an internalised, norm-based benefit of voting. The model treats factor D exogenously. It does not allow for an examination of how the voting norm forms and how it spreads in the population, as well as, which is crucial for my study, how the persistence of this norm depends on the way social influence is reduced in the network and on the structure of connections between individuals.

3 MODEL

To bring Riker and Ordeshook's model closer to reality, it is necessary to include the pressures arising from social interaction. My modification involves introducing two factors into equation (1): S , which reflects the strength of social influence, and β , which expresses the degree of susceptibility of the voter to social influence. In addition, I link the factor D to the coefficient δ , which is a weight indicating how much utility a given level of sense of civic duty provides. The concretised equation (1) takes the following form:

$$R_i(t) = PB - C + \delta D_i(t) + \beta_i S_i(t). \quad (2)$$

With significant social influence and a high susceptibility of the voter to it, the expected utility of voting can be positive, even with little personal benefit and a low probability of casting a decisive vote. Therefore, social norms can be an important determinant of voting, as the model assumes⁴. The presented modification provides a starting point for the "networking" of decision-making, that is, the construction of an agent-based model assuming that individuals do not make decisions in isolation, but in a specific relational context⁵.

In order to investigate the influence of social pressure and the structural properties of the network on the persistence of the voting norm, I conducted

⁴ When $\beta > 0$ and $S > 0$, the product of βS functions as a normative social payoff, reflecting such benefits of conforming to a voting norm as reputational rewards or group approval.

⁵ In the study, I used a model with dynamic adaptive thresholds, which retains the core of the classical calculus of voting without breaking with the foundations of rational choice theory. An alternative would be to adopt a decision rule based on purely behavioural heuristics: "Imitate the behaviour of your direct neighbour with a given probability" (see Fowler, 2005).

an agent-based simulation consisting of 1200 runs (12 scenarios (6 rewiring probability values (p) \times 2 social pressure scale factor values (α)) \times 100 replications) in the population of 1000 voters (N), embedded in networks generated using the Watts-Strogatz algorithm (Watts & Strogatz, 1998)⁶. In each network, each agent was initially connected to ten immediate neighbours ($k=10$, $k/2$ on each side of a node), and then each edge was randomly rewired with a probability value fixed for the given network $p \in \{0, 0.05, 0.1, 0.3, 0.6, 1\}$ ⁷.

Each run comprised 100 iterations (rounds of contact with immediate neighbours)⁸, with the first 25 being the mobilisation phase (with full social influence) and the remaining 75 – the reduction phase. In the first scenario, the strength of social influence was reduced after 25 iterations to 0%, and in the second to 20%. Three measures of the intended turnout were adopted:

(1) percentage of agents declaring their intention to vote in the 25th iteration (end of mobilisation phase);

(2) percentage of agents declaring their intention to vote in the 100th iteration (final state of the population);

(3) the difference between the above percentages was interpreted as the degree of reduction in the norm.

The initial state of the agents was identical in both scenarios of reducing social pressure in the same network. At the time of $t=0$, a randomly selected 0.5% of agents were assigned a declaration of voting intention (external mobilisation incentive). Then, in each iteration ($t \geq 1$), each agent i “calculated” the expected utility of voting according to equation (2) and declared an intention to vote if $R_i(t) > 0$. The decisions of agents were subject to synchronous updates.

I set the values of the parameters of equation (2) so as to: preserve the proportions appropriate to the classical calculus of voting, obtain a realistic activation threshold, and expose the role of social influence transmission. I estimated the value of P for $N=1000$ as ≈ 0.0252 , using the formula of Guillermo Owen and Bernard Grofman (1984, pp. 314–315):

$$P = \frac{2e^{-2(N-1)(p-\frac{1}{2})^2}}{\sqrt{2\pi(N-1)}} \quad (3)$$

⁶ I ran the simulation in R 4.2.3 (R Core Team, 2023), using the packages: igraph (Csárdi & Nepusz, 2006), dplyr (Wickham et al., 2023) and ggplot2 (Wickham, 2016).

⁷An operation performed only once at the initialisation of each network.

⁸In each round, the model computed the mean of the signals from an agent’s direct neighbours (i.e. its 1-hop neighbours).

where: N is the number of voters and p is the probability of voting for candidate 1. I adopted $p=1/2$ (symmetric voter preferences). Owen and Grofman noted that for large electorates, the probability of a single vote breaking a tie (when N is an odd number) or leading to a tie (when N is an even number (my case)) is almost identical. For $N=1000$ at $p=1/2$, the relative error of the applied approximation is $\approx 0.075\%$, so it is sufficiently accurate for the study population. I estimated the value of P ex ante as a constant common to all agents in all simulation runs to separate individual instrumental motivation from social influence. This settlement avoided counting network effects in the expected benefits of voting (PB).

In all replications, I adopted $B=3$ and $C=1$. Keeping the constant values of B and C ensured the comparability of the studied social influence reduction scenarios and allowed a clear distinction between instrumental incentive and endogenous network effects. The value β_i was drawn once from the interval $[0,1]$ at the beginning of the experiment and remained constant over time and identical for a given agent i across all networks and replications. The variable $S_i(t)$ was the percentage of the agent's i immediate neighbours, who declared an intention to vote in the iteration $t-1$, linearly scaled to the interval $[0,10]$. After the mobilisation phase ($t > 25$), the scaled percentage of those declaring their intention to vote was multiplied by the social-pressure scale factor $\alpha \in \{0, 0.2\}$ (total pressure exclusion and pressure reduction to 20%), respectively. The coefficient $\delta=1.5$ measured the strength of the intrinsic motivation that determined whether the voting norm would persist in the population once the impact of the immediate neighbourhood was reduced/removed. For each agent, $D_i(0) = 0$, that is, the absence of an internalised voting norm at the start, was adopted. In each iteration, the variable D_i was updated according to the following formula:

$$D_i(t + 1) = (1 - \lambda)D_i(t) + \lambda v_i(t), \quad (4)$$

where: $\lambda \in [0,1]$ is the norm's learning/decay rate and $v_i(t) \in \{0, 1\}$ is a variable that indicates whether the agent i declared a willingness to vote at the time t ($0 = \text{no}$, $1 = \text{yes}$). In the simulation, I assumed $\lambda=0.1$, meaning that after each declaration of voting intention ($v_i = 1$), 90% of the previous value D_i was retained, to which 0.1 was added, while the absence of a declaration ($v_i = 0$) caused D_i to decrease by 10% in the next iteration.

I simulated different combinations of the values of the two factors:

(1) rewiring probability, which controls the level of randomness of the topology (from $p=0$ – ring lattice to $p=1$ – fully random network);

(2) social pressure scale factor, taking values corresponding to two scenarios: $\alpha=0$ – complete deactivation of pressure after 25 iterations and $\alpha=0.2$ – reduction of pressure to 20% of the initial level after 25 iterations.

Results were reported as averages after replications, together with standard errors (SE), relative standard errors (RSE), and 95% confidence intervals (CI) determined as two-sided t -intervals based on the variance between replications.

4 RESULTS

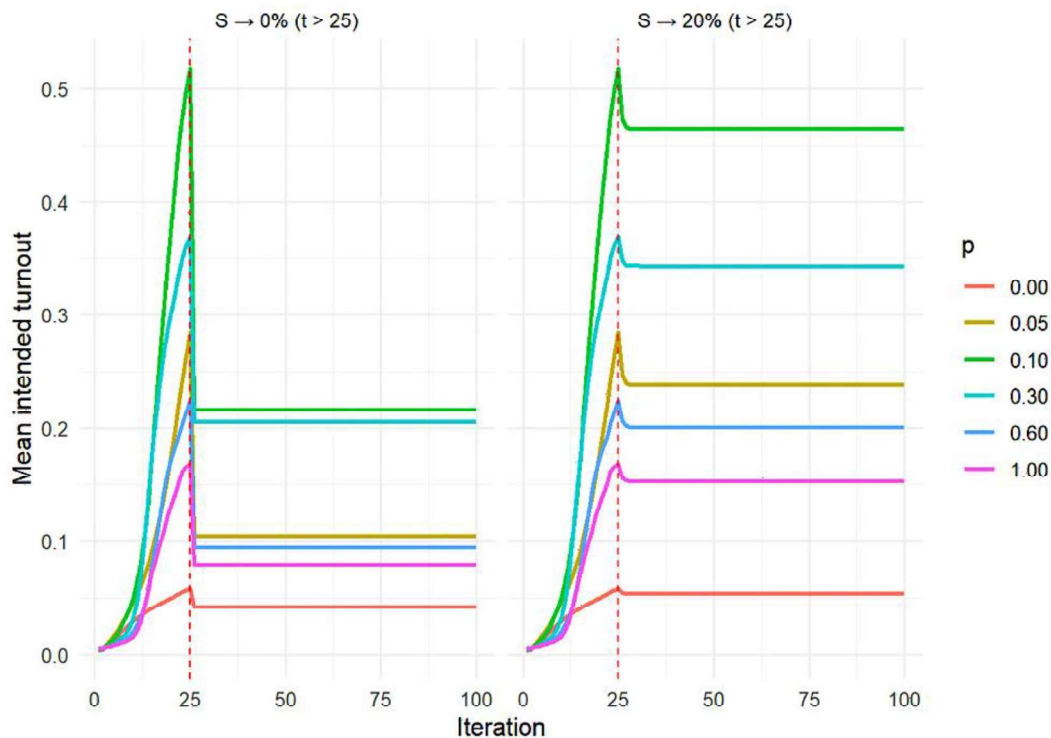
The simulation results show a clear two-stage transmission of the voting norm: up to the 25th iteration, there is an increase in the intended turnout in all networks, followed by a decrease and stabilisation at different levels, depending on the topology and the strength of social pressure. Until the mobilisation signal ($t \leq 25$) is switched off or attenuated, the differences in the transmission dynamics of the norm depend primarily on the rewiring probability. At $p=0$, the mean intended turnout barely exceeds 5%, whereas with even a small proportion of random connections ($p=0.05$) it jumps to $\approx 28\%$. It reaches its highest level at $p=0.1$ ($\approx 52\%$). As the network approaches a fully random topology, the level of frequency decreases, reaching $\approx 17\%$ at $p=1$. The clear increase in turnout between $p=0$ and $p=0.05$ suggests the existence of a structural threshold, beyond which a few random edges begin to play a significant – though not yet dominant – role in shaping the dynamics of the network. The relatively high level of turnout at $p=0.1$ is due to the classic properties of a small world: high clustering, maintaining and reinforcing local pressure, and few random edges shortening the average path length. The relative standard error of most estimates is below 20%. Higher values appear primarily for $p \geq 0.6$, reflecting greater instability in highly randomised networks. The simulation results are presented in Table 1. The values in $t=25$ are identical for $\alpha=0$ and $\alpha=0.2$, as α only works for $t > 25$.

Table 1: Mean intended turnout (averaged over 100 replications) as a function of the rewiring probability and social pressure scale factor.

d	α	Mean (t_{25})	SE	RSE	95% CI	Mean (t_{100})	SE	RSE	95% CI	Mean Δ ($t_{100} - t_{25}$)	SE	RSE	95% CI	Retention ($t_{100} - t_{25}$)
0.0	0.0	0.0580	0.0075	0.1284	[0.0432, 0.0728] 2	0.042 2	0.0051	0.122 2	[0.0319, 0.0524]	-0.0158	0.0025	0.1578	[-0.0208, -0.0109]	0.7276
0.0	0.2	0.0580	0.0075	0.1284	[0.0432, 0.0728] 0	0.054 0	0.0069	0.128 7	[0.0402, 0.0678]	-0.0040	0.0006	0.1400	[-0.0051, -0.0029]	0.9310
0.05	0.0	0.2845	0.0328	0.1153	[0.2194, 0.3496] 7	0.104 7	0.0127	0.120 9	[0.0796, 0.1299]	-0.1797	0.0215	0.1197	[-0.2224, -0.1370]	0.3680
0.05	0.2	0.2845	0.0328	0.1153	[0.2194, 0.3496] 0	0.238 0	0.0268	0.120 1	[0.1813, 0.2948]	-0.0465	0.0054	0.1166	[-0.0572, -0.0357]	0.8366
0.1	0.0	0.5179	0.0421	0.0813	[0.4344, 0.6014] 3	0.216 3	0.0273	0.126 0	[0.1622, 0.2704]	-0.3016	0.0304	0.1008	[-0.3619, -0.2413]	0.4176
0.1	0.2	0.5179	0.0421	0.0813	[0.4344, 0.6014] 4	0.464 4	0.0397	0.085 4	[0.3857, 0.5431]	-0.0535	0.0074	0.1392	[-0.0682, -0.0389]	0.8967
0.3	0.0	0.3685	0.0437	0.1187	[0.2817, 0.4552] 5	0.202 5	0.0336	0.163 3	[0.1389, 0.2721]	-0.1630	0.0294	0.1806	[-0.2214, -0.1046]	0.5495
0.3	0.2	0.3685	0.0437	0.1187	[0.2817, 0.4552] 5	0.343 5	0.0417	0.121 5	[0.2607, 0.4263]	-0.0250	0.0064	0.2550	[-0.0377, -0.0123]	0.9322
0.6	0.0	0.2244	0.0378	0.1685	[0.1494, 0.2995] 6	0.094 6	0.0233	0.246 3	[0.0484, 0.1409]	-0.1298	0.0268	0.2066	[-0.1829, -0.0766]	0.4216
0.6	0.2	0.2244	0.0378	0.1685	[0.1494, 0.2995] 6	0.200 6	0.0353	0.176 0	[0.1306, 0.2708]	-0.0238	0.0065	0.2728	[-0.0367, -0.0109]	0.8939
1.0	0.0	0.1680	0.0341	0.2033	[0.1003, 0.2358] 7	0.079 7	0.0229	0.286 9	[0.0344, 0.1251]	-0.0883	0.0233	0.2640	[-0.1345, -0.0402]	0.4744
1.0	0.2	0.1680	0.0341	0.2033	[0.1003, 0.2358] 6	0.152 6	0.0322	0.211 0	[0.0887, 0.2164]	-0.0155	0.0041	0.2682	[-0.0237, -0.0073]	0.9083

From the 26th iteration, the networks' evolution is mainly determined by the degree of reduction in normative incentives. When social pressure is switched off completely, the level of intended turnout decreases in all networks; the largest decreases occur where the highest increase was recorded up to the 25th iteration (in the network with $p=0.1$, turnout decreases by 30 percentage points). This phenomenon reflects path dependence with partial reversion: the steeper the earlier increase, the greater the magnitude of the later decrease, although the level of the measured phenomenon still remains above the initial value. In contrast, even a significant 80% reduction in the power of social influence generates incomparably lower drops: on the network from $p=0.3$, turnout stabilises at 34%, and the average drop between iterations of 25 and 100 is only 2 percentage points. A small amount of social pressure thus proves to be sufficient to maintain pro-citizenship attitudes in the simulated population in the long term. This observation was also confirmed by estimates of the retention rate. In the case of a total pressure reduction ($\alpha=0$), the retention is low and strongly dependent on the topology (36.8-72.8%), whereas when the pressure is reduced to 20%, the retention remains high and even across all topologies (83.7-93.2%). All estimated differences in mean turnout between iterations 100 and 25 are statistically significant at the 5% level – their 95% t-confidence intervals do not include 0. The evolution of the mean intended turnout is presented in Figure 1.

Figure 1: Evolution of the mean intended turnout (averaged over 100 replications) for different levels of rewiring probability and social-pressure scale factor.



source: own study.

The simulation results show that networks with a small-world structure are most favourable in both scenarios for reducing social pressure. The combination of moderate p with non-zero S ensures that the intended turnout remains relatively high; too low or too high a proportion of random edges leads to lower equilibria. When the mobilisation signal is completely switched off, the smallest relative decrease in turnout is recorded by the highly clustered ring lattice, in which the spreading of changes is slowed down by a high average path length. To summarise: the network topology determines the differences in the level of intended turnout up to the 25th iteration, while in the later phase of the simulation, the differences in the persistence of the voting norm also depend on the degree of reduction of social pressure.

5 DISCUSSION

The simulation reveals a two-phase logic of the spreading of the voting norm. The first phase (iterations 1-25) shows that a small percentage of random edges ($p \in \{0.05, 0.1\}$) is sufficient to trigger a sharp increase in the declared voting intention. This effect reflects the classic properties of the small world: shortening the average path length increases the reach of the mobilisation signal, while high clustering reinforces local social pressure. Consequently, we are seeing a cascading increase in the declared willingness to participate in elections. In densely connected neighbourhoods, individuals with relatively lower susceptibility to social influence are also persuaded to vote, provided that the proportion of agents declaring their intention to vote in their immediate neighbourhood is sufficiently high. This pattern is consistent with Granovetter's (1978) threshold model and Centola and Macy's (2007) complex contagion theory, according to which behaviours requiring social reinforcement only spread once a critical number of active neighbours has been exceeded.

The accelerated diffusion effect observed in the first phase occurs with a moderate number of random edges; a further increase in the randomness of the network inhibits the increase in the declared turnout. This observation is consistent with the findings that the effective transmission of social norms in tightly clustered communities with strong in-group ties is facilitated, under certain conditions, by the existence of a few long ties (Eckles et al., 2023; Latora & Marchiori, 2001; Siegel, 2009). The propagative role of long ties, for example, is suggested by field experiments with mailings revealing the voting history of neighbours (Gerber et al., 2008; Rogers et al., 2017). Mailing can act as a shortcut that links households, broadening the knowledge of the voting behaviour of neighbours and lowering the cost of reaching new people with the norm. It does not form physical relationships but functionally accelerates the spread of the voting norm, just as a random edge shortens the distance in the Watts-Strogatz model.

The second phase (iterations 26-100) indicates the role of the degree of social influence reduction. When the mobilisation signal is completely switched off, the mean intended turnout decreases – depending on the topology – by 2–30 percentage points, whereas with an eighty per cent reduction in the influence of the immediate neighbourhood, the falls are only 0.4–5 percentage points. The decline from $t=26$ is due to the weakening of S and the dynamics of D : with $\lambda=0.1$, the lack of a voting declaration lowers D_i in subsequent iterations, making it more difficult to cross the

$R_i(t) > 0$ threshold. Highly clustered networks with a moderate number of random edges again have the highest turnout. The results obtained are consistent with field experiments showing that even single mobilisation incentives can condition an increase in individual turnout, which then persists for some time (Coppock & Green, 2016; Gerber et al., 2010; Mann, 2010; Panagopoulos, 2010; Rogers et al., 2017).

The simulation reveals the structural conditions of voter turnout highlighted by Kernell and Lamberson (2023). However, the role of the network structure differed between the two phases of the simulation. Up to $t=25$, differences in the level of intended turnout are mainly determined by the structure of connections between agents: the highest increase in turnout was recorded in the range of p values, typical of a small world. From $t=26$, however, the degree to which the influence of the immediate neighbourhood is reduced becomes crucial. With a partial reduction in social pressure, a combination of moderate p and high clustering keeps turnout relatively high. In turn, the total reduction in social pressure leads to a significant decrease in the declared voting intention. The exception is the ring lattice, which retains the greatest stability (lowest relative decrease in the intended turnout rate). However, the differences in turnout rates between the social influence reduction scenarios studied are not sustainable. The tested system shows high sensitivity to even small changes in the values of individual parameters. Already, for example, the extension of the mobilisation phase to 30 iterations significantly approximates the trajectories of turnout evolution between the analysed scenarios of social pressure reduction. A longer mobilisation phase creates the possibility of a stronger internalisation of the voting norm, which translates into smaller drops in turnout once the influence of the immediate neighbourhood has completely ceased⁹.

The study provides an alternative to individualist approaches, which focus on the preferences and decisions of individual political actors, ignoring the social and cultural context. The simulated model does not explain voter turnout as a simple sum of independent decisions of individuals but shows how the decisions of voters embedded in specific relational structures generate emergent collective effects. This gives us a more complete picture of voting decisions and a better understanding of why a voting norm persists or disappears depending on the structure of connections in the population. The model shows that a favourable network architecture can

⁹A similar effect is produced by increasing the initial number of agents declaring their intention to vote to 1%.

lead to a dynamic increase in turnout and to its maintenance even with a small number of agents initially declaring their intention to vote. It offers a partial solution to the paradox of voting, which is not available in studies that ignore the level of social interaction.

6 LIMITATIONS

The research utility of the simulated model is limited by several design and operational simplifications. However, these simplifications play a very important role, as they allow the focus to be on the essence of the problem being investigated and the study to be carried out efficiently within the constraints of computing power. Below, I have listed some of the most important ones:

- Static network structure. Rewiring only occurs when networks are initialised, making it impossible to analyse the feedback between the attitudes of individuals and the structure of social relations.
- Highly idealised decision rule. Although the model includes randomness in the network structure and initial conditions, the voting decision is deterministic: it takes into account neither the individual random component (idiosyncratic noise, e.g. perception errors) nor other forms of decision uncertainty (e.g. probabilistic selection rule).
- Synchronous updates. All agents update decisions simultaneously; asynchronous updating can change the pace and scale of cascades.
- Residual heterogeneity of the voters. In the model, the only characteristic that varies individually *ex ante* is the susceptibility of voters to social influence. The costs of voting, the expected benefits and the weight of civic duty remain identical for all agents. As a result, the model does not allow for an examination of how variations in economic or moral motivations affect turnout dynamics.
- Two scenarios for reducing social pressure after the mobilisation phase. The accepted scenarios ignore cases in which the pressure may diminish up to a certain point and then be renewed.
- Calibration of the social influence scale. S is linearly scaled to the interval $[0,10]$, and the reduction of influence follows $t=25$ by leaps and bounds; other schemes (non-linear scaling S , smooth reduction) may give different trajectories for the evolution of turnout.
- No consideration of the impact of external incentives. The studied system is closed; the only source of variability in it are internal social

interactions. The failure to capture the impact of the environment limits the ability to compare the model with the real world, where voters are subject to complex and multidirectional institutional and informational influences.

Including omitted factors in a model can increase its explanatory potential and bring it closer to reality.

CONCLUSION

The simulation shows that the persistence of the voting norm is the result of the coupling between social pressure and network topology. Even a small influence from the immediate neighbourhood can lead to an increase in intended turnout and help maintain it at a relatively high level if the network is sufficiently clustered and the random edges do not disappear completely. These findings are in line with empirical observations suggesting that the effectiveness of social influence does not depend solely on the content and strength of the incentives, but also on the way in which they spread through the population.

The results point to a broader conclusion about the structural conditions of collective political behaviour: network architecture is not a neutral medium through which information merely passes, but an active determinant of whether norms emerge, consolidate, and endure. This finding has practical implications. Campaigns and institutions seeking to sustain civic engagement may benefit not only from increasing the strength of mobilisation appeals but also from attending to the relational structures through which those appeals travel.

The study also demonstrates the value of the agent-based approach as a complement to analytical models. By simulating intended turnout dynamics from the ground up, it becomes possible to track how local interactions produce macro-level patterns of norm persistence – patterns that cannot be derived from equilibrium analysis alone. Future research could extend this framework by incorporating heterogeneous costs and benefits of voting, dynamic network rewiring, or empirically calibrated network structures. Abandoning the assumption of synchronous updating or introducing stochastic decision rules would be a further natural step toward a more realistic representation of the dynamics of political participation.

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