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The Voter Model:
Background, Approach, and Implementation

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**Introduction**

This paper describes the Data Integration Model for the voting outcome as described in the ‘Modelling Approach’ paper. Our aim is to develop an agent based model of voting which, as far as possible, is consistent with well established and empirically verified theoretical models of turnout at the individual and aggregate level. The model described provides a baseline agent based model of voting which can be adapted to explore the effects of specific social, demographic and political changes as well as specific assumptions. For example, the model may be adapted to examine the impact of immigration on turnout levels amongst minority and majority ethnic group electors. The paper is structured as follows. First we briefly describe the structure of the model. Second we provide a brief introduction to the theoretical literature upon which the model is based. Third, we describe in more detail the causal narratives underpinning the model and the evidence up on which these are based, and how these are implemented.

**The model structure**

The baseline model is initialised using data from the 1992 British Household Panel Survey (University of Essex, 2010). The demographic trends and the empirical research used to inform the model are drawn from the period approximately 1970-2008. The macro election results (which party one/lost etc) are drawn from post war elections results for the UK but could be adapted to emerge from the model rather than be determined exogenously. The universe of agents roughly represents a single town or constituency, and the demographic makeup of that hypothetical town may be adjusted to reflect a real life geographical location.

The model can be roughly split into four “layers”: general population dynamics, social networks, influence and the voting decision. Each of these layers effects those after it, but has no or only weak effects on those before. The voting decision is made in two steps. First an agent has an intention to
vote which is influenced by individual characteristics, memory (of previous voting, discussion etc) and social networks. Second the action of voting is mediated by exogenous factors that might interrupt the intention to vote or not vote (such as the moving home or the voting intention of family members). The model structure is summarised in 1 below.

The “input” to the model consists of: a number of parameter settings, the individual characteristics of the initial and source immigrant populations (gained from the 1992 BHPS) and the external “shocks” in terms of the UK general election results. The characteristics of the agents in the simulation include: age, ethnicity, immigration generation (1st, 2nd or > 2nd generation), its social links (relationships which, should the individuals involved be inclined) might result in political influence or a conversation about politics, its children and parents, state of employment and memory of events (such as whether they voted last time, recent political conversations etc.). The output from the model can be anything that is derivable from the state of the simulation at each simulation tick but includes: how many people vote for each of the main parties, a histogram of ages in the population, the distribution of household sizes, a histogram of clustering in the social network and a “trace”, in pseudo-narrative form, of a particular individual in the simulation over time.
The Voter Model
SCID Review Discussion paper

Theories of voting and non-voting

The wealth of literature on theories of turnout can generally be divided into two main camps. First there is the broad body of sociological models of voting revolve around socio-economic characteristics and social psychology (Dalton and Wattenberg 1993; Clarke, Sanders et al. 2004). Whilst there is an array of different theories within the sociological framework, what distinguishes them is that political attachments are shaped by a voter’s social characteristics, belonging to a specific social group or social class and by the social context in which an individual lives and works. Influential accounts have, for example, explained participation by reference to perceptions of equity or fairness (Runciman 1966), social capita (Putnam 2000) and civic voluntarism with an emphasis on ‘resources’ (Verba and Nie 1972; Parry, Moyser et al. 1992) and mobilisation by political parties or candidates (Rosenstone and Hansen 1993). Social context and interpersonal influence were at the heart of early sociological models of voting, but following the behavioural revolution there was a shift away from the social logic of politics as characterised by the Columbia School to a focus on rational motivations and social psychology of individual voters and parties (associated with the Michigan School) (Zuckerman 2005).

In social-psychological approaches the importance of social group membership is re-enforced by early socialisation experiences that foster the development of partisan attachments or party identification associated with social class membership (Campbell 1960). In turn these influence the propensity to vote as well as party choice. Thus, in the sociological framework, the act of voting is an act of allegiance, and therefore a potential explanation for abstention is a lack of such group attachment.

Instrumental or choice based models focus on the individual benefits accrued from voting. Classic rational choice theories explain non-voting as the rational course of action when the benefits of
voting are expected to be outweighed by the costs (Downs 1957; Riker and Ordeshook 1968; Blais 2000). Although the costs of voting are usually minor e.g. gathering information about candidates, distance travelled to polling station etc); they are generally expected to exceed the expected benefits due to the extremely low probability that any one individual’s vote will be decisive.\(^1\)

Notwithstanding this, the expected utility from voting is a function of the relative difference between the utility of a vote cast for one party instead of another. Without a preference for one party over the other(s) there can be no relative utility differences and non-voting may occur because of indifference. Even if the elector is not indifferent, abstention may occur through alienation (when electors perceive too great a ‘distance’ between their own values and interests and those of even the most preferred candidates) (Brody and Page 1973; Adams and Merrill 2003). There have been many solutions offered to the paradox of voting including extended definitions of rationality (e.g. to include expressive benefits (Schuessler 2000) and to allow group benefits to be taken into account (Morton 1991; Feddersen 2004).

Other choice based models highlight the role of political context in determining voter turnout, including the role of institutions and electoral rules (Johnston and Pattie 2006). The cognitive mobilisation model links political participation with political satisfaction (or dissatisfaction), which is shaped by the level of interest and knowledge of electors. In turn this is linked with levels of education and exposure to information (Dalton 1984).

In summary, both sociological and rational choice theories predict multiple causes for non-voting. Both traditions predict a lack of a clear partisan preference as perhaps the most straightforward

\(^{1}\) This is the ‘paradox of voting’ – rational, self-interested actors should not vote, yet people do vote in their millions. There is no paradox if voting is considered as an act of consumption (‘expression’) rather than one of investment, however, because the benefit is not discounted, although some commentators suggest that non-probabilistic consumptive benefits are not really part of a rational choice theory (see Ordeshook and Zeng 1997).
factor underlying non-voting. However, electors may still vote due to benefits accrued from the act of voting or attachment towards the wider political system (often be referred to as civic duty in the sociological framework, and voting as consumption or expressive benefits in the rational choice framework). Not surprisingly, a hybrid view of the stereotypical non-voter has emerged that concatenates many of the factors discussed. Famously, Verba et al stated that electors don’t always vote "because they can't, because they don't want to, or because nobody asked" (Verba, Schlozman, Brady and Nie 1991), capturing the essence of socio-economic and cognitive resources, rational choice and mobilisation. Pattie and Johnston (1998) describe it thus:

“From past research, the archetypal abstainer is a socially isolated, working class, private tenant who lives in a safe seat, is not a member of local or national organisations, and who has few distinctive political views beyond doubt over their own (and the system’s) political efficacy.” (p. 266).

Cutting across both traditions, there has been a substantial body of research which looks at both individual and group dynamics in voting. For example, at the individual level scholars have looked at the role of habit and inertia (Plutzer 2002; Fowler 2006) while at the family, group, neighbourhood and social network level much research has demonstrated the importance of interpersonal influence on voting behaviour (Huckfeldt 1986; Huckfeldt and Sprague 1995) and a high level of correspondence in at the family and household level (Cutts and Fieldhouse 2009). These dynamic relationships (within and between individuals) are often overlooked in analytical models of turnout based on observational data (Franklin 2004)\(^2\). In the following sections we discuss in more detail some of the core ideas that have emerged from existing theories of voting and, in particular, how we propose to incorporate those ideas into an agent based model of turnout.

\(^2\) Notable exceptions include for macro level dynamics (e.g., Franklin 2004). For network dynamics see for example Huckfeldt, Johnson, and Sprague (2004). For micro dynamics see Fowler (2005).
Causal Stories: Evidence and Implementation in the Model

The model of turnout is based on narrative (i.e. causal) stories of voting that are found in the existing literature, broadly reflecting theories of socio-economic resources, rational choice and mobilisation (Leighley 1995) although due to the nature of the modelling approach adopted there is a rather greater emphasis on individual level and network dynamics than much of this existing research. It is from these stories that we build the rules driving the behaviour of our agents. The main groupings of stories of ‘why people vote’ are at the micro (individual, relationships), meso (networks), and macro levels. We also include stories of ‘why people start voting’ and ‘why people stop voting’, which also need to be taken into account when examining turnout. This section will outline those stories and the evidence attached to them and will also indicate which stories are currently implemented in the model.

There are also important factors that are not part of the causal stories but may influence many of them, either because they are inherently correlated with emergent properties of agents, or because they are used to determine the characteristics of agents. For example, age is not included explicitly as an influence on voting but is likely to be correlated with the development of habit (see below) more directly through senescence. Employment status does not influence voting directly, but differences in turnout for those in employment and not in employment are likely to emerge due to the differential opportunities for network formation and influence. Socio-economic resources more generally are captured through class status, which (for simplicity) is also used as a proxy for education. Social class has no direct effects on voting in the model but is indirectly correlated with some initial characteristics of voters (such as civic duty) and may have more lasting effects through social networks. Later versions of the model may incorporate a more direct class effect on other factors in the model such as political discussion and civic duty. Similarly, whilst ethnic group has no pre-determined impact own propensity to vote, network formation is influenced by homophily.
(including class and ethnic homophily) which in turn will affect network influence. Immigrants of minority status may also enter the model with different characteristics which in turn will affect voting decisions. More generally these second order effects are brought about by various factors (such as fertility, mortality, and immigration rates) and have an indirect influence on turnout.

Fertility, mortality, and migration are taken into account in the model but Demographic changes are included and are based on existing birth and mortality statistics. Migration, on the other hand, is implemented in the model by allowing whole households to move location on the grid each year, or leave the grid entirely. Relocation is based on homophily (see below). Immigration is implemented through the introduction of new agents from the UK or overseas (where agents are taken from a BHPS sample). We are currently in the process of synthesising information about the migratory flows of various groups on a (semi) continuous manner.

There are many possible influences on voting and causal stories that are not yet implemented but may be added in later versions. These include concepts such as political efficacy and group identity or consciousness. This may be especially helpful in accounting for minority group turnout. Similarly there are agent attributes which are not yet included in the model such as sex which may be incorporated in later versions to allow processes to vary across these categories.

**Micro-level: the individual**

The first set of stories at the micro level focus on the psycho-social characteristics of individuals and how these might affect turnout, usually in a positive manner.

**Habit and inertia**

The propensity to vote is often shown to be highly correlated within individuals across elections.

There are three reasons why individual voting is likely to be persistent (Gerber, Green et al. 2003).
First, voter turnout is influenced by factors that tend to remain stable over time, such as civic duty, strong partisanship and interest in politics. Second, parties manage and target campaign effort in specific areas - as well as to particular groups within the social structure - to enhance mobilisation (Huckfeldt and Sprague 1995). Third, the act of voting itself may be habit forming time; i.e. the idea that the mere fact of going to the polls in one election will increase one’s likelihood of voting in a subsequent election (Gerber, Green et al. 2003). Habit in and of itself may be a product of habitual political interest (Prior 2010), and linked to level of (mostly internal) efficacy (Valentino, Gregorowicz et al. 2009). Persistence in attributes is already handled elsewhere in the model (see below), and many such attributes (e.g. interest in politics) are programmed to be relatively stable. However, the third possibility – that voting in and of itself leads to an increase in voting at subsequent elections – requires a separate treatment in the model. This treatment represents two main habit-related stories of why people vote:

- They do what they did before several times, don’t really consider any alternative (i.e. voting is a standing decision);

- A person knows how to vote, where it is etc. so it is easier to put into practice (there is a learning process).

These stories are linked to various approaches that see habit as a function of: individual responses to specific context clues that activate memory to vote; strong socialisation component to habitual voting via family influences during childhood; the link between individuals’ attitudes and their environment; a cost-benefit calculation of voting; being part of the political environment; the self-reinforcing aspect of voting; sense of civic duty; and the minimization of psychological discomfort via the maintenance of behavioural consistency (Plutzer 2002; Gerber, Green et al. 2003; Cutts, Fieldhouse et al. 2009; Denny and Doyle 2009; Aldrich, Montgomery et al. 2010).
Habit is included in the current version of the model but does not differentiate between the two stories above. If an agent remembers having voted in at least 3 of the 4 previous elections, then habit is acquired, which implies that an agent that has voted in 3 of the last 4 elections will intend to vote at subsequent elections. Yet, if an agent who has developed a voting habit happens to not vote for two subsequent elections, mostly related to lifestyle changes, then the habit is lost. Agents can also forget having voted at previous elections, which can hinder habit. The habit of voting may be interrupted due to exogenous factors such as moving home (see Aldrich, Montgomery et al. 2010). This is implemented through the exogenous factors that intervene between the intention to vote and actual voting behaviour (see below). An alternative way of specifying the effect of habit is to allow a cumulative increase (or decrease) in probability of intention to vote over time which is updated at each voting decision (i.e. a modifiable running tally). This may be implemented in a later version of the model.

The habit or inertia rule provides an individual level dynamic to voting which approximates to observed patterns of persistence over time (e.g. Plutzer 2002). It is also likely to produce emergent second order properties such as a correlation between age and voting.

'Rational' Choice

As discussed above the rational choice perspective has been one of the dominant approaches to voting, and whilst have never fully managed to explain why people vote, they have contributed much to understanding decisions at the margin (e.g. the effect of weather on voting). The crux of the problem is the so called paradox of voting, which lead Grofman (1993) to ask ‘is voting the paradox the ate rational choice theory?’ The paradox is that rational, self-interested actors should not vote, yet people do vote in their millions. Under strict rational choice theory the utility of voting (U) is a function of the perceived benefits (B) from a preferred candidate winning and the probability of one’s vote being decisive (P), minus the cost of voting (C) (Riker and Ordeshook 1968);
i.e. \( U = B \cdot P - C \)

If \( C \) is non-zero and \( P \) is vanishingly small (in large electorates) then nobody should vote. One solution is to introduce outcomes that are not dependent on the outcome such as civic duty (D)

i.e. \( U = (B \cdot P) - C + D \)

There is no paradox if voting is considered as an act of consumption (‘expression’) rather than one of investment, however, because the benefit is not discounted, although some commentators suggest that non-probabilistic consumptive benefits are not really part of a rational choice theory (see Ordeshook and Zeng 1997). This extension of rational choice sees voting as an expressive act; either as an expression of personal beliefs for the sake of self-expression or as a means to express (positive or negative) views and/or beliefs to other individuals as well as to the government or the ‘establishment’. Expression does not only include ways in which one can express beliefs, but also ways in which to use voting as a counterweight to opposing views in order to confront those views, provoke those holding those views, or cancel the votes of those with opposing views. This much in line with socio-psychological models of voting behaviour that see voting as a means for self-expression (Crepaz 1990), which is linked to the existing opportunities for expression, or models of expressive voting that see voting as a means to satisfy the internalised value of voting (Riker and Ordeshook 1968; Goldfarb and Sigelman 2010).\(^3\)

Narratives under this heading are not all explicitly linked to rational choice approaches to voting but indicate that individuals have an intrinsic belief that voting, as a result of a weighted choice, will tend to benefit them. These stories highlight various factors that might influence that choice, such as:

- The closeness of the election race: two hypotheses can be used to explain the importance of the closeness of the election. The Downsian Closeness Hypothesis states that the closer the

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\(^3\) See also Schuessler (2000)
race, the higher the probability that an individual vote will influence the outcome, hence leading to higher levels of turnout (Matsusaka and Palda 1993; Francois and Fauvelle-Aymar 2006). The perceived influence may be captured by a measure of efficacy, such that those with a greater sense of efficacy will be more likely to vote. Closeness of the race is also linked to the mobilisation narrative (see below).

- The weather at the time of going to the polling station (or on election day): for a long time held as conventional wisdom rather than a tested assumption, weather (especially the presence of rain) at the time of the election is assumed to decrease turnout, as it can increase the costs of voting (Gomez, Hansford et al. 2007). Whilst rain might discourage turnout, it does tend to discourage individuals with low levels of civic duty (Knack 1994).

- Minimising the maximum regret: linked to the minimax regret criterion, this narrative states that, instead of trying to maximise their utility (in the strict rational choice sense of the term), so individuals vote on the basis of trying to minimise regret, i.e. failing to vote and not getting expected outcome in the election (Ferejohn and Fiorina 1974; Li and Majumdar 2010).

- Perception of outcome benefits and its likelihood: again linked to the classical rational choice approach (Downs 1957; Aldrich 1993), this narrative states that individuals will be more likely to turnout if there are benefits associated with the outcome (voting) and the likelihood of these benefits actually occurring (more or less a cost/benefit calculation story). Whilst benefits can be linked to the individual, some might include in their calculation benefits for others, the ‘greater good, a argued by Fowler (2006). Electors with stronger preferences for a particular party or candidate will be more likely to vote than those without
• Intrinsic pleasure from voting (expressive benefits): this narrative states that individuals get intrinsic pleasure from voting, which usually stems from the pleasure one finds in fulfilling ones civic duty or for voicing ones approval or disapproval for a particular candidate (Riker and Ordeshook 1968; Gerber, Green et al. 2008).

‘Rational’ behaviour on the part of agents is currently implemented in the model through the strength of preference (the B term). A combination of level of interest in politics with a party preference affects voting intention. This also has a feedback effect through remembering if voting (or not) last time resulted in a desirable/undesirable outcome (a learning process). At the moment, there is not weighing in terms of predicted utility. A more sophisticated measure of proximity to parties would reflect indifference (where there is no clear preference) and alienation (where all options are equally unattractive) (see Brody and Page 1973). Future versions of the model may also include a measure of agents’ reactions to the closeness of the elections and their resultant perception of influence (P). Costs of voting (C) are perceived to be small and constant, except where exogenous factors intervene (see below).

The use of voting as a means of (counter) expression is not currently implemented in the model but will be linked to group identity/opposition in subsequent versions.

Identity

One narrative under this header see voting either as a way in which one identifies with a specific group (i.e. voters), in line with social identity theory (Fowler and Kam 2007), which states that identification with a certain group will increase turnout (the same would apply for those identifying as non-voters). This is most likely an identity that grows over time and over repeated turnout.

Another narrative stems from the consequence of abstaining and the psychological impact it would have: individuals vote in order to avoid feeling bad about themselves, feeling guilty, if they had
abstained and a ‘bad’ result (here defined as a result contrary to their preferences) occurred (Acevedo and Krueger 2004). Group identify has been identified as of particular relevance in understanding ethnic and racial minority voting (Miller, Gurin et al. 1981). Ethnic identity may also be related to the rational decision to vote or abstain, for example through group interests (e.g. Morton 1991) or relational benefits which “enable one to make sense of group mobilization in terms of individual preferences and behavior” (Uhlaner 1989: 280).

One form of identity is implicitly included in the current model: voter identity can be found in the habit effect, whereas agents develop a self-identity as voters if they have voted in the past few elections. Moreover, effects which appear consistent with theories of group identity may emerge from the model with no specific mechanism required. In particular homophily effects might reinforce group identity as a voter where particular groups have a high propensity to vote or high level of civic duty which is perpetuated through network effects. However, specific rules could be adapted to take into account particular conditions where group identity is thought to be important, for example amongst minority groups where collective efficacy is high, but political trust is low (Shingles 1981).

Learning

Narratives based on learning come from the idea that individuals ‘learn’ to vote (or to sustain this activity, mainly helping habit formation) via negative/positive reinforcement (or feedback from others), such as having voted and getting a positive result such as getting the desired party into power or preventing a party from winning.

These ‘trial-and-error’ narratives are based on various models of voter turnout such as the Bendor, Diermeier and Ting (BDT) model, both in its original (Bendor, Diermeier et al. 2003) and modified form (Fowler 2006), and the stochastic learner theory (Kanazawa 1998; Kanazawa 2000).
Learning from positive/negative outcomes of elections is implemented in the model. The psychological satisfaction one derives from the physical act of voting brings reality to an otherwise abstract duty/right. When agents vote for a party that has won a given election then they are satisfied and their level of interest for the subsequent election increases. On the other hand, agents who voted for a party that did not win are dissatisfied and will have a lower level of interest at the subsequent election. Non voters can also experience satisfaction or dissatisfaction depending on the outcome of the election. Memory of the outcome, comes the subsequent election, is also affected in older agents: they will tend to forget about whether the party they voted for won/lost the previous election.

**Efficacy**

Political efficacy is here defined as “a combination of one’s sense of competence in the political sphere and one’s assessment of the responsiveness of the system” (Valentino, Gregorowicz et al. 2009: 308). Efficacy can be internal (within-individual confidence) or external (confidence in the system).

One’s belief about the difference that their (or their group’s) vote will influence the outcome of an election is an important one in the rational choice literature (see above): the higher the level of efficacy, the more likely one will vote (Clarke and Acock 1989; Karp and Banducci 2008). Internal efficacy, and the associated emotions it triggers (mostly anger), shapes reactions to (policy) threats and in turn motivates political participation more than external efficacy. This in turns increases efficacy (especially if voting is successful) and conditions current or future participation, yet in an incremental manner (Valentino, Gregorowicz et al. 2009).

Political efficacy is not currently implemented. As noted above, future versions may link electoral efficacy (how influential an agent believes her vote to be) with the closeness of the race. In other
words the probability of making a difference (the P term in the calculus of voting) as opportunity for ‘making a difference’ will be higher in close elections. This in turn will be interacted with the strength of preference to give a more nuanced rational choice function than the one described above.

_Interest and Knowledge_

Much electoral research shows the importance of interest and knowledge in the voting decision. For example, cognitive mobilisation theory is important for modelling turnout is knowledge of voting (e.g. Dalton 1984). The cognitive mobilisation model links political participation with political satisfaction (or dissatisfaction), which is shaped by the level of interest and knowledge of electors. In turn this is linked with levels of education and exposure to information. Whilst the impact of increased knowledge can have both positive and negative effects on participation⁴, most research finds a positive relationship between electoral participation and political interest (e.g. Verba, Schlozmanet al. 1995). Possessing more knowledge of voting and having experienced it can increase the intrinsic pleasure one gets from voting and its perceived benefits. This can easily be linked to habit formation and the long term calculus of voting (Plutzer 2002). There is also a (somewhat circular) link between knowledge of voting and interest in voting: whereas being more interested in the act of voting itself increases one’s level of knowledge, it is also the case that increased levels of knowledge also increase the levels of interest. Yet, we also argue that, without any type of interest for voting, knowledge becomes redundant.

Knowledge is not implemented in the current version of the model but levels of political interest and involvement are, both of which are related to knowledge. Political interest and involvement are part of important internal states of the agents, and are themselves the result of internal levels of noticing politics as well as being biased towards certain issues. In order to have a certain level of political involvement and interest, agents first need to have noticed politics, which is not a given and is

⁴ e.g. see Teixeira (1992) as contrasted with Dalton (2004).
dependent on the level of political interest in the household (for young people) and among their friends. Once an agent notices politics, then it is never forgotten and then it can develop a bias toward certain issues, which is shaped by various life events and interactions within personal networks. The bias is not unidirectional but can change across the agents’ life course.

The levels of political interest or involvement are as follows:

1. Notices Politics Whether they notice political events and talk at all

2. Political Bias A political bias towards issues but not normally expressed (except events such as elections)

3. Politically Interested Will talk about politics to like-minded friends at any time

4. Politically Involved Involved in political process, leafleting, may talk politics to acquaintances

The presence of a bias also implies that agents will show a certain level of interest in politics, which is defined as talking about politics with friends and like-minded agents and is influenced by the level of interest in politics amongst friends. Political interest determines whether an agent will discuss politics, an important driver of influence within networks. The level of political interest, just as the level and direction of political bias, changes during the agents’ life course and can also be lost.

Varying levels of interest will also foster varying levels of political involvement (here defined as involvement in the political process, leafleting, or discussing politics to members of personal networks). The political interest scale is important to determine both an agent’s propensity to vote (through the strength of preference function described above) and through the level of political discussion it will partake in. Political involvement not only arises from the level of interest, but also from the number of politically involved network members (e.g. household members, friends, or other types of acquaintances).
Maturation

The relationship between voting and age has been well-established (Blais 2006), yet the rationale behind why this is the case is not always clear. In our model, we take into account a ‘maturation’ effect, which links certain life events associated with ageing with turnout, mainly via an increase in one’s level of interest, civic duty and overall resources and networks. As individuals grow older, they potentially become more engaged in many spheres; they take on stakes and/or responsibilities such as children or owning a house; they gain a certain status in society/their community, which might heighten their sense of civic duty; they tend to have more peers who take an interest in politics and vote; and gain more knowledge and experience. These processes all are believed to motivate turnout (Plutzer 2002; Harder and Krosnick 2008). Yet, there are also arguments as to whether the impact of maturation acts uniformly among cohorts, as the delay in the experience in certain life events in later generations might also lead delays in turnout (Smets 2010).

Maturation is implemented in the model. As they aged, agents tend to gain more knowledge (here indirectly linked to level of interest and involvement), join more activities (but also drop some), which increases their level of engagement (and their links) within their community/networks. They also tend to have links with (older) agents who are interested in politics and vote (mainly via a mixture of homophily and maturation effects). Family formation has an important role in the politicisation process of the agents: disregarding the initial short-term lull in turnout associated with a new born child, the presence of children in a household tends to increase the agent’s links to various activities (linked to the child), especially once children are of schooling age, thus embedding it further within its community. The link between status attainment (broadly defined) and the associated rise in civic duty is currently not directly implemented in the model but the level of civic duty (see below) increases with age. Future versions of the model will link civic duty and social attainment over the life course.
Micro-level: relational attributes

These narratives focus on how the act of voting (or abstaining) is affected by social pressures on individuals, mostly via their perception of the reaction of external actors, whether or not they are related (i.e. through social norms).

Civic duty

Implicated in both sociological models and rational choice accounts of voting behaviour, civic duty (the belief that voting is an important social obligation) is widely recognised as an important factor driving turnout. This conviction dates back to the early election studies and survives today (Campbell 1954; Blais 2000). The narratives on civic duty are based on the fact that individuals vote to fulfil this duty either because of the fact that they have high levels of civic duty; that they perceive that voting is a social norm that should not be ignored, or they see voting as a service for other in order to contribute to electoral decisions for the benefit of all (Downs 1957; Riker and Ordeshook 1968; Coleman 2004; Blais 2006).

There is a civic duty norm in the model but it does not differentiate between the different narratives. An agent’s characteristic that can rarely be lost, civic duty is mainly acquired via inheritance or interactions with other agents who possess civic duty (via the household for young agents or via friendship networks). Civic duty (which is dichotomous), is important in determining the agent’s intention to vote at a given election and the level (or presence) of political discussion, either about voting or about civic duty itself. It is also crucial in determining an agent’s voting intention insofar as those who have a sense of duty to vote will normally intend to vote. Notably, following Blais and Achen (2011), the model recognises an interaction between preference and duty: duty and preference do not affect turnout additively. According to Blais and Achen, their joint
impact is only a bit larger than their separate effects: in other words in the presence of duty, preference matters less.

Conformity

One of the ways in which voting might (or might not) occur in relation to contact with others is via conformity. Related to the presence, and interaction within, family, friends or other groups to which individuals belong (i.e., the presence of personal networks, which will be discussed below), conformity might arise from the desire to simply imitate the voting behaviour of individuals within one’s network (Fowler 2005). Conformity might also arise from the desire to be viewed favourably by others, rather than simply imitate for the sake of imitating, much in line with reference group theory (Green and Shapiro 1994; Chong 1995).

In the model conformity via mobilisation is indirectly implemented via homophilic processes within social networks, as conformity with network peers’ behaviour is assumed to arise with increased interactions with them.

Mobilisation

Mobilisation, either by friends, families, groups, or even political parties, is seen as an important driver of turnout (Rosenstone and Hansen 1993). The literature often differentiates between interpersonal (network based) mobilisation and that carried out by political parties. Here we focus on the former, although the politically involved (see above) are important mobilising agents and could be regarded as akin to party volunteers.

In our model, there are several causal stories for the way in which mobilisation influences turnout. One states that mobilisation can happen as a result of shift in an individual’s focus of attention towards voting when it becomes a topic of discussion by others, especially at election time (such as
family, friends, groups, or organisation they belong to). Hence, individuals become aware of politics via these channels of discussion and that, in turn, makes it likely for them to be mobilised to vote (Brady, Verba et al. 1995; Verba, Schlozman et al. 2005). Another story sees mobilisation as a result of individuals being asked to vote either by friends and acquaintances (Huckfeldt and Sprague 1995). Party based GOTV efforts have also been deemed important in increasing turnout (Gerber and Green 2000; Cutts, Fieldhouse et al. 2009).

Another way in which mobilisation may come about is via the additional motivational factor that knowing and/or seeing someone going to the polling station comes on election day has on individual turnout (Cutts and Fieldhouse 2009). Recent evidence suggests that not only is living with another voter extremely highly correlated with turnout, but also that a majority of votes in a number of different countries, go the polling station with a partner or as part of a group (Fieldhouse and Cutts 2009). Be it because of ease of access, shame, conformity pressure, or the intrinsic pleasure one takes from sharing activities with others, the mere act of can be a great mobilising factor.

Mobilisation via persuasion from another agent or even a political party to either vote or go to the polling station is indirectly present within the model given the influence that politically-involved agents will have on other agents when talking about politics. Within households, agents observe the voting behaviour of other agents and are positively influenced to go to cast a vote (or the opposite) by the behaviour of other household members. In other words the voting intention of other household members affects the vote intention-action link of agents (i.e it acts as a positive confounder).

Political discussion, either about politics or the importance of voting, is a fundamental element of the model, as it is through it that most influence is disseminated. Politically interested agents will

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5 See, for example, Berelson, Lazarsfeld and McPhee (1954); Lazarsfeld, Berelson and Gaudet (1948), Huckfeldt and Sprague (1995).
talk to other agents (who are usually also political interested/involved). Those with high levels of civic duty will also discuss the importance of voting. As important as political discussions are, their impact is very short term and agents quickly forget political discussions (until the next opportunity). Direct mobilisation by parties or candidates may be incorporated in later versions of the model and, according to the mobilisation hypothesis, as the closeness of the race will motivate parties to mobilise voters (Aldrich 1993; Matsusaka 1993; Francois and Fauvelle-Aymar 2006). Moreover, particular groups (e.g. immigrants) may be more likely to be mobilised where they constitute a larger proportion of the electorate (e.g. Leighley 2001).

Meso level: social networks and overlapping groups

The embeddedness of individuals in multiple groups and the way in which these groups influence individual turnout, by way of mutual influence between their members, has been widely acknowledged (Huckfeldt and Sprague 1987; Fowler 2005) and is an important feature of our model of turnout. This section outlines both the way in which the model deals with this influence and the way in which networks are generated within the model.

Generating Networks

The literature on network formation identifies four mechanisms which are of relevance in terms of our model:-

1) Homophily – actors are disproportionately attracted to others who are similar to them (Lazarsfeld and Merton 1954; McPherson, Smith-Lovin et al. 2001).

2) Propinquity – actors are disproportionately likely to form ties to others who live or work close to them (e.g. neighbours) and who they therefore bump into regularly (partly because
contact is a prerequisite of forming a tie but also because the costs a maintaining ties or lower when the effort required for contact is minimal (Festinger et.al 1950).

3) *Foci* - (combining 1 and 2) actors are more likely to form ties with others who share their interests, identities and/or tastes because shared interests increase the likelihood that they will cross paths and come into contact: e.g. jazz fans in a small town are more likely to know one another because they will converge upon the same clubs, record shops etc. (Feld 1981)

4) *Transitivity* - actors who have ties to a common alter are more likely to form ties with one because of the likelihood that their shared alter will introduce them to one another ((Newman and Park 2003).

These factors are all included in our model. The model differentiates between three types of social networks: household links (family, broadly defined), social links (friends) and activity links (such as school, work, place of worship, and sports club). All agents in a given household (one square on the grid) are linked internally. Agents form a new household by pairing up with a similar agent (similar refers to convergence between agents in terms of age, politics and ethnicity). Agents tend to form social links from a similar pool of similar agents, as well as from agents in neighbouring households (reflecting observed tendencies of both propinquity and homophily in process of network formation. The probability of creating social links with similar individuals stays more or less constant from age 12 onwards, with some differences depending upon life course events or joining activities. The opportunity for forging links with ‘friends of friends’ (i.e. transitivity) increases from age 16. As agents join activities and have children, they make new social connections. Agents not only create social links, they also drop some at random. With regard to activity links, these are formed as follows and increase the likelihood of interaction with similar agents and the formation of social links. From age 4 to 18, agents add an activity link to a neighbouring school (which changes if the household moves). After age 18, and up until age 65, agents gain an employment status. If employed, agents
will add an activity link to a randomly chosen workplace on the grid; agents without employment will have no such links (or will lose it if they lose their current employment). From age 15 onwards, agents also join other activities based on the similarity they share with agents already linked to that activity; such activities are also dropped depending on the average dissimilarity of a given activity one is linked to.

**Network influence and political discussion networks**

Social networks are thought to influence turnout primarily through the level of political discussion that individuals encounter within their networks (Huckfeld and Sprague, 1995). For the Columbia school social interaction helped create political agreement thorough political discussion and persuasion (e.g. Lazarsfeld et al, 1944). Whilst the tendency towards conformity and assimilation are powerful they are not inevitable. The importance of weak ties and overlapping networks mean that voters are exposed to diverse opinions and political disagreement survives (Huckfeld et al. 2004). Recent years have seen a plethora of studies examining various aspects of network influence such as the role of opinion leaders and experts, the role of political sophistication of discussants, and the role of disagreement in mobilising or demobilising political participation.

People’s membership in political organisations, or the fact that they hold political viewpoints, increases the frequency of political discussion, which in turns motivates turnout (Leighley 1990; Lake and Huckfeldt 1998; McClurg 2003; McClurg 2006). Networks of political discussions, which are assumed to be formed by individuals close to an actor and have an average size of 2 to 3 people (Klofstad, McClurg et al. 2009), yet the greater the network of political discussion, the more positive its impact on turnout (Leighley 1990). There also seems to be gender differences in the occurrence

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6 Non-discussion based effects may also participation through reference group effects and group identification/loyalties (Langton and Rapoport 1975).
of political discussion networks and their effects, including with regard to the gender composition of
the networks (Cassese and Snyder 2008).

Political discussions are important, but so is the content of those discussions. The presence of
disagreement within political discussion networks may have some detrimental effect on turnout
(Mutz 2002; Mutz 2006), yet heterogeneity within networks of political discussion is not as negative
as one might think, either having no effect, or even a positive effect, on electoral turnout. Indeed
many studies have shown that political competition can be as important a driver of participation as
agreement (Jang 2009; Nir 2011).

Political discussion networks are important in the model as they influence the propensity of agents
to vote. Agents engage in political discussion in the model in various settings (household, social
network, activity network). The politically-involved (cf. experts) are more likely to talk about politics
and more likely to be influential than the less politically interested. The networks and the levels of
interest in our population affect the exposure to political messages/discussions (generally speaking,
the greater number of discussions, the greater the influence). In line with the theory of auto-
regressive network effects (Huckfeldt, Johnson et al. 2004) the influence of a political discussion is
proportional to the relative frequency of a particular message and contradictory messages.
Disagreement within political discussion networks is indirectly implemented via the ‘ambivalence’
rule, where reception of mixed political messages reduces the influence of other agents. Having
someone to discuss politics with is important for agents’ levels of political discussion; for their
perception of the importance of voting; for the level of civic duty; for the level of political
involvement; for political bias; and for ambivalence. The current version of the model does not
differentiate between men and women and thus does not include gender differences in the level of
political discussion/discussants and on impact of disagreement within networks.
**Household formation and influence**

As mentioned, homophilic processes are at play when it comes to household formation. If one thinks of ideas of assortative matching (Becker 1973), individuals tend to form households as the result of choosing a long-term partners of similar age, ethnicity, class, profession, political viewpoint, etc., or as a result of having to move out of their existing households because of new employment, education, dissolution of partnerships. The convergence of household members on specific traits also implies that there is a higher likelihood in the convergence of turnout regardless of interpersonal influence (Cutts and Fieldhouse 2009). Thus voting decisions of members of household and families are likely to be connected in two different ways: directly through interpersonal influence and mobilisation, and indirectly through shared characteristics and attitudes acquired through socialisation (see below).

A number of studies have drawn attention to the household as a key arena for political discussions and influence (Zuckerman 2005) especially for women (Cassese and Snyder 2008). Previous research has also identified a powerful correlation between turnout of one member of a household and that of the others (Glaser 1959; Straits 1990; Johnston, Jones et al. 2005; Cutts and Fieldhouse 2009). In particular, there is a strong link between the political behaviour of husbands and wives (Stoker and Jennings 2005) and parents and children (Verba, Schlozman et al. 2005).

Homophily in partnership formation is implemented in the model (using a reduced list of characteristics) and has an indirect effect on voting, mainly via household-level mobilisation and political discussion. Moreover, mobility between households is also implemented in the model: agents have a probability to form/dissolve a household, in which case the new resulting household(s) move to an empty space on the grid (along with family members) and lose/gain new activity links. Family members may also influence each other through the vote intention-action link which depends in part on the decision of family members.
Starting to vote: Socialisation

Given that we are modelling agents of all ages who evolve in different types of households with different voting histories, we are not only focusing on stories of why people turn out to vote, but also stories on why people start voting. Our focus here is on stories that are closely related to family-level influences, as well as processes that occur with getting older.

According to theories of political socialization which dominated political science between the 1950s and 1970s, political values and identities that underpin participation are acquired at an early age and remain fairly (albeit not completely) stable throughout the life-course (Jennings and Niemi 1968; Sapiro 2004; Jennings, Stoker et al. 2009). Socialization provides a lens through which social patterns that correspond to one’s position in society are learned (Hyman 1959). Key socialization agents include most notably the family, but also schools, neighborhoods and other agencies (Jennings and Niemi 1981). The importance of social group membership is reinforced by early socialization experiences that foster the development of partisan attachments or party identifications associated with social class memberships (Campbell 1960). In turn, these influence the propensity to vote.

The way in which individuals are socialised into voting via the influence of their family is important, especially with regard to the starting probability that an individual will vote. The family, where most of the influence comes from the parents and their own level of political interest and education, is a primary unit for learning how to vote, learning about and internalising values such as civic duty, and learning to express political action (Plutzer 2002; Braconnier and Dormagen 2010). Moreover, there is also a high level of conformity of voting behaviour within family units (Braconnier and Dormagen 2010).

At the moment, agents within households are socialised via the presence of political discussion, political interest, political involvement, and existing levels of civic duty within the household (which
will have an important impact on whether an agent notices politics at all and whether it is biased; this raises awareness to politics and the importance voting. If there is an absence of early socialisation into politics (i.e., before an agent becomes a voter) then it will negatively affect the agent’s capacity to remember political discussions, and reduce the level of interest in voting.

Future versions of the model will also include socialisation processes linked to socio-demographic household characteristics such as level of resources (linked to social class).

**Exogenous factors**

Some circumstances may intervene between the intention to vote and the act of voting. These include abstention from voting due to practical issues such as having a new baby, which increases the costs of leaving the house, abstention from short-term alienation or sudden change in circumstances such as becoming unemployed close to the election, or abstention due to a shift of attention related to new events such as having a new job, entering into a new relationship, and so on (Rosenstone 1982; Plutzer 2002). For example, for some, it could be the case that voting seems (or is) difficult, which can be related to the stories of household changes, such the birth of a child (Plutzer 2002), frailty (Goerres 2007), or to issues of linguistic capabilities, which will tend to affect immigrants and the information they are (un)able to gather given specific language barriers.

Geographical mobility is often linked with lower levels of turnout either directly because it leads to interruption in registration or in knowledge about candidates or electoral procedures (e.g. immigrants eligible to vote, do not possess the appropriate information about the act of voting).

Secondly moving home interrupts social networks leading to an indirect negative influence on voting (Highton 2000; Plutzer 2002).
One reason an individual might stop voting is due to frailty or, at the extreme, death (Goerres 2007; Harder and Krosnick 2008). In fact, turnout seems to peak and decline at around age 70 (Fieldhouse, Tranmer et al. 2007), which might be partly due to senescence. In the model, the propensity to vote declines after age 75 (and stops when the agents die; this is determined using existing information about mortality rates, as described above).

In the model a number of practicalities of voting are included. For those intending to vote, that intention may be interrupted by birth of a new child (the probability of voting decreases if there is a young child in the household), by old age (participation decreases after age 75), and by having just moved house. Agents lacking the intention to vote, however, may be mobilised to vote by family or friends who do intend to vote. This represents the companion effect discussed above, and is implemented by allowing agents who do vote persuade family and (less commonly) friends who did not intend to vote, to join them in voting.

### Possible additions to the model.

Presently not included in the model but under consideration are:

**Proposed to include:**

- **Waves of immigration.** That we can add waves of different kinds of immigrant to reflect the immigration patterns over time for a particular case study. There is no direct data on the detail of such waves (e.g. household composition etc.).

- **Mobilisation.** During an election party members might persuade people to go out and vote.

- **Immigration and class.** There is a tendency of 2nd, 3rd generation immigrants to return to the class level the 1st generation were at in their country of origin.

- **Close/interesting elections.** That close or interesting elections will provoke more interest and hence more voting.
• **Group Consciousness.** One might vote with a group one identifies with or against a group perceived as alien or the enemy.

• **Multiple sources for a social relationship.** That relationships where you know a person in multiple contexts are more influential.

*Might include:*

• **Disillusionment.** People getting pissed off with your own party and so not voting.

• **Changing demographics.** Changing fertility, death rates over time

• **Level of education.** That level of education affects voting in a number of ways, e.g. that higher levels imply a greater interest in politics or that there is an inherently higher level of interest since they see the possibility of changing things. This might be implied by class.

• **A finer grain of ethnicity representation.** Represent a greater variety of ethnic identities in the model, which would subtly effect the social clustering in the model (due to less homophily).

• **Safe Seats.** When an election result seems certain people (merely biased) do not bother to vote.

• **Changing Homophily relationship.** That the underlying homophily measure of “social distance” be enhanced, e.g. to reflect the extent of changing perceptions of inter-ethnic differences.

• **Sex.** Women talk to their partners more about politics than men, who tend to talk about it more to work mates etc. Maybe wider link between sex and political interest.

*Proposed not to include:*

• **University.** That a percentage of young people in the model should go to a “university”

• **Demographic heterogeneity.** That fertility, partnering, separation, death rates vary with different groups in the population.

• **Local Consistency.** The local consistency of politics increases effect of class on voting.
• **Agreement/Disagreement.** That whether people agree or disagree over politics should affect social influence processes. There is some affect in terms of influence over which direction people adopt already and when people become politically involved.

• **Cultural characteristics.** Adding different behavioural rules for agents of different ethnicities, i.e. differing tendencies to move near others of the same ethnicity (but this might be better linked to which generation of immigration they are), or family structure and demographics.

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**Reference list**


