If I recall correctly. An event history analysis of forgetting and recollecting past voting behavior

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ABSTRACT

The mechanisms behind vote recall inaccuracy are not well understood. The literature has been unable to separate inaccuracy due to the nature of the voter (such as non-attitudes) from inaccuracy due to interfering events after casting the vote (such as a change in vote intention). This paper employs event history analysis to disentangle time-invariant and time-variant explanations of recall inaccuracy. Using Dutch panel data on 20,936 respondents in 42 waves between 2010 and 2012 (and additional data collected between 2006 and 2010), we explain the likelihood of misreporting the 2010 vote during the subsequent electoral cycle. The analyses show that although both explanations play a role, voters’ general level of volatility before casting the recalled vote matters less than changes in vote intention after the vote. We conclude that accurate recall is affected mainly by events rather than the nature of voters. Our findings imply that survey measures of voting behavior could be improved by offering cues on the elections of interest.

Introduction

Because of the privacy of the voting booth, political scientists rely on respondents’ recollection of their voting behavior. Yet, these recollections notoriously suffer from recall inaccuracy. While vote recall tends to be highly accurate directly after the election, recollections become increasingly inconsistent with the passage of time (e.g. Himmelweit, Jaeger, and Stockdale 1978; Van der Eijk and Niemöller 1979; Tourangeau, Rips, and Rasinski 2008). This has direct consequences for especially those studies that use vote recall measures that were collected months or even years after the elections took place, for instance to assess electoral volatility (over time or at different types of elections) or to explain phenomena such as (feelings of) representation or political disaffection.\textsuperscript{1}

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\textsuperscript{1}The data used in this study can be obtained for replication purposes by contacting Tom van der Meer (email: t.w.g.vandermeer@uva.nl). For new, original analyses, please contact EenVandaag for their explicit consent.
The literature suggests two types of explanations to account for recall inaccuracy. First, inaccurate vote recall can be due to the nature of the voter or the vote that was already set when the recalled vote was cast and remained static afterwards. For instance, some voters forget their vote because it was simply not very well considered, or based on non-attitudes (Converse 1962, 1964; Zaller 1992; Hill and Kriesi 2001). Second, inaccurate recall can result from specific interfering events that occur after the vote is cast. For instance, changing party preference after the elections might lead to cognitive dissonance (Katz, Niemi, and Newman 1980, 514; Pearson, Ross, and Dawes 1994; Waldahl and Aardal 2000; Beasley and Joslyn 2001; Schoen 2011). Although these are two distinct processes, which differ in the extent to which they can be remedied, no study has yet separated inaccurate vote recall due to time-invariant explanations from inaccurate vote recall due to time-variant events after the elections.

We therefore distinguish conceptually, theoretically and methodologically between time-invariant voter characteristics, on the one hand (pre-electoral characteristics that were present at the time of casting the vote), and interfering time variant events (internal events or transitions that occurred after the vote was cast), on the other. We define time-variant events as occurrences, a “qualitative change ['transition’ – authors] that can be situated in time” (Allison 2010, 2), that by definition take place in the period between the measure of the actual vote and the recall of this vote.2

To assess the importance of interfering events that cause voters to forget their casted vote, this paper employs event history (survival) analysis. We analyze the extensive Dutch 1VOP 2006-2012 panel data set, following 20,936 respondents who first reported their vote within days after the 2010 elections. Subsequently, these respondents participated in up to 42 waves in which they reported their current party preference, including 8 waves in which they were also asked to recollect their 2010 vote 300 to 802 days after the elections. We thus focus on vote recall beyond the immediate post-election period. This set-up allows us to assess the impact of not only time invariant characteristics (e.g. education, pre-electoral forgetfulness and pre-electoral partisanship/volatility) but also time-variant events (specifically changing party preferences after the recalled elections) on consistent vote recall.

This contribution aims to answer three research questions. First, do the root causes of incorrect recall lie in voters’ stable characteristics or in specific events? Effectively, we question to what extent incorrect recall is due to voters’ volatile nature or due to the event of changing party preference. Second, which events drive incorrect recall? Although earlier research has

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2Because we aim to open the psychological black box of inaccurate vote recall and because internal events such as changing preferences need not be induced by external events, we focus exclusively on internal events.
shown effects of volatile preferences on recall accuracy, it is as of yet unclear whether this effect is caused by the number of changes in party preference or by the number of parties considered, and at which number of changes and parties the largest loss in recall accuracy occurs. Third, to what extent does the impact of (time-variant) events differ with voters’ (time-invariant) stable characteristics? Are voters with generally volatile preferences more or less strongly affected by a changing party preference?

By answering these questions, this paper contributes to the literature in two ways. First, the distinction between time-invariant and time-variant (post-electoral) explanations improves scholarly understanding of the causes of recall inaccuracy. Moreover, it analyzes various ways in which the event of changing party preference (its occurrence, its frequency and its direction) affects the recall of the vote. Second, this paper gives insight into the consequences of recall inaccuracy for survey measures of voting behavior. Its implications are particularly relevant to (cross-national) surveys that pose recall questions months or years after the elections and nevertheless aim to reduce recall inaccuracy by survey design. If some votes are simply predestined to be forgotten even before they are cast, improving our measurements would be of little help. If, on the other hand, it is mainly the subsequently changing vote intentions that obscure the memory, survey questions offering cues on the elections of interest could help to bring the correct memory to the fore.

Theory and hypotheses

Direct effects

The most evident explanation why some voters inaccurately recall their preferences at the previous elections is simply that they have a rather forgetful nature, reflected by a longer history in inaccurate recall. We refer to this more enduring tendency to forget past behavior as pre-electoral forgetfulness. Lacking sufficiently long panel data with recall questions on multiple elections, this line of reasoning has not yet been tested in the field.

H1. Voters who had inconsistently recalled their vote in earlier elections are less likely to recall their voting behavior during the next elections correctly.

A second characteristic that is predominantly fixed is level of education. Level of education may facilitate accurate vote recall, so that higher educated voters are more likely to recall their past voting behavior correctly (Van Elsas et al. 2014). However, this effect is not consistent (e.g. Weir 1975; Schoen 2011). If education has an effect, this is likely because it reflects (or induces) differences in cognitive capacities and political sophistication.

H2. Higher educated voters are more likely to recall their past voting behavior correctly.
Third, electoral volatility is by now well established as being related to inconsistent recall. Respondents who have a tendency to change vote intention more often are less likely to have an accurate recall (e.g. Schoen 2011; Van Elsas et al. 2014). However, what explains this relationship has remained unclear.

Theoretically, we consider two sets of explanations. First, volatility may reflect that respondents have less political or partisan opinions in general, leading to preferences that do not go very deep. Non-attitudes at the basis of the casted vote (Van Elsas et al. 2014) and a structural lack of partisanship (Weir 1975) are argued to have a strong, detrimental effect on recall. Second, the occurrence of changing one’s party preferences after the elections is an interfering event that affects the process of recall itself, because the memory is obscured by other, more recent preferences (Van der Eijk and Niemöller 1979, 312; MacDermid 1989, 370; Waldahl and Aardal 2000, 375). Every additional change in vote intention since the recalled election is likely to further undermine accurate vote recall, although the first of these events probably matters most.

These are two rivaling explanations why volatility affects vote recall. While the first reflects a fundamental quality of the voter and the vote, the latter refers to an event of changing preference that any voter may experience. Especially in multiparty systems, the two cannot be conflated, outside the most extreme partisan and the most extreme non-partisan voters. Moreover, they have different implications: inaccurate recall due to the interfering event of changing party preference is more likely to be counteracted by offering more detailed information about the election under study than inaccurate recall due to non-attitudes or lack of partisanship.

We thus distinguish between electoral volatility as an indicator of partisanship, and electoral volatility as the actual event of changing vote intention. Analytically, we pull them apart by understanding the first as the tendency to change vote intention before the recalled behavior took place (a time-invariant characteristic as it does not change after the elections), and the second as the event(s) of changing vote intention after the recalled behavior took place (a time-variant characteristic).

We test both explanations simultaneously via the following set of hypotheses:

H3. Voters who changed vote intention before casting the actual vote are less likely to recall their voting behavior during the past elections correctly.

H4a. After the event of a changing vote intention since the recalled election, voters are less likely to recall their past voting behavior correctly.

H4b. With every subsequent change in vote intention since the recalled election, voters are less likely to recall their past voting behavior correctly.
The number of parties that respondents mention as their current vote intention should affect vote recall similarly. Voters’ choice set increases with every additional party under consideration, and so does the likelihood of inaccurate recall. The number of parties that voters considered to vote for is often smaller than the number of times that they changed: many voters shift back and forth between two or three parties (Van der Meer et al. 2011). However, switching among three or more parties is likely to affect recall accuracy even more strongly than repeated switching between two parties.

H5. With every additional party voters intend to vote for since the recalled election, voters are less likely to recall their past voting behavior correctly.

**Conditional effects**

The interfering event of changing vote intention is likely to impact differently upon different groups of voters. On the one hand, pre-electoral volatility can signal voting behavior that is based on more superficial attitudes. If voting occurred in a more superficial or random way, the voter could yield more easily to interfering, new vote intentions when recalling the vote. Voters who made a thorough and well-considered vote choice are likely to be aware of a change in their party preference, and are thus less likely to have their recall obscured by this change.

H6a: The negative effect of a change in vote intention since the recalled election on recall accuracy is stronger among voters that already had more volatile party preferences beforehand.

On the other hand, we can argue the opposite: pre-electoral volatility may signal voters who are used to changing party preferences. For them, the post-electoral change in party preference may not be a very significant event in the light of the (many) earlier changes. For generally stable voters, a post-electoral preference change would have a much greater impact, strengthening their wish for consistency and the degree of cognitive dissonance.

H6b: The negative effect of a change in vote intention since the recalled election on recall accuracy is stronger among voters that had more stable party preferences beforehand.

**Data and methods**

To distinguish between time-invariant and time-variant explanations of vote recall accuracy, we employ event history analysis (EHA). The dependent variable in EHA is the hazard rate, which stands for the likelihood of the event (incorrect recall) occurring at a specific point in time, given that this event has not yet occurred (Yamaguchi 1991, 9). The hazard rate is thus essentially
based upon time durations until the occurrence of the event: the longer the
time interval until an event occurs, the lower the hazard rate (and thus the
likelihood of incorrect recall).

**Data**

The Dutch EenVandaag Opinion Panel (1VOP) offers the opportunity to study
vote recall in an event history framework. Data were collected by the Dutch
current affairs program EenVandaag since 2006 among a pool of self-sub-
scribed members, who receive an invitation to participate each time a new
survey wave is fielded. The present study focuses on repeated recalls of
the vote in the Dutch national parliamentary elections of 9 June 2010, and
covers 42 survey waves between 10 June 2010 and 31 August 2012 (shortly
before the 2012 national elections). Additionally, we draw on information
from 53 survey waves between the 2006 and 2010 elections to operationalize
the time-invariant voter characteristics.

Both the opinion panel and the individual waves suffer from self-selection
bias. However, despite a bias toward left-wing parties, we found no bias in the
direction in which the respondents’ voting intentions change, which would be
the prime concern: weighting respondents on the basis of their reported vote
at the 2006 elections (relative to the actual 2006 election outcome), the
outcome of the 2010 elections (in vote share per party) correlates strongly
\( r = .98 \) with the outcome according to the reported 2010 votes in the
1VOP, as do the changes in election outcomes \( r = .98 \) (cf. Van der Meer
et al. 2011). Moreover, the data set comprises a wide variety of respondents
that allow for robustness checks (cf. Van Elsas et al. 2014).

We restrict the sample to respondents who reported their 2010 voting
behavior in either or both of the two survey waves shortly after the 2010 elec-
tions (on 10 and 21 June 2010, respectively), taking this as the actual vote.4
Strictly speaking, no recall can be assumed to be factually correct. While we
expect the most valid responses shortly after the elections, a small degree
of mostly random measurement error should be taken into account. Two
hundred and thirty-nine respondents (1.1%) reported different parties in
these post-election waves.5 To deal with these inconsistent respondents, we
used their first report and include a dummy to model their inconsistency in

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3Respondents sign up for the panel through the show’s website and are then invited to participate in each
survey wave per e-mail. We checked for shared e-mail accounts through repeated questions on age, sex,
and educational level.

4The youngest age group in our model (up to 22 years old) contains merely 1% of the overall sample. 74%
of this age group have a missing value on the 2006 recall. However, our models control for having a
missing value on this measure; the effect is not significant. Additionally, the youngest age group is
not overrepresented among those who have not reported party preferences between 2006 and 2010.
Their inclusion does not affect our findings.

5Given the short time interval, the inconsistency is likely to be due to measurement error rather than
memory decay. It suggests that a small amount of error also exists in the first report of the vote.
the analysis. Additional robustness checks (estimated only on respondents’ report in the first post-election wave) show that the results are highly consistent to alternative operationalizations.\(^6\)

From April 2011 onwards (i.e. at least 10 months after the elections), respondents were asked to recall their 2010 vote on eight occasions (see Online Appendix A1 for the exact dates). We determined whether and when the event of inaccurate recall occurred.\(^7\) Respondents who did not participate directly after the elections, or who never responded to any of the subsequent recall questions are excluded from the sample. This yields a sample of 20,936 respondents, of whom 4552 (22\%) misreport their vote at a certain point in time.

Vote intentions are measured in 40 post-electoral survey waves (see Online Appendix A1), which we used to operationalize events. Figure 1 provides a schematic overview.\(^8\) Many voters changed vote intention quite quickly after the elections: 10\% had already shifted by the end of June 2010, by December 30\% had changed vote intention at least once.

**Method**

The analysis models the time it takes to reach a single event: after one incorrect recall, respondents are excluded from the risk set. The duration until the occurrence of this event is an episode, which is central to our models. For all respondents, the episode starts when the 2010 vote is reported shortly after the elections and continues until the first incorrect recall, at the latest in August 2012. Not all recall error occurs within this two-year post-election period: earlier studies show that recall error increases over the course of years (Van Elsas et al. 2014) and as a result of intervening subsequent elections (Waldahl and Aardal 2000). Thus, a group of respondents might not have mis-reported their 2010 vote at the end of our observed period, but might well do

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\(^6\)While there might still be unobserved bias such as social desirability, any possible misestimation of recall error would bias our analyses to more conservative estimates.

\(^7\)Recalled votes are measured by the question: “Which party did you vote for in the previous parliamentary elections of June 9, 2010?”

\(^8\)Vote intentions are measured by the question “Which party would you vote for if parliamentary elections were held today?”
so at later dates. This group of respondents is considered ‘right-censored’. EHA deals with right-censoring by assuming that individuals who did not experience an event may still do so after the observation period, and that the time at which they do so is independent from the time of censoring (Cleves et al. 2008). The episode duration \((t_{fn})\) for right-censored respondents equals the total number of days they were observed, counted from the elections \((t_0)\). For respondents who do misreport their vote, the episode duration is the number of days until the event of incorrect recall. On the basis of the episode durations, the hazard rate is estimated for each point in time. This dynamic modeling strategy enables the crucial distinction between time-invariant and time-variant explanations.

The analyses are built up as follows. We first present descriptive Kaplan–Meier graphs of the hazard rate for different groups of voters, to gauge whether some voters tend to forget their vote sooner than others, and when most forgetting occurs. The graphs do not provide an estimation of effect sizes, and do not control for rivaling explanations. For this, we turn to semi-parametric Cox models, which allow for an estimation of the hazard ratios, expressing the effect of each covariate on the hazard rate. We start with a Cox proportional hazard model including only time-invariant covariates, and check whether the hazard ratios are constant over time (as required by the proportional hazard assumption). In order to estimate the effect of time-variant covariates, we relax the proportional hazard assumption in an extended Cox model, which re-evaluates the hazard rate depending on changes in covariates over time.

The extended Cox model requires a data reorganization by means of episode splitting. The original episodes are divided into sub-episodes defined by each change occurring in any of the time-variant covariates. So, a new episode is started (and the previous one ended) each time a respondent changes vote intention. The rows in the data matrix are then the sub-episodes respondents go through during the full observation window. The occurrence of changes in the time-variant covariates is recorded by dummy variables \((0/1)\), which remain 1 in the episodes after the change has occurred. Only the final episode of each individual has an event or right-censoring of the main episode (Brüedelr and Diekmann 1995). Table 1 displays an excerpt of the data matrix after episode splitting. Respondent 268 changes vote intention for the first time at \(t = 102\), which thus marks the end of the first episode, and the start of the second. The second episode ends with a second change in vote intention at \(t = 218\). Finally, at \(t = 803\), the respondent is last observed, without having forgotten his vote during the observation period (and is thus right-censored). Respondent 329 first changes vote intention at \(t = 302\). Then, at \(t = 465\), an event occurs (event = 1). From this time point onwards, this respondent is no longer included in the analysis, despite a later change in vote intention at 670.
Stable background characteristics are based on data collected between 2006 and 2010. To measure pre-electoral forgetfulness, we compare two recalls of the 2006 vote (respondents were asked to recall their 2006 vote twice before 2010) and create a dummy scoring 1 when these recalls are inconsistent. We checked whether this autoregressive determinant would explain most variance in the dependent variable, but we found that this was not the case empirically (see below). Education is measured on an 8-point-scale, ranging from primary education (1) to academic education (8).

Of particular interest is our measure of partisanship or non-attitudes before the recalled elections took place (H3). The best available measure is the average rate with which respondents changed party preference between 2006 and 2010. While the indicator is ultimately based on “events”, these are not “interfering” events (i.e. they do not take place after the 2010 elections that are recalled). We create two time-invariant measures of pre-electoral volatility. A dummy indicates whether the respondent ever changed vote intention in the period 2006–2010. A relative measure divides the number of changes in vote intention by the number of times participated in the survey in this period.

Methodologically, we control for the frequency of participation in the period 2010–2012 (ranging from 2 to 36). We include a dummy capturing the respondents who are inconsistent in the two post-election waves (which were used to reconstruct the actual vote). Respondents who did not participate in at least two survey waves in the period between the 2006 and 2010 elections have missing values on the measures of general volatility in 2006–2010 and the earlier forgetfulness of the 2006 vote. We apply pairwise deletion of these missing values on these time-invariant covariates.

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**Table 1. Example of data matrix after episode splitting.**

| Respondent | Vote 2010 | Event (0/1) | $t_0$ episode | $t_{fin}$ episode | 1st volatility (0/1) | 2nd volatility (0/1) | Time 1st volatility | Time 2nd volatility |
|------------|-----------|-------------|---------------|------------------|---------------------|---------------------|---------------------|---------------------|
| 268 PvdA   | 0         | 0           | 102           | 0                | 0                   | 0                   | 102                 | 218                 |
| 268 PvdA   | 0         | 102         | 218           | 1                | 0                   | 0                   | 102                 | 218                 |
| 268 PvdA   | 0         | 218         | 803           | 1                | 1                   | 102                 | 218                 |                     |
| 329 GL     | 0         | 0           | 302           | 0                | 0                   | 0                   | 302                 | 670                 |
| 329 GL     | 1         | 302         | 465           | 1                | 0                   | 0                   | 302                 | 670                 |

Note: $t_{fin}$ refers to end time (in days) of episode.

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**Time-invariant covariates**

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9We could assess the volatility rate for either of two electoral cycles: 2006–2010 or 2010–2012. Theoretically, they should be equivalent. Because the latter option risks putting the consequence before the cause, we use the former.
Time-variant covariates

Current vote intentions are reported in up to 40 survey waves since the elections of 2010. On the basis of these items, we create two time-variant covariates. First, to measure the interfering event of changing vote intentions, we compare each respondent’s vote intention to the vote intention given at the previous participation. The interfering event strictly occurs at specific dates between voting behavior and recall: the emphasis on when the interfering event occurs sets it apart from the structural feature of volatility both conceptually and operationally. The majority (85%) of respondents change 5 times or less, with a mean of 2.4 changes. We generate variables that record the first, second, third, fourth and fifth time a respondent changes vote intention. In survey waves in which the respondent does not participate or gives a non-substantive response (e.g. don’t know), we assume that the vote intention remained constant. The measure is thus conservative.

A second time-variant covariate is the number of parties one intended to vote for. Volatile respondents have a choice set of at least two parties – the 2010 vote and the party to which their vote intention shifted at a later time point. We measure whether the choice set expands over time by recording the date at which respondents mention a third, fourth and fifth party, captured from actual vote intentions. Respondents on average mention two parties, and only 10% of the respondents mention four parties or more.

Results

Descriptive analyses

Figure 2 offers descriptive information about the moments at which different groups of respondents start to forget their voting behavior. Figure 2(a) provides the overall picture. The figure shows eight pairs of recall moments (reflecting that some respondents had 10 June as the start of the first episode, others 21 June). At each recall moment, additional respondents start to recall their voting behavior at the 2010 elections incorrectly: after 803 days, more than 25% of the respondents has had an incorrect recall at least once.10

Next, we split the sample in different subgroups. Figure 2(b) separates individuals with the highest educational level from individuals who received middle and lower education.11 Although the higher educated are more likely to recall their 2010 voting behavior correctly at every wave, differences

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10This estimation of 25% is somewhat higher than the 22% (4552) respondents who actually forget their vote, because it is based on episodes rather than respondents.

11Education is categorized into low (elementary, primary and preparatory vocational education), middle (intermediate vocational and general secondary education) and high (higher professional education and university).
are substantially small. Figure 2(c) shows large differences between voters who had been more and less volatile before casting the 2010 vote. After more than 800 days, an estimated 83% of the previously non-volatile voters still has an accurate recall, compared to almost 70% of the previously somewhat volatile voters, and a mere 44% of the previously highly volatile voters. These strong differences are remarkable, because the volatility we measure here had taken place before the elections that we ask them to recall. However, they may partly capture effects of volatility as interfering events after the subsequent elections. Figure 2(d) shows that the impact of respondents’ inconsistent recall of their 2006 vote is surprisingly weaker than the impact of their pre-electoral volatility is (see Figure 2(d)): it leads to a mere 10% relative drop in recall after more than 800 days.

**Multivariate analyses I: changing vote intention**

Table 2 turns to multivariate tests. Model 1 confirms Figure 2(a)–(d). The chance to have an inconsistent recall is larger among voters who had had an inaccurate recall of their 2006 vote ($b = .20$, meaning they are 1.2 times

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12 Respondents are classified as low (<25th percentile on the relative volatility measure), medium (25th–75th percentile) or highly (>75th percentile) volatile.
as likely \((e^{1.2})\), supporting H1. The chance to have an inaccurate recall is slightly lower among the highest educated \((b = -0.03\): 0.8 times as likely to forget compared to the lowest educated \((e^{-0.21})\), supporting H2. Respondents who had changed vote intention at least once between 2006 and 2010 are more likely to have an inaccurate recall \((b = 0.67\): almost 2 times as likely as constant respondents), and the relatively more frequent changers are even more forgetful \((b = 1.62\): 5 times as likely as constant voters), supporting H3. These effects remain significant after the inclusion of a range of events in models 2–4.  

Model 2 shows a very strong effect of the interfering event of changing one’s vote intention, supporting H4a. The first change in vote intention makes respondents 8.8 times as likely to have an inaccurate recall \((e^{2.17})\). This event explains a large part of the effect of pre-electoral volatility: the effects of both having been volatile in 2006–2010 and the degree of volatility in 2006–2010 are more than halved compared to model 1. Controlled for the interfering event of volatility, having been volatile in 2006–2010 only makes inaccurate recall 1.3 times more likely, whereas increasing the degree of pre-electoral volatility from minimum to maximum multiplies the likelihood with 2.2. While the history of volatility between 2006 and 2010 thus continues to have a significant, positive effect on the likelihood to have an incorrect recall after the 2010 elections, the interfering event of changing one’s vote intention after these elections exerts by far the largest effect.

Model 3 adds four additional events, namely changing vote intention for the second, third, fourth and fifth times. The effects are puzzling. As expected, the first (2.45), third (0.76) and fifth (0.32) change make inaccurate recall more likely (to an ever decreasing degree). However, the second (−0.83) and fourth (−0.37) change would make inaccurate recall somewhat less likely (though again the effects decrease). While the net effect of all subsequent changes is always positive, voters with two changes are less likely to have an inaccurate recall than voters who changed once or thrice. This counter-intuitive finding may be due to respondents who changed vote intention twice simply returning to the party they had originally intended to vote for shortly after the 2010 elections. The second and fourth changes do capture not only the event of changing vote intention but also the event of returning to the original party. Model 4 adds interaction effects to tease this out. We measure whether the vote intention is the same as original vote recall, and interact this with the change frequency. This allows us to assess whether there is a negative marginal effect on recall inaccuracy for those

\[ \text{Effect of times participated is positive at } t_0, \text{ but decreases with time (as the variation in times participated decreases over time). The effect of degree of volatility turns more strongly positive over time (suggesting that forgetfulness manifests itself over time). Interacting these variables with time does not alter the other variables substantively. These interactions are therefore left out of the main models.} \]
Table 2. Event history model explaining first inaccurate recall by changing vote intention.

|                        | Model 1       | Model 2       | Model 3       | Model 4       |
|------------------------|---------------|---------------|---------------|---------------|
| **Time invariant**     |               |               |               |               |
| Education (1–8)        | −0.03 (0.01)***| −0.02 (0.01)***| −0.03 (0.01)***| −0.03 (0.01)***|
| Times participated     | −0.01 (0.00)***| −0.01 (0.00)***| −0.01 (0.00)***| −0.00 (0.00)***|
| Volatility 2006–2010 (dummy) | 0.67 (0.04)***| 0.24 (0.04)***| 0.25 (0.04)***| 0.25 (0.04)***|
| Degree of volatility 2006–2010 | 1.62 (0.14)***| 0.77 (0.15)***| 0.81 (0.15)***| 0.78 (0.15)***|
| Forgot 2006 vote (dummy) | 0.20 (.07)***| 0.16 (.07)* | 0.16 (0.07)* | 0.14 (0.07)* |
| Inconsistent first report 2010 vote (dummy) | 1.37 (0.08)***| 0.90 (.008)***| 0.90 (0.08)***| 0.87 (0.08)***|
| Volatile 2006–2010 missing | −0.15 (0.15) | −0.09 (0.15) | −0.09 (0.14) | −0.06 (0.14) |
| Forgot 2006 missing    | 0.13 (0.04)***| 0.04 (0.04)   | 0.04 (0.04)   | 0.04 (0.04)   |
| Inconsistent first report 2010 vote missing | 0.26 (0.03)***| 0.25 (0.03)***| 0.25 (0.03)***| 0.26 (0.03)***|
| **Time variant**       |               |               |               |               |
| Changing vote intention 1st | 2.17 (0.04)***| 2.45 (0.05)***| 2.52 (0.05)***| 2.52 (0.05)***|
| Changing vote intention 2nd |              |               |               |               |
| Changing vote intention 3rd |              |               |               |               |
| Changing vote intention 4th |              |               |               |               |
| Changing vote intention 5th |              |               |               |               |
| Vol2: Current preference = 2010 vote |              |               |               | −0.19 (0.05)***|
| Interaction: Change2nd * (Pref_vol2 = 2010vote) |              |               |               | −0.11 (0.09)   |
| Vol3: Current preference = 2010 vote |              |               |               | −0.14 (0.05)** |
| Interaction: Change3rd * (Pref_vol3 = 2010vote) |              |               |               | −0.18 (0.09)* |
| Vol4: Current preference = 2010 vote |              |               |               | −0.12 (0.07)   |
| Interaction: Change4th * (Pref_vol4 = 2010vote) |              |               |               | −0.23 (0.15)   |
| Vol5: Current preference = 2010 vote |              |               |               |               |
| Interaction: Change5th * (Pref_vol5 = 2010vote) |              |               |               |               |
| **N (episodes)**       | 52,186        | 52,186        | 52,186        | 52,186        |
| **N (respondents)**    | 20,936        | 20,936        | 20,936        | 20,936        |

Notes: 1VOP 2006–2012: All respondents participating in either of the two immediate post-electoral waves. Pairwise missing values: volatility 2006–2010, accuracy 2006, consistency 1VOP wave 10 June 2010 and 21 June 2010. Entries are log hazard ratios, significant (one-tailed) at $p < .05 (*)$, $p < .01(***)$, $p < .001(****)$. 

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who at the time of the second (or third, fourth and fifth) recall moved back to the party they originally voted for, and a positive marginal effect for those who at the time of the recall moved to a different party. We find partial evidence for the explanation. The interaction term halves the main effect of the second change in vote intention (from $-0.83$ to $-0.39$). Moreover, the interaction term itself is significantly negative ($-0.48$). This means that for voters who switch back to their 2010 vote, second volatility has a strong negative effect ($-0.39 + -0.48$), whereas for voters whose second change is to a different party, this effect is much weaker ($-0.39$). The pattern is similar for the effect of fourth change in vote intention. Thus, part of the negative effect of second and fourth volatility is indeed explained by respondents returning to their original preference. Nevertheless, a small negative effect remains also for those respondents whose vote intention does not equal their 2010 vote.

We do not know what might explain the remaining effect. We find no fundamental differences between respondents who change vote intention two or four times, and those with one, three or five changes. The models are not disproportionally influenced by either frequent or infrequent survey participants. Harmful multicollinearity (as caused by the cumulative nature of the frequency of changes in vote intention) is unlikely, as our results are very robust to alternative model specifications.

**Multivariate analyses II: number of parties**

Table 3 models the effect of naming additional parties next to changing vote intention. In support of H5, in model 5, we find that mentioning a third party indeed stimulates inaccurate recall ($0.55$). This event explains some of the effect ascribed to changing vote intention for the third or the fifth time. Mentioning a fourth or fifth party has no significant effect. This is at least in part due to the very low number of respondents mentioning more than three unique parties.

**Multivariate analyses III: different effects for different voters**

Models 6 and 7 (Table 4) test the expectation that the interfering event of changing vote intention impacts differently with voters’ level of pre-electoral volatility. The first change in vote intention has a significantly lower effect ($-0.23$ and $-1.99$, respectively) on the likelihood of recalling incorrectly for generally more volatile voters, regardless whether we focus on the binary measure (model 6) or relative measure (model 7). This provides support for H6b: previously stable voters are affected more strongly by the event of changing vote intention.\(^{14}\)
Cognitive dissonance?

Our analyses so far provide no information to what extent incorrect recalls match current vote intentions. Figure 3 focuses exclusively on voters who incorrectly recalled their vote, and shows whether they mentioned this (incorrect) party as their vote intention in any of the survey waves before, during or after the incorrect recall. Not shown in the graph are the respondents who never mention the incorrectly recalled party as their vote intention (17%).

Cognitive dissonance is a common explanation for recall inaccuracy (e.g. Waldahl and Aardal 2000; Beasley and Joslyn 2001; Van Elsas et al. 2014): current vote intentions, if different from the party voted for, eventually pressure the voter to adapt his memory. If cognitive dissonance drives inconsistent recall, we would expect to see particularly large groups of voters who have a similarity between recalled vote and vote intention both before and during the time of incorrect recall. However, the percentages in Figure 3 do

\[ \text{Table 3. Event history model explaining first inaccurate recall by vote intention for additional party.} \]

| Model 3 | Model 5 |
|---------|---------|
| **Time invariant** | **Time invariant** |
| Education (1–8) | −0.03 (0.01)***** | −0.02 (0.01)***** |
| Times participated | −0.01 (0.00)** | −0.00 (0.00)* |
| Volatility 2006–2010 (dummy) | 0.25 (0.04)***** | 0.25 (0.04)***** |
| Degree of volatility 2006–2010 | 0.81 (0.15)***** | 0.77 (0.15)***** |
| Forgot 2006 vote (dummy) | 0.16 (0.07)* | 0.16 (0.07)** |
| Inconsistent first report 2010 vote (dummy) | 0.90 (0.08)***** | 0.89 (0.08)***** |
| Volatile 2006–2010 missing | −0.09 (0.14) | −0.06 (0.15) |
| Forgot 2006 missing | 0.04 (0.04) | 0.04 (0.04) |
| Inconsistent first report 2010 vote missing | 0.25 (0.03)***** | 0.25 (0.03)***** |
| **Time variant** | **Time variant** |
| Changing vote intention 1st | 2.45 (0.05)***** | 2.45 (0.05)***** |
| Changing vote intention 2nd | −0.83 (0.05)***** | −0.97 (0.05)***** |
| Changing vote intention 3rd | 0.76 (0.05)***** | 0.54 (0.06)***** |
| Changing vote intention 4th | −0.37 (0.07)***** | −0.38 (0.07)***** |
| Changing vote intention 5th | 0.32 (0.07)***** | 0.22 (0.07)***** |
| Preference for 3rd party | 0.55 (0.05)***** | 0.55 (0.05)***** |
| Preference for 4th party | −0.01 (0.07) | −0.01 (0.07) |
| Preference for 5th party | 0.02 (0.11) | 0.02 (0.11) |
| N (episodes) | 52,186 | 52,186 |
| N (respondents) | 20,936 | 20,936 |

Notes: 1VOP 2006-2012: All respondents participating in either (or both) of the two immediate post-electoral waves. Pairwise missing values: volatility 2006–2010, accuracy 2006, consistency 1VOP wave 10 June 2010 and 21 June 2010. Entries are log hazard ratios, significant (one-tailed) at \( p < .05 (*)\), \( p < .01(**)\), \( p < .001(***)\).

\[ ^{14}\text{Volatility as a trait is related to voters’ age through habituation. With age, voters become habituated to voting for a specific party and this reinforces their party loyalty (Gomez, 2013), which in turn could increase recall accuracy. We explore this age effect in Online Appendix B. Most important for this paper’s purposes is that the effects of volatility (as trait and as interfering event) remain highly robust in these models.} \]
not clearly point to this: fewer respondents mention the party during (54%) than before (68%) and after (64%) their incorrect recall. While 42% mentioned their recalled party as vote intention at least once before, during and after forgetting their vote, this tells us little. The group that mentions the party during and before (4% + 42%) is quite small, compared to during and after (6% + 42%) and to before and after (12% + 42%). More than to cognitive dissonance, the results point to a choice set mechanism behind incorrect recall: voters have a few parties in mind which they could have possibly voted for, and when in doubt, they use this information to guess their past vote. This is not necessarily the party they prefer at that point in time. While cognitive dissonance may play a role, it does not explain most of the occurrences of incorrect recall.

Table 4. Event history model explaining first inaccurate recall by changing vote intention, including interactions.

|                      | Model 3  | Model 6  | Model 7  |
|----------------------|----------|----------|----------|
| **Time invariant**   |          |          |          |
| Education (1–8)      | −0.03 (0.01)** | −0.03 (0.01)** | −0.03 (0.01)** |
| Times participated   | −0.01 (0.00)** | −0.01 (0.00)** | −0.01 (0.00)** |
| Volatility 2006–2010 (dummy) | 0.25 (0.04)** | 0.42 (0.08)** | 0.23 (0.04)** |
| Degree of volatility 2006–2010 | 0.81 (0.15)** | 0.84 (0.15)** | 2.28 (0.38)** |
| Forgot 2006 vote (dummy) | 0.16 (0.07)* | 0.15 (0.07)* | 0.15 (0.07)* |
| Inconsistent first report 2010 vote (dummy) | 0.90 (0.08)** | 0.90 (0.08)** | 0.91 (0.08)** |
| **Volatility 2006–2010 missing** | −0.09 (0.14) | −0.84 (0.45) | −0.96 (0.45) |
| Forgot 2006 missing | 0.04 (0.04) | 0.04 (0.04) | 0.04 (0.04) |
| Inconsistent first report 2010 vote missing | 0.25 (0.03)** | 0.25 (0.03)** | 0.25 (0.03)** |
| **Time variant**     |          |          |          |
| Changing vote intention 1st | 2.45 (0.05)** | 2.55 (0.07)** | 2.56 (0.06)** |
| Changing vote intention 2nd | −0.83 (0.05)** | −0.90 (0.08)** | −0.91 (0.06)** |
| Changing vote intention 3rd | 0.76 (0.05)** | 0.85 (0.10)** | 0.81 (0.07)** |
| Changing vote intention 4th | −0.37 (0.07)** | −0.49 (0.14)* | −0.40 (0.09)* |
| Changing vote intention 5th | 0.32 (0.07)** | 0.51 (0.15)** | 0.32 (0.10)** |
| **Interactions**     |          |          |          |
| Volatility 2006–2010 (dummy) * Change 1st | −0.23 (0.09)** |          |          |
| Volatility 2006–2010 (dummy) * Change 2nd | 0.10 (0.10) |          |          |
| Volatility 2006–2010 (dummy) * Change 3rd | −0.12 (0.12) |          |          |
| Volatility 2006–2010 (dummy) * Change 4th | 0.14 (0.16) |          |          |
| Volatility 2006–2010 (dummy) * Change 5th | −0.22 (0.17) |          |          |
| Degree volatility * Change 1st |          | −1.99 (0.43)** |          |
| Degree volatility * Change 2nd | 0.78 (0.37)* |          |          |
| Degree volatility * Change 3rd | −0.40 (0.41) |          |          |
| Degree volatility * Change 4th | 0.14 (0.51) |          |          |
| Degree volatility * Change 5th | 0.12 (0.51) |          |          |
| Volatility missing * Change 1st | 0.97 (0.50) | 1.12 (0.49)* |          |
| Volatility missing * Change 2nd | −0.02 (0.42) | −0.08 (0.42) |          |
| Volatility missing * Change 3rd | −0.65 (0.62) | −0.58 (0.61) |          |
| Volatility missing * Change 4th | 1.38 (0.66) | 1.28 (0.65)* |          |
| Volatility missing * Change 5th | −1.26 (0.66) | −1.08 (0.61)* |          |
| **N (episodes)**     | 52,186 | 52,186 | 52,186 |
| **N (respondents)**  | 20,936 | 20,936 | 20,936 |

Notes: 1VOP 2006–2012: All respondents participating in either (or both) of the two immediate post-electoral waves. Pairwise missing values: volatility 2006–2010, accuracy 2006, consistency 1VOP wave 10 June 2010 and 21 June 2010.

Entries are log hazard ratios, significant (one-tailed) at $p < .05$ (*), $p < .01$(**), $p < .001$(***).
Conclusion

Voting behavior as measured by recall questions in surveys contains a considerable share of inaccurate reports. Any attempt to improve the accuracy of these measures should start by understanding the explanations of vote recall accuracy. Lacking repeated measures in ongoing panel data, previous studies have been unable to address a crucial question. Does recall inaccuracy reflect a fundamental quality of the voter and his/her vote, or is it a consequence of changing vote intentions that any voter may experience? This study used EHA on the extensive 1VOP panel data set to single out the effect of a change in vote intention after the recalled vote, and contrast it with the effect of having generally volatile preferences before casting the recalled vote.

Our study makes several contributions. First, the results show that both explanatory models are at work, but to varying degrees. Voters who changed vote intentions before casting their 2010 vote are more likely to misreport it afterwards. This suggests that partisans with deeply rooted preferences are indeed more likely to recall their behavior. However, a much stronger effect is exerted by the interfering event of changing one’s vote intention after casting the 2010 vote: controlled for this effect, pre-electoral volatility retains only a small effect, suggesting that its effect is mediated in large part by post-electoral volatility. The effects of education and earlier forgetfulness are also relatively small. This suggests that most inconsistent vote recall is a direct product of changing party preferences after the recalled vote.

Second, we assess how every additional change in vote intention affects recall accuracy. Primarily, the first change causes the recalled vote to be obscured. Subsequent changes in vote intention are less detrimental to recall accuracy, and can even improve recall when voters return to their original party of choice. Current vote intentions thus serve as a cue for recall.

When we distinguish left-wing and right-wing party groups, only 12% of inconsistent recalls takes place between ideological block. This supports the notion that vote recall relies on a choice set of parties.
Third, we delved further into this process of cue-taking, by assessing the extent to which incorrect recalls match the vote intentions that a voter holds at different points in time. We find that the well-studied mechanism of cognitive dissonance – voters resolving inconsistencies that exist between their vote and their changed vote intention (e.g. Waldahl and Aardal 2000; Beasley and Joslyn 2001; Jaspers, Lubbers, and De Graaf 2009, 289; Van Elsas et al. 2014) – is only part of the story. Rather, the evidence points to the existence of a choice set containing the parties a voter considers, on the basis of which voters make informed guesses of their actual vote.

These findings apply to vote recall beyond the immediate post-election period of six months to two years after elections. The longer the time span since the elections, the larger the problem of inaccurate recall. Moreover, the dominant mechanism differs with time: the effect of volatility strongly increases with time (indicating forgetfulness), as does the likelihood to assimilate recall to one’s current preference (Van Elsas et al. 2014). As previous studies were unable to separate inaccurate vote recall due to the nature of respondents (their forgetfulness or partisanship) from inaccurate vote recall due to interfering events, it remained unclear why recall accuracy decreases with time. The present study moves the literature forward by showing that particularly these latter, dynamic factors explain vote recall: with time, people become more likely to change preference or to consider multiple parties, inducing recall inaccuracy.

These findings and biases are relevant to substantive scholars that use such recall measures in their study. The problem of incorrect and biased recall tends to be quite small in post-election surveys that are organized within days of weeks after the elections (Van Elsas et al. 2014). However, many surveys do not follow the national election cycles but nevertheless ask respondents what they voted at generally large and often varying time spans after the national elections. This includes general international surveys such as the European Social Survey, supra- or sub-national election surveys such as the European Election Study, and various national surveys (including some that participate in the International Social Survey Programme). It is crucial to acknowledge that post-electoral changes in vote intentions tend to bias vote recall, and that the effect of such changes is much stronger than the effect of characteristics that are fixed at the time of voting. The inaccurate vote recall that occurs over a longer time span decreases the quality of data collection, and more importantly in a way that is not equivalent across countries in cross-national surveys. The most obvious recommendation is therefore to pose vote recall questions as shortly after the elections as possible. The insight this paper has given into the rate of decay of recall accuracy and especially the impact of (internal) events strongly reinforces this recommendation.

The harmful effect of these events on vote recall stresses recent suggestions in survey design to stimulate accurate recall by face-to-face interviews,
by providing general information on the unique context of the recalled elections, or asking the respondent to recall that context (Iarossi 2006, 57; Al Baghal et al. 2014, 534). The relevant context may be the main points of debate, the most prominent leaders, or the coalition government in place at that time. The boost of more valid information will come at the cost of standardization and reliability. Yet, this may be a cost that we should be willing to pay, especially when we ask respondents to recall behavior further in the past.

Disclosure statement
No potential conflict of interest was reported by the authors.

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