The Impact of Voting Advice Applications on Party Choice in Dutch National and Provincial Elections

MASTER THESIS

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StemWijzer

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UNIVERSITY OF TWENTE.

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Abstract

Advanced democracies witness a decline of party identification and increased electoral volatility. With the rise of the Internet, Voting Advice Applications (VAAs) became available to guide people's vote choice. This study examines how the use of VAAs influences people's party choice in Dutch elections. Three main VAA effects are studied: preference change, preference formation and preference confirmation. Drawing on three successive editions from the Dutch Parliamentary Election Study (DPES) and new Internet panel data collected over the course of the 2015 Dutch provincial elections campaign, we find that VAA use increases vote switching (preference change). VAAs also offer undecided citizens a cue to make their party choice (preference formation) and strengthen existing party preferences (preference confirmation). These findings attest to the relevance of VAAs as a vote cue in a volatile electoral context. Models of party choice would gain from incorporating VAA use as independent variable next to traditional vote predictors.

Keywords: Voting advice applications; elections; party choice; the Netherlands

Preface

This master thesis results from a stimulating and sometimes challenging process that started in September 2014, when I had a meeting with Martin Rosema, who would soon become my first supervisor. After exchanging ideas for a possible thesis subject, we agreed that Voting Advice Applications (or VAAs, as they are commonly abbreviated) would be a suitable topic to investigate. VAAs originated in the Netherlands and have become an integral part of Dutch election campaigns, attracting millions of visitors. I was triggered by the empirical question how these tools would affect party choice at elections. Although research in the field of VAAs has proliferated in recent years, I saw ample opportunity to take the relationship between VAA use and party choice as the principal subject of my thesis.

This thesis uses data from two sources. The first source is the Dutch Parliamentary Election Study (DPES), which is a collective enterprise of the Dutch political science departments. The second source is the I&O panel study, conducted within the context of the 2015 Dutch provincial elections. I am very thankful for the opportunity to do an internship at I&O Research between January and April 2015. During these months, I have gained much practical experience in doing research in a very pleasant atmosphere. I would like to thank all colleagues, and in particular Frank ten Doeschot, Peter Kanne and Meta Leban Buschenhenke for their assistance and feedback.

Furthermore, Job Leemreize has been helpful in designing the front picture of this thesis. In addition, I owe a great debt to Martin Rosema and Kees Aarts for their invaluable feedback, which helped me a lot to improve this thesis. I also enjoyed presenting a paper (based on this thesis) at the Politicologenetmaal in Maastricht. Finally, I would like to thank my parents and brother for their continued support.

Laurens Klein Kranenburg

Eibergen, 23 June 2015

List of abbreviations

CAPI	Computer Assisted Personal Interviewing
CATI	Computer Assisted Telephone Interviewing
DPES	Dutch Parliamentary Election Study
PAPI	Paper and Pencil Interviewing
PS	Provincial elections (*Provinciale Statenverkiezingen*)
PTV	Propensity to Vote
TK	National parliamentary elections (*Tweede Kamerverkiezingen*)
VAA	Voting Advice Application

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1 Introduction

1.1 Research area and topic

Advanced democracies witness a decline of party identification and increased electoral volatility. A gradual process of dealignment has weakened the traditional link between voters' social background and party choice (Aarts & Thomassen, 2008; Dalton & Wattenberg, 2000; Franklin, Mackie, & Valen, 1992; Van der Eijk & Franklin, 2009). From the 1960s onwards, the Netherlands has shifted from a pillarized society with stable voting patterns structured by class and religion to a competitive party system with comparatively high levels of electoral volatility (Andeweg & Irwin, 2009; Mair, 2008). With the rise of the Internet, Voting Advice Applications (VAAs) became available to guide people's vote choice. An emerging body of literature confirms that the use of VAAs increases turnout and influences people's party choice (Gemenis & Rosema, 2014; Ladner, Fivaz, & Pianzola, 2012; Walgrave, Van Aelst, & Nuytemans, 2008; Wall, Krouwel, & Vitiello, 2014). To date, these studies have resulted in different estimates of the effects of VAAs on voting behaviour. This study improves upon previous research by focusing on three dimensions of party choice that have seldom been studied together (Ruusuvirta & Rosema, 2009). We use new data collected during the 2015 Dutch provincial elections campaign and existing national election data to shed new light on the relationship between VAA use and party choice.

1.1.1 History of VAAs

VAAs are online tools that provide a personalized voting recommendation based on the congruence of user and party (candidate) responses to a set of issue statements (Alvarez, Levin, Mair, & Trechsel, 2014; Fivaz & Nadig, 2010). The Netherlands are generally considered the breeding ground of VAAs. In 1989, the first VAA predecessor was launched as a booklet with 60 statements and a diskette (De Graaf, 2010). This tool had a clear educational purpose, reflected by its name StemWijzer ("vote wiser"). In 1998, the test went online for the first time. In the early 2000s, online user traffic exploded, which rose to 4.8 million vote recommendations ahead of the 2012 parliamentary elections. A major competitor, Kieskompas, was introduced in 2006 by a university researcher and a daily newspaper. This VAA, too, was capable of attracting a sizeable part of the electorate, with more than 1 million vote recommendations. It is estimated that approximately 40% of the Dutch electorate use at least one VAA during national parliamentary elections, while VAAs also attract between 10% and 30% of the electorate in other European countries (Andreadis & Wall, 2014; Louwerse & Rosema, 2014; Ruusuvirta & Rosema, 2009).

1.1.2 Strands in VAA research

In recent years, there has been a growing body of literature on different aspects of VAAs. These studies may be grouped in several categories. One strand of research focuses on the methodological aspects of VAAs (Gemenis, 2013; Germann, Mendez, Wheatley, & Serdült, 2015; Lefevere & Walgrave, 2014; Louwerse & Rosema, 2014; Otjes & Louwerse, 2014; Walgrave, Nuytemans, & Pepermans, 2009). It deals with VAA design (e.g. how to select and formulate statements) and the effects of these design choices on the output of VAAs. Research indicates that the specific selection of statements exerts a strong influence on the distribution of voting recommendations. A party's share of voting recommendations depends in part on the specific set of statements used in the VAA (Walgrave et al., 2009). Complex interactions are said to exist. If a specific selection contains more economic left-right statements, economic left-wing parties score higher among economic left-wing voters. The same effect is observed for parties at the right, which fare better among voters holding

economic right-wing orientations (Lefevere & Walgrave, 2014). Moreover, the type of spatial framework and metric that has been used to translate voters' responses into voting recommendations has a profound impact on the output of VAAs, both at the individual and party level (Louwerse & Rosema, 2014).

A second strand in VAA research is concerned with profiling VAA users and examines how people use and experience VAAs, with strong roots in the political communication literature (Alvarez, Levin, Trechsel, & Vassil, 2014; Hanel & Schultze, 2014; Hirzalla, Van Zoonen, & De Ridder, 2010; Marschall, 2014; Marschall & Schultze, 2014; Van de Pol, Holleman, Kamoen, Krouwel, & de Vreese, 2014). It is known that the typical VAA user is male, young, highly educated and someone who has an above-average interest in politics (Hooghe & Teepe, 2007; Ladner et al., 2012; Schultze, 2014; Van de Pol et al., 2014; Wall, Sudulich, Costello, & Leon, 2009). These differences are generally attenuated if VAA use becomes more widespread among the population. A recent attempt has been made to move beyond the general classification of male, young and politically interested users. It has been suggested that VAA users can be classified into three types: doubters, seekers and checkers (Van de Pol et al., 2014).

A relatively new and unexplored branch of VAA research deals with the normative notions inherent in VAAs (Anderson & Fossen, 2014; Fossen & Anderson, 2014). It is asked how VAAs fit into existing perspectives on democracy and citizenship. Current VAAs predominantly resemble the model of social choice democracy, featuring citizens as savvy political shoppers (Fossen & Anderson, 2014).

A fourth approach in VAA research focuses on the influence of VAAs on voting behaviour and electoral outcomes, a category to which this study belongs. Research indicates that VAA use increases turnout and influences people's party choice (Dinas, Trechsel, & Vassil, 2014; Gemenis & Rosema, 2014; Ladner et al., 2012; Walgrave et al., 2008; Wall et al., 2014). We already pointed out that these studies provided different estimates of the effects of VAAs on voting behaviour. These divergences can be partly attributed to differences in research design. Some studies compare VAA users with non-users, while others exclusively focus on VAA users. There is generally a lack of randomized experiments with VAA use as treatment to be manipulated (Pianzola, 2014a). Most inferences are based on observational research, with a wide variety of data sources used: (1) log files directly taken from VAAs, (2) exit surveys after users filled in a VAA, (3) internet [access] panel data and (4) national election studies. These data sources all have their pros and cons in terms of internal and external validity, but it only adds to the relevance of rigorously studying the influence of VAAs on party choice. This study seeks to enhance our understanding of VAAs by analysing their impact on party choice in Dutch national and provincial elections. As stated earlier, this research improves upon existing studies by focusing on three key aspects of party choice that have seldom been studied together (see for an exception: Ruusuvirta and Rosema (2009)). These dimensions are preference change, preference formation and preference confirmation, which are further outlined below.

1.2   Research goal and research questions

The goal of this research is to assess whether and to what extent people's party choice is affected by the use of online VAAs in the Netherlands. The main research question can be stated as follows:

> *How does the use of Voting Advice Applications (VAAs) influence people's party choice in Dutch national and provincial elections?*

Party choice concerns the party voted for at elections. The effects of VAAs on party choice are preference change, preference formation and preference confirmation. Preference change refers to vote switching, i.e. people who vote for a different party than they did at previous elections or some other point in time. VAAs could also help undecided citizens to reach a vote choice (preference formation) or they could strengthen people's existing vote preferences, which is referred to as preference confirmation (Ruusuvirta & Rosema, 2009). In order to answer the main research question, the following three sub-questions need to be addressed:

- To what extent does the use of VAAs lead to vote switching among VAA users relative to non-users?
- To what extent does the use of VAAs have an influence on party choice through preference formation?
- To what extent does the use of VAAs have an influence on party choice through preference confirmation?

1.3   Method
We use data from the Dutch Parliamentary Election Study (DPES) and Internet panel data collected around the 2015 Dutch provincial elections (I&O panel study) to examine both VAA usage and party choice at Dutch elections. DPES is based on a stratified random sample of the Dutch electorate, which includes both users and non-users of VAAs. The impact of VAAs on party choice is examined in three election years (DPES 2006, 2010 and 2012). This allows us to test whether the relationships hold across different years. Moreover, since Dutch VAAs have been part of national election campaigns from 1998 onwards, it underscores the need for a research design which goes beyond a single election year. In addition to DPES, Internet panel data are used to track VAA use and party choice in the 2015 Dutch provincial elections.

1.4   Relevance
Although an emerging body of literature confirms that VAAs affect turnout and party choice, it is also widely acknowledged that much work remains to be done in this field (e.g., Alvarez, Levin, Mair, et al., 2014; Andreadis & Wall, 2014; Van de Pol et al., 2014). This study takes up this challenge by investigating to what extent the use of VAAs has an influence on party choice at Dutch elections. The DPES data have certain advantages over other datasets, in terms of sampling procedure and data quality, while the Internet panel data cover the most recent (provincial) elections. Dutch VAAs attract millions of users during the election campaign, which further adds to the relevance of this research. In contrast to most studies, we adopt a more fine-grained approach to the influence of VAAs on party choice by focusing on three key dimensions: preference change, preference formation and preference confirmation. By linking VAA use to actual voting behaviour, this study sheds light on the relative impact of VAAs vis-à-vis other vote determinants, which is relevant to both VAA designers, political scientists and – ultimately – the electorate at large.

1.5   Outline of thesis
Chapter 2 explores how VAAs could theoretically have an impact on party choice. This Chapter concludes with hypotheses for each dimension of party choice. In Chapter 3, we describe what research design is used and elaborate on its strengths and weaknesses. Chapter 4 presents the main results, followed by a concluding chapter (Chapter 5).

2 Impact of VAAs on party choice: a theoretical perspective

In this Chapter, we investigate how VAAs could have an impact on party choice at elections. People turn to VAAs, receive a voting recommendation and cast their ballot on Election Day, but how could we expect the link between VAA use and voting behaviour to operate? In what way(s) are people influenced by the voting recommendation they get? In Section 2.1, we first outline what is meant by party choice, the dependent variable of this research. It is posited that VAAs could bring about three different effects: preference change, preference formation and preference confirmation. These are further elaborated in Section 2.2 through to Section 2.4 respectively.

2.1 Party choice

On a scale from candidate-centred to party-centred democracies, the Dutch electoral system finds itself closer to the party-centred end of the continuum (Van der Eijk & Franklin, 2009). This is reflected by the output of Dutch VAAs. They issue a party recommendation or plot party positions, but they generally do not give candidate advice. For these theoretical reasons, party choice is the dependent variable of this research.

Party choice is the party voted for at elections. Following Ruusuvirta and Rosema (2009), the effects of VAAs on party choice are conceptualised in terms of preference change, preference formation and preference confirmation. These could be considered different dimensions of party choice, if we compare actual party choice with previous voting behaviour or vote intentions.

Figure 1 shows a simplified model of how the use of VAAs could influence party choice. VAA use might also influence the decision to cast a vote (turnout) (Garzia, De Angelis, & Pianzola, 2014; Gemenis & Rosema, 2014), but this falls outside the scope of this thesis. It must also be borne in mind that preference change, formation and confirmation might be the result of factors other than VAA use, which are not visualised here.

VAA use $\longrightarrow$ **Party choice**
- Preference change
- Preference formation
- Preference confirmation

t_0
Time --------------------->

t_1
Election Day
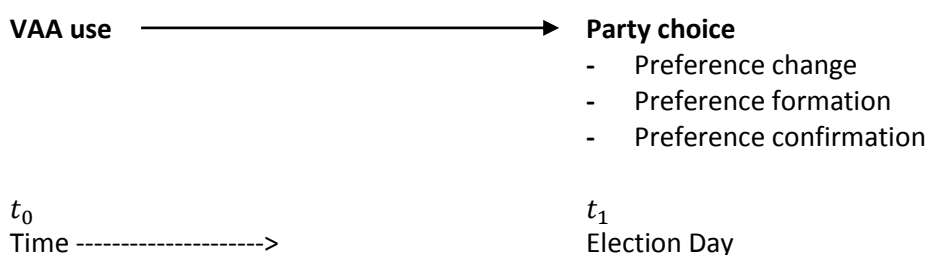
Figure 1: Relationship between VAA use and party choice at the individual level

Reading note: Solid arrow denotes a causal connection. Dashed line represents time. Variables appear in boldface.

The first VAA effect on party choice is **preference change**, which is understood here as vote switching. It refers to people who vote for a different party than they did before at previous elections. This is known as inter-election vote switching. Preference change could also imply that people vote for a different party than what they previously considered at some other point in time.

This represents a change in pre-electoral vote intentions. If voters change their mind over the course of an election campaign, this is referred to as in-campaign vote switching. This conceptualisation accounts for the fact that changes in party preferences may take place at different intervals. Preference change has been defined more narrowly by Ruusuvirta and Rosema (2009), as regards time (between VAA launch and elections) and focus (decided voters). In their paper, preference change refers to people with a vote preference (before filling in the VAA), but who change their preference in response to the VAA results (Ruusuvirta & Rosema, 2009, pp. 6, 8).[1] Preference change has been empirically investigated in relation to VAA use (Andreadis & Wall, 2014; Ladner et al., 2012; Pianzola, 2014b; Walgrave et al., 2008), but mainly with respect to inter-election vote switching. The use of VAAs, however, could bring about different effects other than preference change. These effects have received little scholarly attention to date. According to Ruusuvirta and Rosema (2009), VAAs could also help undecided citizens to make a party choice. For the purposes of this research, undecided citizens are those who do not (yet) know which party to vote for. VAAs could be thought of as facilitators of a vote decision-making process in this regard. This is referred to as **preference formation**. By contrast, in the case of decided voters who have already made up their mind, consulting a VAA could strengthen them in their existing vote preferences. This effect is known as **preference confirmation** (Ruusuvirta & Rosema, 2009). These three VAA effects are not mutually exclusive, depending on the time frame adopted. An example serves to illustrate this point. A voter may hold a party preference at the start of the election campaign (t_0), which is subsequently confirmed by a VAA. If this voter indeed votes as intended (t_1), the VAA effect is described in terms of preference confirmation. However, this voter may also have voted differently than at previous elections (t_{-1}), which reflects preference change. In the former case, the election campaign is the time frame under investigation, while in the latter case we focus on the entire time span between two consecutive elections.

2.2 Preference change

The first VAA effect on party choice is preference change or vote switching. Preference change due to VAA use is expected from (1) the issue voting model and associated spatial theory (Section 2.2.1) and (2) the heuristic model of voting (Section 2.2.2). Preference change can be studied as vote switching between elections (Section 2.2.3) and in-campaign vote switching (Section 2.2.4). The indirect effects of VAAs on political information seeking and vote switching are discussed in Section 2.2.5.

2.2.1 Issue voting and spatial theory

In general, the concept of issue voting refers to the importance of political issues in people's vote decisions. The policy positions of parties and candidates, voters' perceptions thereof, and voters' own policy preferences have an influence on party and candidate choice (cf. Van der Eijk & Franklin, 2009, pp. 18-20). If we know people's policy preferences, we can to some extent predict individual voting behaviour (Carmines & Stimson, 1980). From the issue voting perspective, VAAs are devices that help people to become informed about political issues and policy stances. To get politically informed, voters generally incur costs. VAAs could reduce the costs of becoming informed at three stages (cf. Downs, 1957, p. 210; Garzia, 2010):

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[1] This does not necessarily imply that people vote for the recommended party. They might also abandon their initial preference by voting for a non-recommended party (Ruusuvirta & Rosema, 2009, pp. 16-17).

- **Procurement:** VAAs gather and select the information necessary for informed issue voting by consulting parties, experts and/or party manifestos.
- **Analysis:** the information needs to be analysed, which is done in VAAs through the use of an algorithm comparing user and party positions.
- **Evaluation:** the results of the analysis must be presented in some meaningful way. VAAs issue a voting recommendation, in various tabular or graphical formats.

These cost reductions make VAAs an attractive tool to voters.[2] They are exposed to potentially new information, obtain a relatively comprehensive overview of party stances and are left with a personal voting recommendation. By consulting a VAA, people could be advised to vote for a different party than they voted for previously or considered earlier. Those who do not fill in a VAA are not exposed to these online voting recommendations and have no incentive to change their vote, *ceteris paribus*.

VAAs show users which parties are closest to them by means of a rank order or *n*-dimensional political space. This rank order, too, can be conceptualised in spatial terms (Louwerse & Rosema, 2014).[3] Presenting a VAA recommendation in this way is inspired by the spatial theory of voting. At the heart of this theory lies the proximity or smallest distance hypothesis, positing that a voter chooses the party that is closest to him in a political space (Downs, 1957; Evans, 2004; Wagner & Ruusuvirta, 2012). Downs acknowledged that voters are not able to review each and every policy stance, as the ideal issue voter would do. Instead, most voters orient themselves towards party ideologies as a convenient short cut in vote decisions (Evans 2004). VAAs can help voters to move back from exploring *general* ideological orientations to probing party positions on *specific* policy issues. By consulting a VAA, people may find out that a different party is closer to their own position than their preferred party. In this sense, we expect VAAs to contribute to vote switching. Besides showing proximity, VAAs incorporate elements of the salience model of voting. According to this model, voters support the party that best addresses the issues they care about most (Wagner & Ruusuvirta, 2012). Most VAAs, including Kieskompas and StemWijzer, allow users to assign extra weight to certain issues or themes. On the results screen, users furthermore have the option to compare their position with party stances on each issue. Users may do these kinds of comparisons for issues that carry personal salience. These features may enable users to identify parties which they agree with most on salient issues. This might be a different party than previously voted for, which results in vote switching.

2.2.2   Heuristic model of voting

From the heuristic model of voting, it is also expected that VAAs have a positive impact on vote switching. In this model, humans are "limited information processors", being subject to "bounded rationality" (Simon, 1957). Instead of considering all advantages and disadvantages of all options available, people rely on simple decision rules or *heuristics* to come to a decision (Lau & Redlawsk, 2001). These heuristics are short cuts, in the sense that certain alternatives or certain attributes which might be relevant to a decision are passed over. Instead of striving to optimal outcomes,

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[2] In a Downsian perspective, rational citizens first weigh costs and benefits of turning out to vote (Downs, 1957; Evans, 2004). Since the relationship between VAA use and turnout is not our central research topic, we do not make claims in this respect here. See for a more thorough examination of the VAA-turnout relationship: Gemenis and Rosema (2014), and Dinas, Trechsel and Vassil (2014).

[3] In this view, each statement represents a separate dimension, creating a high-dimensional spatial model.

people are engaged in satisficing strategies. Heuristics have been defined as "problem-solving strategies (often employed automatically or unconsciously) which serve to keep the information processing demands of the task within bounds" (Lau & Redlawsk, 2001, p. 952). Heuristics are there to prevent information overload (Gemenis & Rosema, 2014). VAAs could be considered as heuristics, because they relieve voters to a considerable extent from the burden of gathering, processing and evaluating information on policy stances. A unique feature of VAAs is that they offer personalized vote advice (Alvarez, Levin, Mair, et al., 2014; Ladner et al., 2012; Wall et al., 2014). Instead of having to collecting general information on party positions themselves, users get a tailored and automated recommendation based on their own preferences. This output could be taken as heuristic short cut to make the actual party choice. If this VAA heuristic recommends another party than previously voted for, we expect people to follow this advice and change their vote accordingly. Non-users do not employ this heuristic and have no incentive to change their vote, *ceteris paribus*.

2.2.3 Vote switching between elections

Andreadis and Wall (2014) indeed found that VAA users are more likely to switch parties between two consecutive elections than non-users, after controlling for other factors. Andreadis and Wall covered nine national election studies from four West-European democracies (Finland 3x, Germany 1x, Switzerland 2x, and the Netherlands 3x). This study is in line with earlier research which found that people who reported to be influenced by the voting recommendation are more likely to change their vote between elections (Ladner et al., 2012). Further evidence of a positive effect on vote switching is provided by Pianzola (2014b). She found that Swiss Smartvote users were between 16% and 18% more likely to change their vote between elections than non-users. No evidence was found for Smartvote use to have a stronger effect on vote switching among younger voters than older voters, which was partly due to small sample sizes.

The relationship between VAA use and vote switching is prone to many confounders. Age influences both VAA use and vote switching. Younger voters are more likely to visit a VAA and vote switching decreases with age (Andreadis & Wall, 2014; Hooghe & Teepe, 2007). Another moderator variable is party identification. It has been repeatedly demonstrated that people with a strong party identification are less likely to change their vote (Andreadis & Wall, 2014; Dassonneville & Dejaeghere, 2014). Party identification also seems to negatively impact on VAA use, but this effect is rather unstable and sensitive to model specifications.[4] Also, people with an intermediate level of political knowledge are most likely to change their vote between elections, suggesting a curvilinear effect of political sophistication on vote switching (Dassonneville & Dejaeghere, 2014). Voters with multiple vote propensities, i.e. those who seriously consider two or more parties, are also expected to have a higher probability of vote switching (Ladner et al., 2012; Van der Eijk & Franklin, 2009). On the aggregate level, Andreadis and Wall (2014) found that left-wing voters were more likely to switch. This effect, however, was not observed in the Netherlands. Following the logic of retrospective voting, it is expected that government supporters being unsatisfied with the government's past performance are more likely to change their vote (Fiorina, 1981; Rosema, 2006; Söderlund, 2008). The first hypothesis is:

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[4] In the full sample with nine national election studies, the coefficient for the effect of party identification on VAA use is -0.027 (SE: 0.016, P < 0.10). In a restricted sample of six studies, the sign of the coefficient changes: 0.068 (SE: 0.024, P < 0.01) (Andreadis & Wall, 2014).

Hypothesis 1a (preference change): Vote switching between elections occurs more frequently among VAA users than non-users.

2.2.4 In-campaign vote switching

Preference change or vote switching could be observed by comparing elections over time. As was argued in Section 2.1, however, preference change could also involve a vote (intention) change between two points in time which do not coincide with Election Day(s). If this vote change takes place over the course of an election campaign, it is often referred to as in-campaign vote switching. Andreadis and Wall (2014) found an effect in terms of vote switching between two consecutive elections. But what is known about in-campaign vote switching? In Belgium, users of *Do the Vote Test* switched more between parties than non-users during the electoral campaign, although this effect disappeared by Election Day (Walgrave et al., 2008). The Belgian case, however, was different from the Netherlands in the sense that an online VAA was combined with a TV-show broadcast on three different occasions, which could have introduced all sorts of interaction effects. Moreover, the authors attribute part of the modest effects to the TV-show that gave a separate vote recommendation during each broadcast, leaving viewers with sometimes contradictory results. For these reasons, this study puts both vote switching between elections and in-campaign vote switching to an empirical test. We hypothesize that VAA use also contributes to in-campaign vote switching. The use of this relatively short time span is warranted by the fact that VAAs are typically launched only a few weeks or months ahead of the elections. VAAs are not only tailored in the sense that they offer personalized vote advice, but also taking into consideration that the advice is bound to specific elections within a specific party landscape.

Hypothesis 1b (preference change): In-campaign vote switching occurs more frequently among VAA users than non-users.

2.2.5 Indirect effects

As a side effect, users could take the output of VAAs as a starting point to further investigate party programmes or to obtain more information on political issues by other means (e.g. reading newspapers or watching TV debates) (Garzia, 2010). Data from pop-up questionnaires among German VAA users revealed that 47.3% of the respondents in 2005 and 52.1% in 2009 were motivated to collect further political information after consulting the VAA (Marschall, 2005, 2011). Apart from the issue whether people indeed search for information afterwards, we cannot directly trace whether this leads to a vote change. VAA users may change their vote due to the VAA recommendation as such, but it might also be the result of political information collected ex post (or a combination of both). There has been no empirical evidence which examined the indirect effects of VAA use on vote switching through various kinds of political behaviour. Since we cannot determine the exact sequence of activities (VAA use, reading newspapers, watching TV debates) based on the data available, no hypothesis is formulated in this respect here.

2.3 Preference formation

In Section 2.1, it was outlined that VAAs could help undecided citizens to make a party choice, an effect known as preference formation (Ruusuvirta & Rosema, 2009). Undecided citizens were defined as those who do not (yet) know which party to vote for. The term "undecided" can have multiple meanings. We primarily focus on voters who intend to cast their vote, but do not know which party to vote for. VAAs could also have a mobilising effect in that non-voters are persuaded to cast their

vote (Gemenis & Rosema, 2014). As argued in Section 2.1, the effects of VAAs in terms of turnout are beyond the scope of this study.

It is hypothesized that VAAs help undecided voters to reach a decision by showing them one or more parties that are most congruent with their own views. We cannot directly observe what would happen if undecided voters who consulted a VAA, did not use a VAA at the same time (cf. Ruusuvirta & Rosema, 2009). In the social science literature, this problem is known as the impossibility of observing the counterfactual. It is sometimes referred to as the fundamental problem of causal inference (Gerring, 2012, p. 218). To shed some light on this issue, though, the role of VAAs in preference formation is tested in two ways. First, preference formation could be indirectly examined by comparing undecided and decided voters in terms of VAA usage. Second, we can investigate to what extent undecided voters follow the recommendation(s) of VAAs in their actual party choice. This is important, since VAA use *per se* does not guarantee that users take the advice seriously.

2.3.1   Vote uncertainty and VAA use

Regarding the first effect, we contend that consulting a VAA could be considered as a first step towards preference formation. It is plausible that undecided voters are more likely to turn to a VAA, precisely *because* they are undecided. This is supported by data from a major Dutch VAA (*Kieskompas*). A considerable part of *Kieskompas* users report that they use this VAA to determine which party to vote for (17.2%) or to gain insight into the positions of various parties (15.9%) (Van de Pol et al., 2014).[5] These answers are derived from a pop-up questionnaire (*N* = 52,999) with a response rate of 7%, so these figures need to be interpreted with some caution.[6] A robustness check was performed on a weighted sample, which was representative of all *Kieskompas* users with respect to age, gender and education. Despite this weighting, we do not know how the remaining *Kieskompas* users would have responded to questions about their reasons for using *Kieskompas*, because they were not presented with these questions. Van de Pol et al. (2014) also constructed a typology of VAA users based on a set of motivational and cognitive characteristics. Besides *Reason for using Kieskompas,* these characteristics include political interest, vote certainty, internal and external political efficacy. A latent class analysis revealed that three user types could be distinguished: doubters (10%), seekers (32%), and checkers (58%). People who do not yet know which party to vote for are predominantly found among doubters and seekers, and less so among checkers. A less hesitant, but still undecided category – people who are still deciding between a few parties – makes up a large share of all three user categories. At the aggregate level, almost half of the respondents indicated that they were still deciding between a few parties, whereas another 15.9% did not know yet.[7] These results further corroborate the hypothesis that undecided voters are more likely to consult a VAA than decided voters.

Party attachment and age could mediate the relationship between vote uncertainty and VAA use. Younger voters generally have less crystallized party preferences and are more likely to consult a VAA

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[5] The question *Reason for using Kieskompas* had four answer categories. The other categories were: "To check whether I agree with the party I intend to vote for" (38.6%) and "Entertaining test to think about or discuss with others" (28.2%).

[6] Response rate: % of fully completed sessions (*N* = 757,052).

[7] Vote certainty with three categories: "I have already decided which party to vote for (34.4%), "I am still deciding between a few parties" (49.7%), and "I do not know yet" (15.9%). A fourth category, "I will not vote at all", was omitted, because it was chosen by only 1% of the users.

(Van de Pol et al., 2014; Van der Kolk, Aarts, & Rosema, 2007). It has been shown that older people and those with a strong party identification are less likely to consult a VAA, although the first effect is more robust than the second (Andreadis & Wall, 2014). These findings suggest that it is of great importance to test the relationship between vote uncertainty and VAA use against a set of control variables. Although other factors might be at work, there are theoretical considerations to assume an independent effect of vote uncertainty on VAA use. We can identify several general trends which cause an overall rise in floating voters among all segments of society, which in turn may stimulate VAA use (Garzia, 2010). These trends pertain to the erosion of cleavage-based voting and decline of party membership and loyalties (Dalton & Wattenberg, 2000; Franklin et al., 1992; Mair & van Biezen, 2001). According to Van der Kolk et al. (2007, p. 216), there is some empirical evidence that VAAs attract proportionally more people who are still in doubt only weeks before the elections. Based on user traffic statistics of *Kieskompas* in 2012, Van de Pol et al. (2014) show that the share of checkers, who are most certain of their vote, decreased over the period this VAA was online. The share of seekers increased, but the proportion of doubters remained relatively stable. We might therefore expect that VAA usage is higher among undecided voters than decided voters, even after controlling for other factors (e.g. age).

> **Hypothesis 2a (preference formation):** Undecided voters are more likely to consult a VAA than decided voters, other things being equal.

2.3.2 VAA use and party choice

The second effect in terms of preference formation is about the actual party choice made by undecided voters. Although it is important to establish whether undecided voters are more likely to use a VAA than decided voters, we do not know whether they take the advice seriously. VAAs can help undecided voters to identify those parties that best represent their views, following the logic of the proximity hypothesis (Downs, 1957; Evans, 2004). Again, VAAs could also serve as a heuristic short cut that leads people to vote for the recommended party (Lau & Redlawsk, 2001). Empirical evidence shows that, other things being equal, VAA users are more likely to vote for a party if the VAA recommends them to do so (Wall et al., 2014). This finding is not limited to undecided voters, but applies to all VAA users. Given our focus on preference formation and hence undecided voters, we formulated the following hypothesis:

> **Hypothesis 2b (preference formation):** Among VAA users, undecided voters are more likely to vote for a specific party if this has been recommended by a VAA, other things being equal.

2.4 Preference confirmation

With respect to preference confirmation, the third dimension of party choice, Ruusuvirta and Rosema (2009) found support for the hypothesis that VAAs strengthen existing vote preferences. Using data from the 2006 Dutch Parliamentary Election Study (DPES), they compared decided voters who received confirmation from the VAA's output with decided voters receiving VAA advice which contradicted their initial preferences. Among decided voters who received confirmation, 91% voted as intended, whereas 73% of the disconfirmation group did. In line with these findings, Wall et al. (2014) demonstrated that the effect of VAAs on vote choice is mediated by users' pre-existing preferences. If users are advised to vote for a party which they already seriously considered, they are more likely to vote for the recommended party than when they get the advice to support a party which they did not seriously consider. This conclusion coheres with cognitive dissonance theories,

which predict that users are likely to reject a recommendation which conflicts with their pre-existing preferences (Festinger, 1957; Garzia, 2010). Preference confirmation relates to decided voters who already have an initial party preference. This effect needs to be distinguished from preference formation, which applies to undecided voters lacking a solid initial party preference (and hence we cannot determine whether the advice is in line with their initial preferences).

> **Hypothesis 3 (preference confirmation):** Among VAA users, decided voters are more likely to vote for their preferred party if they receive confirming VAA advice instead of disconfirming VAA advice.

In dealing with VAA effects on party choice, we distinguished between preference change, formation and confirmation. Chapter 3 proceeds by describing the core elements of the research design in order to test whether any of these VAA effects do occur at Dutch elections.

3 Research design

This Chapter elaborates on the research design used for this study. In Section 3.1, we briefly review the reasons why the Netherlands is a suitable case to examine the effects of VAAs on party choice. Section 3.2 covers the main data sources and modes of data collection. Reliability and validity issues involved in this research are dealt with in Section 3.3 and 3.4 respectively. Section 3.5 details how the main variables are operationalized to test the hypotheses formulated in Chapter 2. Finally, we briefly discuss the manner in which the empirical results are analysed and presented (Section 3.6).

3.1 Case selection

The Netherlands is a particularly suitable case to examine the effects of VAAs on party choice. The roots of VAAs can be traced back here to 1989, which saw the introduction of a paper-and-pencil test. Soon after, the Netherlands were among the first to launch an online VAA (in 1998) (Louwerse & Rosema, 2014).[8] Today, multiple VAAs exist which are consulted frequently and receive extensive media coverage. Since 1967, the number of parties contesting the election has hovered around 20 (Andeweg & Irwin, 2009). This increases the potential relevance of VAAs helping voters to reach a decision in a fragmented party landscape (Wall et al., 2014). Furthermore, the Netherlands is selected for reasons of data availability. The Dutch Parliamentary Election Study (DPES) provides suitable data to test the hypotheses formulated in Chapter 2. In addition, Internet panel data could be collected during the 2015 Dutch provincial elections.

3.2 Data sources

This study incorporates data from two sources: (1) the Dutch Parliamentary Election Study (DPES), and (2) the I&O panel study.

3.2.1 DPES

This study uses data from three successive editions of the **Dutch Parliamentary Election Study** (DPES), which is conducted with every general national election for the Lower House (*Tweede Kamer*). The editions used in this study were conducted with the Dutch parliamentary elections in 2006, 2010 and 2012 respectively (Table 1).

Table 1: Dutch Parliamentary Election Study (DPES) research design

Edition	N	Design	Election Day	Data collection
DPES 2006	2806	Pre-electoral and post-electoral personal interviews	22 November 2006	*Round 1:* 10 October – 21 November 2006 *Round 2:* 23 November 2006 – 4 January 2007
DPES 2010	2621	Pre-electoral and post electoral personal interviews	9 June 2010	*Round 1:* 28 April – 8 June 2010 *Round 2:* 10 June – 22 July 2010
DPES 2012	1677	Post-electoral personal interviews	12 September 2012	13 September – 31 October 2012

Sources: Aarts et al. (2008), Schmeets & Van der Bie (2008), Schmeets (2011), Van der Kolk et al. (2013). N refers to the number of respondents. This table only describes the main features of DPES study design. Consult the source code books for further details.

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[8] Finland was the first country to launch an online VAA, which took place in 1996 (Garzia, 2010, p. 29).

DPES is based on a two-stage stratified random sample of the Dutch electorate (Schmeets & Van der Bie, 2008; Van der Kolk et al., 2013). The core design of DPES consists of a two-round system of face-to-face interviews (CAPI), which take place before and after the elections. After the interviews, respondents could fill in a drop-off questionnaire (PAPI). People who refused to cooperate and those who could initially not be contacted were approached later again for a shortened questionnaire, either by telephone or mail. The design of DPES 2012 underwent some significant changes as compared to DPES 2006 and 2010. DPES 2012 is a post-electoral study only, with no interviews held before the elections. Non-respondents were not re-approached by telephone or mail. The response rate in DPES 2006 through DPES 2012 is well above 60% in the first wave. In the second wave, 10-15% of the first-wave respondents drop out on average (Appendix I).

Using DPES data has certain advantages over other datasets, including (1) high response rates alleviating concerns over nonresponse bias, (2) inclusion of vote intentions as well as actual voting behaviour, (3) limited recall bias regarding most recent vote due to short interval between elections and interview date, and (4) high level of external validity as a result of stratified random sampling.

3.2.2 I&O panel study

In addition to DPES, new data have been collected with the I&O Research Panel, maintained by private research firm I&O Research. This is an Internet panel, whose members have been mainly recruited through household and address sampling in previous research projects.[9] Between December 2014 and March 2015, five waves took place to collect data on voting intentions, political orientations, attitudes towards political parties and the government, VAA use and voting behaviour in the provincial elections on March 18, 2015.[10] Four surveys were carried out before the elections, while the final wave immediately started after Election Day (Appendix V). In total, 13,584 respondents participated in at least one wave. The final survey was filled in by 8,111 respondents. This dataset is hereafter referred to as **I&O panel study**. Although this dataset does not constitute a random sample of the Dutch electorate, it offers a unique opportunity to conduct large-N research into VAA use and voting behaviour in settings other than Lower House (Second Chamber) elections. Although panellists have been carefully recruited, we note that the net sample deviates to some extent from the Dutch population aged 18 years and older. The sample includes proportionally more men than women, while young and middle-aged people (< 45 years) are underrepresented. Mean level of education in the sample is higher than in the Dutch population, whereas party membership is also more frequent.[11] Geographical coverage is somewhat skewed, with panellists from Zuid-Holland and Drenthe being overrepresented, while proportionally less people come from the northern or southern part of the Netherlands (except Drenthe). With respect to the 2015 provincial elections, it is evident that vote shares for most parties are adequately predicted within 1% margin. The PVV is the only party that is significantly underrepresented, while the vote for GroenLinks, D66 and PvdA is overestimated (> 1% deviation). Turnout is overestimated, with 87.4% of the panellists indicating to

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[9] Self-registration via Internet is also possible, but this only applies to 1% of the panellists.

[10] Elections for the district water boards took place simultaneously. For reasons of space and convenience, we refer to provincial elections only.

[11] As of 1 January 2015, 295,326 people are member of a political party. This is 2.2% of the Dutch population aged 18 years and older, or 2.4% of eligible voters at the time of the 2014 municipal elections. In the sample, we find that 10.3% is a member of a political party. Source membership data: DNPP. (2015, 25 February). Gezamenlijk ledental van de Nederlandse politieke partijen daalt in 2014 met 4,4%. Retrieved 12 May, 2015, from http://dnpp.ub.rug.nl/dnpp/nieuws/dnpp/25022015/persbericht_ledentallen.

have voted in the 2015 provincial elections (real turnout: 47.8%). For more detailed information about the composition of this sample, we refer to Appendix VI.

3.3 Reliability

In essence, reliability is defined as "the extent to which an experiment, test, or any measuring procedure yields the same results on repeated trials" (Carmines & Zeller, 1994, p. 3). In any measurement, there is always a certain amount of random error, which happens by chance. The higher the amount of random error, the less reliable is the measuring instrument. The above definition of reliability refers to stability, which is particularly important in longitudinal research. According to Zeller (2000), reliability includes a second component: consistency. The concept of consistency is defined as "the degree to which two measures of the same concept provide the same assessment at the same time" (Zeller, 2000, p. 2343). Consistency is an important criterion in cross-sectional research.

The use of DPES datasets from different years, in conjunction with I&O panel data, allows us to test the robustness of our findings over time. This is consistent with the notion of stability, the first component of reliability, although the various DPES editions do not constitute a series of repeated trials in the strict sense of the classical experiment. Regarding consistency, the second component of reliability, we note that this is mainly tested at the data analysis stage while using scales. This study uses scales that have been validated in previous research (Aarts, Van der Kolk, & Kamp, 1999).

3.4 Validity

A measuring device or instrument is valid to the extent that it measures the concept it intends to measure (Babbie, 2010; Carmines & Zeller, 1994). Strictly taken, validity is not a property of an instrument, method or design, but a property of inferences (Shadish, Cook, & Campbell, 2002). As reliability is inversely related to random error, so is validity inversely related to the presence of non-random error (Carmines & Zeller, 1994). Non-random error is also known as systematic error or bias (Gerring, 2012). The less bias is present, the more valid is an inference.

Different classifications of validity exist (see Carmines & Zeller, 1994; Shadish et al., 2002). We primarily focus on the distinction between internal and external validity.[12] **Internal validity** refers to inferences about whether the observed correlation between X (treatment) and Y (outcome) reflects a true causal relationship between X and Y (Shadish et al., 2002, p. 38ff). It is called internal validity, because it is the internal structure of the empirical relationship that is the object of scrutiny. **External validity**, by contrast, deals with inferences about whether the causal relationship found in this context holds over "variation in persons, settings, treatment variables, and measurement variables" (Shadish et al., 2002, p. 38ff). In other words, external validity concerns the degree to which the results of this particular study can be generalized to another context.

There are several threats to internal validity in this research, and we outline some ways of handling them. The first threat concerns the lack of random assignment of the treatment variable. This study's treatment variable is not randomly assigned (respondents are not randomly assigned to either the

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[12] Besides internal and external validity, Shadish et al. (2002) also describe statistical conclusion validity and construct validity. Statistical conclusion validity concerns the validity of inferences about the correlation between X and Y, such as whether statistical power is high enough. Construct validity is defined as "the validity of inferences about the higher order constructs that represent sampling particulars" (Shadish, et al., p. 38).

treatment [VAA use] or control condition [non-VAA use]), which may result in systematic differences between VAA users and non-VAA users. The presumed causal relationship between VAA use and party choice might thus be prone to this selection bias (Shadish et al., 2002, p. 55). From the literature, it is already known that the typical VAA user is male, young, highly educated and someone who has an above-average interest in politics (Hooghe & Teepe, 2007; Ladner et al., 2012; Schultze, 2014; Van de Pol et al., 2014; Wall et al., 2009). It is therefore important to control for these variables while examining the relationship between VAA use and party choice, although these statistical controls do not fundamentally alleviate the problem of selection bias.

Another threat to internal validity is attrition, which refers to the loss of respondents over the course of an experiment or study (Shadish et al., 2002, pp. 55, 59). If this loss is correlated with the treatment, it might produce artificial results. DPES 2006 and 2010 are both a 2-wave panel design. In the second wave, 10-15% of the first-wave respondents drop out on average (Schmeets & Van der Bie, 2008; Van der Kolk et al., 2013), which is relatively low given the duration of the interviews (40-50 minutes). Because attrition did not occur evenly among all groups, nonresponse bias in both DPES 2006 and 2010 increased with each successive study phase, although this bias stayed within acceptable limits (Schmeets, 2011). To mitigate panel attrition in the I&O panel study, adaptive routing was implemented for questions relating to previous voting behaviour and general political orientation. Also, we emphasized the importance of continued participation in the invitation e-mail and tried to motivate people who are less politically interested. Nevertheless, a certain attrition bias cannot be ruled out, because we mentioned the involvement of the University of Twente in each e-mail.

Both DPES and I&O panel data suffer from turnout overestimation (Linssen & Van den Brakel, 2014; Schmeets, 2010, 2011). Since the dependent variable is party choice, which by definition only includes voters, turnout overestimation is less of a problem for the purposes of this research. We can, however, not verify whether people indeed turned out to vote or gave socially desirable answers. If non-voters mistakenly report to have voted and used a VAA as well (which is impossible to verify), this might bias the estimates of VAA effects. With respect to party choice, DPES matches real election outcomes quite well, although PVV voters are significantly underrepresented, especially in DPES 2010 and 2012. PVV is also underrepresented in the I&O panel study, whereas GroenLinks, D66 and PvdA are overestimated. Other parties are predicted within 1% (see Appendix II and VI for more details).

Another potential threat is recall bias, which may result from both random and non-random errors (Van Elsas, Lubbe, Van der Meer, & Van der Brug, 2014). Recall bias thus affects both validity and reliability. Since the post-electoral part of both DPES and I&O panel study is conducted shortly after Election Day, recall bias in terms of retrieving the most recent vote will be limited. Due to voting by secret ballot, we rely on self-reported voting behaviour, with no means to check its accuracy. Electoral research in general, however, is prone to this potential bias. The bias with respect to recalling voting behaviour at previous elections is certainly higher, since recall consistency is known to decrease with the passage of time (Van Elsas et al., 2014). However, we assume that this is not significantly correlated with the treatment (VAA usage).

Due to its sample design, DPES has generally a high level of external validity with respect to the Dutch electorate, although non-voters are systematically underrepresented. The latter problem also

occurs in the I&O panel study. Since panellists were recruited from different household and address samples, external validity is lower than in the case of DPES. This is also reflected in modest bias in background and survey variables (see Appendix VI).

3.5 Operationalization

This Section briefly discusses the operationalization of study and control variables in this research. Operationalization refers to the process of developing operational definitions of abstract concepts, i.e. explicating how variables are measured (Babbie, 2010). We refer to Appendices III and IV for more detailed information on question wordings and variables coding. The following discussion focuses on the operationalization of variables from DPES. Some variables are not covered by the I&O panel study or are coded differently.

3.5.1 Study variables

Study variables are those variables explicitly referred to in the hypotheses. These are: party choice, vote switching, vote uncertainty, VAA use and VAA advice.

Party choice
Respondents are asked whether they voted at most recent and previous elections. If yes, they are presented with a list of parties that contested the election. Party choice is a nominal variable.

Vote switching
Vote switching is coded as a dichotomous variable (0 = no, 1 = yes). Vote switching is studied in two ways: (1) in-campaign vote switching (between pre-election and post-election interview) and (2) between elections (vote in most recent election vs. vote in previous elections). For the I&O panel study, people are considered in-campaign vote switchers, if they changed their vote intention at least once between a pre-electoral wave and Election Day. This excludes changes in vote intentions for people who did not participate in the final wave.

Only voters who cast a valid party vote at both t_0 and t_1 are included to determine vote switching, excluding people who did not vote or did not know which party they voted for. This operationalization differentiates vote switching from vote uncertainty and late timing-of-vote (Dassonneville, 2014). For vote switching between elections, this results in a small bias against younger voters, since they were not eligible to vote at that time. For the purposes of in-campaign vote switching, previous support for a government party is set at 0 (no) for the non-eligible age group.

Vote uncertainty
In the pre-electoral part of DPES 2006 and 2010, respondents indicate whether they intend to vote in the upcoming national elections. The answer categories are: yes, no and don't know yet. If people intend to vote, they are subsequently asked to report their intended party choice.[13] People, who intend to vote and have a specific party intention in mind, are considered decided voters. Those who intend to vote, but do not know which party to vote for, are regarded as undecided voters, as explained in Section 2.3. Furthermore, we include non-voters and people hesitant about whether to cast their ballot. In the I&O panel study, turnout intention is measured on a 4-point scale, with a

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[13] The routing was in fact more complex, also asking non-voters and DK-voters how they would vote if voting were compulsory. We further disregard these complexities in the analysis.

separate Don't know-No answer category (see Appendix IV). The variable "voted as intended" indicates whether people actually voted for the party as previously stated in the pre-election interview. For I&O panellists we included their last known vote intention prior to the elections. Thus, a small timing effect cannot be ruled out.

VAA use

In DPES, the first question on VAAs in the post-election interview is: *Do you know one or more Voting Advice Applications on the Internet, where people can find out which party they agree with most?* Those who respond affirmative are asked to report whether they filled in a VAA prior to the elections. In DPES, those who do not know any VAA are assumed not to have used any VAA. In I&O panel study, only a direct question on VAA use is included in the post-electoral wave.

VAA advice

In DPES, respondents have to report the party or parties that were recommended to them. The I&O panel study includes a separate question for each VAA, which is a single-coded question except for Kieskompas.[14] We constructed a variable to measure whether the VAA recommendation was in line with the pre-electoral vote intention (0 = no and 1 = yes). For I&O panellists we included their last known vote intention prior to the elections. The 2015 provincial elections were somewhat unusual in the sense that district water board elections took place simultaneously. Kieskompas developed a dedicated VAA for 22 district water boards. This VAA is incorporated into estimates of VAA use, but is excluded from analyses related to VAA party recommendations.[15]

Based on DPES data, however, we can neither reconstruct which VAAs have been consulted nor can we discriminate between respondents who have filled in the same VAA multiple times and those who consulted multiple VAAs (or did both). Using I&O panel data, however, has the advantage of gaining insight into which VAAs have been consulted. Self-reports of vote recommendations in a post-electoral survey might be influenced by the actual vote choice. For example, a person who voted for PvdA, might be inclined to report PvdA as VAA recommendation, although he did get a recommendation for the Socialist Party (SP). This results from the human tendency to reduce inconsistencies (dissonance) in one's own beliefs (Garzia, 2010).

3.5.2 Control variables: political variables

In Chapter 2, it was argued that the relationship between VAA use and party choice is prone to many confounders. We therefore included the following political control variables: political interest, political knowledge, party identification, party membership, left-right self-rating, satisfaction with democracy, general satisfaction with government and distance between first and second party preference (see also Todosijević, Aarts, & Van der Kaap, 2010).

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[14] Kieskompas plots user and party positions in a two-dimensional space, without giving an explicit party recommendation. We therefore allowed panellists to name more than one party in the I&O panel study.

[15] Since we are interested in voting behaviour at the provincial elections, the variable 'Vote confirmation from VAA' excludes the advice given by Kieskompas related to the district water board elections (I&O panel study). This decision was also made on the grounds that some major political parties (PVV, SP, GroenLinks and D66) did not contest the district water board elections and hence they were not incorporated into the calculation of this VAA. Kieskompas also developed a VAA for the provincie of Utrecht. The results from this VAA were included in the variable 'Vote confirmation from VAA'. The variable 'VAA use' (0 = no, 1 = yes) includes all respondents who used any type of VAA, either related to the provincial or district water board elections.

Political interest

Political interest is measured on a 5-point scale (0 = low, 4 = high), which is constructed from four variables. It counts the "positive" answers to the following questions (with the values defined as positive between parentheses), reading about national news (1 [nearly] always), talking about national news (1 joins conversation, 2 listens with interest), reading about foreign news (1 [nearly] always, 2 often) and interest in politics (1 very interested). This scale construction is based on Mokken scale analysis to ensure unidimensionality (Aarts et al., 1999, pp. 690-692). Political interest was measured directly through a single survey question in the I&O panel study.

Political knowledge

Political knowledge is only measured in DPES. It is based on four photo questions. Each picture shows a Dutch politician, whose name, party and function have to be mentioned. If all twelve answers are correct, a maximum score of 12 is assigned. If none of the answers given are correct, a minimum score of 0 is recorded. For DPES 2012, no photo questions were available, so a separate measure for political knowledge has been developed.[16]

Party identification

Party identification is measured on a 5-point scale (0-4) (DPES only). A score of 0 indicates that a respondent is neither an adherent to a particular political party, nor does he feel more attracted to a specific party than to other parties. A score of 4 is assigned to people who think of themselves as very convinced adherent to a party. The original scale ran from 0 to 7; with separate categories for Don't knows (DK). Since few people belong to these Don't know categories (e.g. in DPES 2006 only 20 people), and to avoid scale overstretching, a new 5-point scale is created. The Don't know categories are merged with their respective preceding categories, creating a conservative estimate for these respondents.[17]

Party membership

In DPES 2006-2010 and I&O panel study, people are asked to indicate whether they are a member of a political party. This question is not included in DPES 2012. Party membership is coded as 0 = no, 1 = yes.

Left-right self-rating

An 11-point scale (0 = left, 10 = right) is used to gauge people's left-right orientations.

Satisfaction with democracy

Although strictly taken an ordinal variable with four categories, satisfaction with democracy is included here as an interval variable (0-3). Scores are reversed, such that high scores reflect a high degree of satisfaction.

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[16] Political knowledge in DPES 2012 is measured on a 5-point scale (0 = low, 4 = high). These scores are based on the correct identification of (1) both coalition partners (CDA, VVD) [with points subtracted for incorrect parties mentioned], (2) the Dutch Finance Minister and the 2nd largest party at the 2012 national elections (PvdA) [combined score], and (3) the current UN Secretary-General (Ban Ki-Moon). The subtraction of points and inclusion of the 'difficult' item about the UN Secretary-General ensures sufficient variation on this knowledge variable: 0 (low) = 15.2%, 1 = 16.5%, 2 = 14.8%, 3 = 26.7%, 4 (high) = 26.8% (Cronbach's α = 0.56, based on standardized items = 0.604, N of items = 3).

[17] E.g. "No adherent, DK attracted" is merged with "Neither adherent nor attracted", and so on.

General satisfaction with government

General satisfaction with government is measured on a 5-point scale (0-4) in DPES. The I&O panel study uses the same 4-point scale as with satisfaction with democracy. Scores have been reversed, such that high scores are indicative of high levels of general satisfaction with the Dutch government. General satisfaction with government is another indicator of voter satisfaction. It relates to retrospective voting and the accountability function of elections, by asking people to evaluate how the government has performed during their term of office (Rosema, 2006).

Distance first and second party preference

This measure captures the extent to which people have multiple vote propensities. It is based on PTV (Propensity-to-Vote) questions in DPES and sympathy ratings in the I&O panel study. In DPES, respondents indicated the likelihood that they would ever vote for each political party on a 10-point scale. A single measure was constructed for each respondent to reflect the distance between the highest and second highest rated party. In the case of ties (i.e. two or multiple parties got the same rating), distance is 0, reflecting a high degree of multiple vote propensities. The maximum distance is 9 (i.e. 10-1 = 9). In this case, one party is clearly favoured over others, suggesting the absence of multiple vote propensities. This distance measure is self-weighting, in that the maximum score is reduced proportionally to the score of the highest rated party. For example, if the most favoured party is rated at 5, the maximum distance score is 4 (if all other parties are rated at 1). The distance metric was constructed similarly in the I&O panel study, except that sympathy scores for each party were collected on an 11-point scale (Appendix IV). Correspondingly, the maximum distance is 10.

3.5.3 Control variables: socio-demographic variables

Gender is recoded into 0 = male, and 1 = female. Age of respondent is recorded in years. In DPES, level of education refers to the highest level of education completed by respondent, coded into 5 common categories (see Appendix III). In the I&O panel study, level of education was operationalized as the highest level of education attended, coded into seven categories. Income refers to disposable household income after taxes. It is coded differently across DPES datasets: vigintiles (20 groups of equal size, DPES 2006 and 2010) or deciles (10 groups of equal size, DPES 2012). Since we are not interested in the exact rate at which income changes affect vote switching or party choice, but primarily in the direction of the relationship (positive or negative), we further disregard these differences in the analysis. Income was part of the I&O panel study, but is not included here due to a relatively large number of missing values.[18] Religiosity is included as dichotomous variable (DPES only). Income and religiosity could be considered as indicators of cleavage-based voting (social class and religion respectively).

3.6 Data analysis and presentation of results

All DPES data are analysed in SPSS. The first step is to run univariate analyses to verify distributional assumptions and to check for any irregularities or missing values. These results are not shown, unless these analyses provide some noteworthy outcome(s). Secondly, bivariate analyses are conducted to investigate the relationship between independent and dependent variable(s), through a cross-table or correlations table. Thirdly, these bivariate relationships are tested in multivariate analyses to control for several potential confounders which have been listed before. Dichotomous dependent variables, such as vote switching, are analysed with binary logistic regression. This regression

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[18] This is partly the result of panellists who refused to answer this question.

technique relies on the following assumptions (De Vocht, 2010; Hair, Black, Babin, & Anderson, 2010; Mortelmans, 2010):

Model assumptions

- The dependent variable is dichotomous. The independent variables could be categorical (nominal/ordinal) or quantitative (interval/ratio).
- There is a linear relationship between independent variable(s) and the *log odds (logit)* of the dependent variable.
- The error terms are uncorrelated (independence assumption).

Data assumptions

- Sample size. An overall sample size of 400 or more cases is generally recommended. The sample size per group of the dependent variable must be at least 10 observations for each parameter (Hair et al., 2010, p. 415).
- Absence or low impact of multicollinearity, outliers and other data-related problems.

Each logistic regression table in Chapter 4 provides several measures to check the model assumptions and the relative fit of different models. The -2 log likelihood measure indicates how well the maximum likelihood estimation fits with the data. The lower its value, the better is the model fit. Nagelkerke R^2 is a pseudo R^2 measure, ranging between 0 and 1, with 1 indicating a perfect model fit. It is sometimes interpreted as the amount of variation accounted for by the logistic regression model, analogous to linear regression, although it is strictly taken not a real R^2 value (hence it is called a pseudo R^2 measure) (cf. De Vocht, 2010, p. 223). The Hosmer and Lemeshow test is conducted to examine the predictive accuracy of the model, dividing all cases into 10 groups of equal size. A chi-square statistic is computed to compare observed and predicted values for each class. A non-significant chi-square statistic ($P > 0.05$) is taken as a sign of good model fit, although it is sensitive to sample size (Hair et al., 2010, p. 421). Data assumptions are checked as well, but the results of these analyses are generally not presented, provided that no significant deviations have been detected.

For logistic regression, coefficient B refers to the change in the log odds of the dependent variable, if x increases by one unit.[19] The sign of the B coefficient (+ or -) indicates the direction of the relationship. The exponentiated B coefficient, exp(B), represents the change in the odds with a one unit increase in x.[20] If exp(B) is smaller than 1, a negative relationship exists; and if exp(B) is greater than 1, a positive relationship exists. However, some care must be taken in interpreting log-odds ratios and odds ratios as effect measures, because they suffer from the problem of unobserved

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[19] The multiple logistic regression equation is: $\ln\left(\frac{p}{1-p}\right) = \hat{\beta}_0 + \hat{\beta}_1 x_1 + \cdots + \hat{\beta}_n x_n$. Coefficient $\hat{\beta}_n$ represents the change in $\ln\left(\frac{p}{1-p}\right)$, if x_n increases by one unit.

[20] The odds: $\frac{p}{1-p}$. The change in the odds is calculated by dividing the odds for x_1 by the odds for x_0. The resulting outcome is an odds ratio.

heterogeneity[21], even when omitted variables are unrelated to independent variables (Mood, 2010).[22]

Multivariate analyses are based on listwise deletion of cases. Although this reduces the effective number of cases, we note that enough cases are retained in the analysis. Moreover, substituting missing values by imputation is not unproblematic (Hair et al., 2010). All entries are unweighted values, unless stated otherwise. Weights increase the standard errors of estimates used in inferential statistics (Johnson, 2008). Therefore, no weighting is applied in regression models here.[23] For DPES, a further reason not to use weights is that its sample design ensures a sufficient degree of representativeness with respect to most socio-demographic background characteristics and party choice (Schmeets, 2011; Schmeets & Van der Bie, 2008).[24] Reported P-values, denoted by asterisks (e.g., **), are two-sided, since this provides a more stringent test of significance.

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[21] Unobserved heterogeneity is defined as "the variation in the dependent variable that is caused by variables that are not observed (i.e. omitted variables)" (Mood, 2010, p. 67).

[22] The problem of interpreting and comparing effect estimates from logistic regression is not easily resolved, because estimates need to fulfill different criteria. Mood advises to report different types of estimates if necessary (see Mood, 2010, pp. 79-80).

[23] Specific statistical procedures exist to adjust for inflated standard errors. This falls outside the scope of this MSc thesis.

[24] DPES does overestimate turnout (see Section 3.4). Also, the response rate among non-Western people is considerably lower than Dutch and Western people.

4 Results

This Chapter presents the main results of the empirical analyses. Sections 4.1-4.4 are based on DPES 2006 through 2012, whereas Section 4.5 contains results from the I&O panel study. We start by examining the extent to which VAAs are known among the Dutch public and how much they are used (Section 4.1). From Section 4.2 onwards, we follow the logic of the hypotheses proposed earlier: we first examine the impact of VAA use on vote switching. We then move on by investigating the effects of VAAs in terms of preference formation. The third part is devoted to the results on preference confirmation.

4.1 VAAs: familiarity and use

In DPES the first question about VAAs is whether people know any VAA. In all years investigated, more than 6 out of 10 people responded affirmative (Table 2). Familiarity with VAAs is about 5 percentage points higher in 2010 and 2012 compared to 2006. These figures indicate that VAAs have become an integral part of Dutch election campaigns.

Table 2: Familiarity with VAAs (%)

	2006	2010	2012
No	38.7	33.9	33.6
Yes	61.3	66.1	66.4
N	2356	2151	1677

Percentages indicate whether people know one or more VAAs.

Regarding VAA use, we observe that 38.3% of all respondents indicated that they used one or more VAAs in 2006 (Table 3).[25] VAA use in 2010 and 2012 was more than 40%. If we look at those who knew any VAA, the VAA use rate is between 60% and 63% across all DPES editions. This means that about 60% of those who are familiar with VAAs actually use one or more VAAs.

Table 3: VAA use (%)

		2006	2010	2012
All	No	61.7	58.3	59.9
	Yes	38.3	41.7	40.1
	N	2356	2151	1677
Familiar = yes	No	37.5	36.9	39.7
	Yes	62.5	63.1	60.3
	N	1444	1422	1114

4.2 Preference change

Preference change, or vote switching, can be studied in two ways: we distinguish between (1) vote switching between elections and (2) in-campaign vote switching. According to hypothesis 1a, vote switching between elections occurs more frequently among VAA users than non-users. From Table 4, it can be concluded that VAA users are significantly more likely to change their vote between

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[25] Recall that those who do not know any VAA are assumed not to have used any VAA (see Section 3.5.1).

elections than non-users. In 2006 through to 2012, vote switching differences between VAA users and non-users are 13, 19 and 15 percentage points respectively.

Table 4: Vote switching between elections (%)

| | **2006** | | | **2010** | | | **2012** | | |
	Non-VAA	VAA	Total	Non-VAA	VAA	Total	Non-VAA	VAA	Total
No	67.6	54.5	62.4	64.6	45.2	56.0	72.3	57.8	65.9
Yes	32.4	45.5	37.6	35.4	54.8	44.0	27.7	42.2	34.1
N	1128	719	1963*	940	710	1713*	701	547	1248
	χ^2	32.270		χ^2	61.622		χ^2	28.986	
	Df	1		Df	1		Df	1	
	P	< 0.001		P	< 0.001		P	< 0.001	

* The total N is higher than the sum of non-VAA and VAA users. Total N also includes respondents who answered the party choice questions (and for whom vote switching could be established), but who did not answer the VAA questions due to the data collection mode. The VAA questions were asked in the face-to-face interviews only.

Table 5 shows the rate of in-campaign vote switching by VAA use for DPES 2006 and 2010. Following hypothesis 1b, in-campaign vote switching occurs more frequently among VAA users than non-users. This relationship receives empirical support. VAA users are more likely to switch vote over the course of an election campaign than non-users, although the difference is smaller compared to vote switching between elections. It must also be noted that the overall rate of in-campaign vote switching is 13.8% in 2006, against 37.6% between elections. The rate of in-campaign vote switching is lower than inter-election vote switching because of the shorter time interval (six weeks versus several years). Another tempering effect relates to the timing of the pre-election interviews. These are generally held within six weeks before the election, with some interviews taking place in the final week before Election Day. This might be too late to capture in-campaign vote switching.

Table 5: In-campaign vote switching (%)

| | **2006** | | | **2010** | | |
	Non-VAA	VAA	Total	Non-VAA	VAA	Total
No	87.9	83.1	86.2	85.2	78.0	81.9
Yes	12.1	16.9	13.8	14.8	22.0	18.1
N	854	467	1410*	703	432	1183*
	χ^2	5.992		χ^2	9.585	
	Df	1		Df	1	
	P	0.014		P	0.002	

* The total N is higher than the sum of non-VAA and VAA users. Total N also includes respondents who answered the party choice questions (and for whom vote switching could be established), but who did not answer the VAA questions due to the data collection mode. The VAA questions were asked in the face-to-face interviews only.

The results of the multivariate analysis of vote switching between elections (2003-2006) are presented in Table 6. Model 1 confirms that VAA use is positively associated with vote switching. Model 2 adds socio-demographic background variables to test whether this relationship holds. The positive relationship between VAA use and vote switching decreases in magnitude, but it is still significant at the 0.05 level. It seems that socio-demographic characteristics are not as important as political (attitudinal) variables to predict vote switching. Put differently: if we know already people's

political attitudes and behaviour, socio-demographic background characteristics add relatively little in terms of model accuracy (R^2).[26] Both model 1 and 2 indicate that people with a strong party identification and party members are significantly less likely to change their vote between elections. The negative impact of party identification has already received much empirical support (Andreadis & Wall, 2014; Ladner et al., 2012).

Table 6: Logistic regression of vote switching between elections 2003-2006

	Model 1				Model 2			
	B	SE	Exp(B)		B	SE	Exp(B)	
VAA use	0.357	0.120	1.429	**	0.286	0.131	1.330	*
Political interest	0.103	0.063	1.108		0.134	0.066	1.143	*
Political knowledge	-0.035	0.024	0.966		-0.024	0.025	0.976	
Party identification	-0.407	0.060	0.665	***	-0.389	0.061	0.678	***
Party membership	-1.485	0.398	0.226	***	-1.517	0.401	0.219	***
Leftright	0.051	0.116	1.052		0.062	0.117	1.064	
Leftright^2	-0.002	0.011	0.998		-0.003	0.011	0.997	
Satisfaction democracy	-0.240	0.111	0.786	*	-0.278	0.113	0.757	*
Satisfaction government	-0.051	0.097	0.950		-0.018	0.098	0.982	
Previous vote government	1.706	0.333	5.506	***	1.874	0.339	6.512	***
Satgov x Prevgov	-0.766	0.147	0.465	***	-0.817	0.149	0.442	***
Distance first-second party	-0.446	0.043	0.640	***	-0.454	0.044	0.635	***
Gender					-0.084	0.121	0.919	
Age					-0.007	0.005	0.993	
Education					-0.147	0.062	0.863	*
Income					0.015	0.011	1.015	
Religiosity					-0.402	0.123	0.669	**
Constant	1.178	0.386	3.247	**	1.850	0.476	6.360	***
N	1628				1628			
Hosmer and Lemeshow	0.135				0.086			
-2 Log likelihood	1728.3				1709.1			
Nagelkerke R²	0.312				0.324			

VAA use: 0 = no, Party membership: 0 = no, Previously voted for government party: 0 = no, Gender: 0 = male, Religiosity: 0 = no. Entries for Hosmer and Lemeshow test are P-values. Tests of significance (two-sided) are denoted as: *** P < 0.001, ** P < 0.01, * P < 0.05, † P < 0.10.

Political interest increases the likelihood of vote switching (at the 0.05 level), while people who are satisfied with the way democracy works in the Netherlands have a lower probability of vote switching. Education and religiosity have a negative impact on vote switching between elections. The strongest effect on vote switching is due to multiple vote propensities. The further people's first preference on the PTV scale lies ahead of their second preference, the less likely is vote switching. This means that people who have a clear preference for a single party are the least likely to change

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[26] The reduction in -2 Log likelihood is, however, statistically significant (χ^2 = 19.135, df = 5, P = 0.002), so the socio-demographic variables have some additional explanatory power.

their vote. At the same time, people with multiple vote propensities (seriously considering multiple parties) are more likely to change their vote (Figure 2), which accords with earlier findings (Ladner et al., 2012). The highest rate of vote switching is found for people who express an equally strong preference for two or more parties (distance = 0).
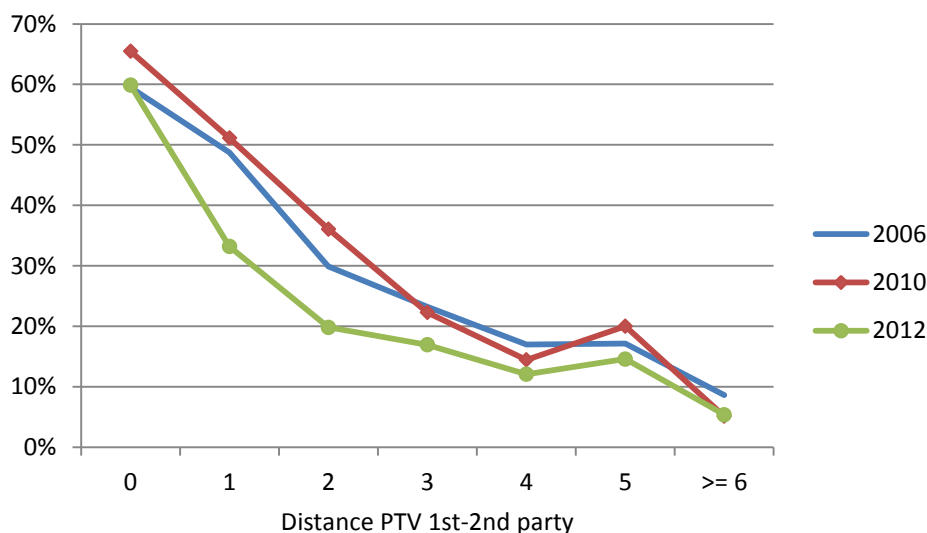
Figure 2: Observed vote switching between elections and PTV distance, 2006-2012

People who previously supported a government party have a higher probability of vote switching. This effect is mediated by satisfaction with government. Government supporters who are satisfied with the government's performance are less likely to change their vote than government supporters who are unsatisfied with what the government has done during its term of office (Figure 3). This is in line with the incumbent approval heuristic (Rosema, 2006, 2007). The predicted probabilities also indicate that satisfied government supporters are even less likely to change their vote than satisfied opposition supporters.
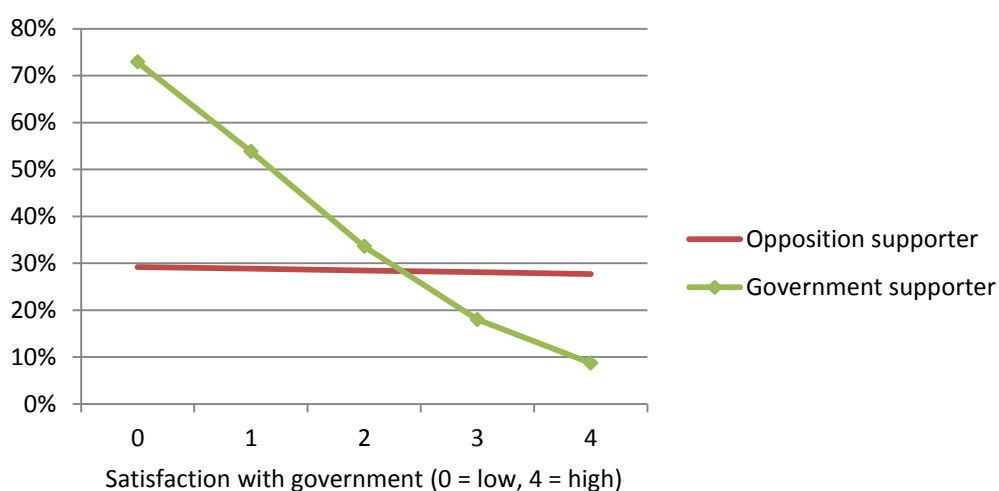
Figure 3: Predicted probability of vote switching between elections (2006)

The moderator variables are satisfaction with government and previous vote for government party. Predicted probabilities are based on the full model (Model 2). All other variables are kept at their median values.

Table 7 shows the logistic regression of in-campaign vote switching in 2006. The model accuracy is lower than for between-election vote switching, as evidenced by Nagelkerke R^2. In both models, VAA use has a positive impact on the rate of vote switching. The odds of in-campaign vote switching are 1.6 times larger for VAA users than non-users. Both political knowledge and party identification decrease the probability of in-campaign vote switching. Distance on the PTV scale reduces the likelihood of vote switching, whereas satisfaction with democracy increases vote switching at the 0.05 level. The same interaction effect between previous vote for government party and satisfaction with government is found as was the case for vote switching between elections.

Table 7: Logistic regression of in-campaign vote switching in 2006

|	Model 1				Model 2			
	B	SE	Exp(B)		B	SE	Exp(B)	
VAA use	0.458	0.198	1.580	*	0.476	0.223	1.609	*
Political interest	0.006	0.098	1.006		0.000	0.101	1.000	
Political knowledge	-0.127	0.038	0.881	***	-0.125	0.040	0.882	**
Party identification	-0.240	0.092	0.787	**	-0.240	0.094	0.787	*
Party membership	-0.881	0.542	0.414		-0.879	0.543	0.415	
Leftright	0.098	0.184	1.103		0.100	0.185	1.105	
Leftright^2	-0.004	0.017	0.996		-0.005	0.017	0.995	
Satisfaction democracy	0.361	0.181	1.434	*	0.360	0.183	1.433	*
Satisfaction government	-0.096	0.147	0.908		-0.087	0.147	0.916	
Previous vote government	1.428	0.500	4.170	**	1.501	0.506	4.488	**
Satgov x Prevgov	-0.665	0.218	0.514	**	-0.693	0.219	0.500	**
Distance first-second party	-0.348	0.067	0.706	***	-0.352	0.067	0.703	***
Gender					-0.235	0.199	0.790	
Age					0.001	0.007	1.001	
Education					-0.067	0.098	0.935	
Income					0.000	0.018	1.000	
Religiosity					-0.162	0.202	0.851	
Constant	-0.888	0.611	0.411		-0.596	0.762	0.551	
N	1119				1119			
Hosmer and Lemeshow	0.839				0.419			
-2 Log likelihood	737.0				734.4			
Nagelkerke R²	0.172				0.176			

VAA use: 0 = no, Party membership: 0 = no, Previously voted for government party: 0 = no, Gender: 0 = male, Religiosity: 0 = no. Entries for Hosmer and Lemeshow test are P-values. Tests of significance (two-sided) are denoted as: *** P < 0.001, ** P < 0.01, * P < 0.05, † P < 0.10.

Table 8 presents the full models of both types of vote switching for each election year. It is demonstrated that VAA use has a significantly positive impact on vote switching, although the coefficient is only significant at the 0.10 level with respect to in-campaign vote switching in 2010. Both hypothesis 1a and 1b are thus generally confirmed. Party identification consistently reduces the probability of vote switching across all models. We have also run logistic regression analyses including an interaction term between VAA use and party identification. The interaction term proves

not to be significant, except for in-campaign vote switching in 2006. In this case, VAA use increases vote switching, but less so among people with a strong party identification.

The likelihood of vote switching decreases with a larger distance between people's first and second party preference on the PTV scale. The interaction effect between previous vote for a government party and satisfaction with government is not found in 2010. With the exception of DPES 2006, we find a quadratic effect of left-right self-placement on between-election vote switching. The rate of vote switching is highest among people who are in the middle of the left-right spectrum, whereas vote switching decreases to either side of the continuum. The same effect, although not significant, is found for in-campaign vote switching. Political knowledge does not significantly affect inter-election vote switching, except for 2010. People with high political knowledge, however, are less likely to change their vote during the election campaign. This seems to accord with the theory that highly sophisticated voters decide relatively early, prior to the election campaign, which party they are going to vote for. They are less sensitive to campaign messages and thus less likely to switch during the campaign (Dassonneville, 2014). We also tested for any curvilinear effects of political knowledge, but we did not find supportive evidence in this regard.[27]

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[27] Both the main effect and the quadratic term failed to meet statistical significance at the 0.10 level.

Table 8: Overview vote switching 2006-2012, final models

	Vote switching between elections					In-campaign vote switching		
	2006		2010		2012		2006		2010
	B		B		B		B		B
VAA use	0.286	*	0.407	**	0.465	**	0.476	*	0.381 †
Political interest	0.134	*	0.102		-0.100		0.000		0.147
Political knowledge	-0.024		-0.043	*	-0.027		-0.125	**	-0.098 **
Party identification	-0.389	***	-0.436	***	-0.322	***	-0.240	*	-0.325 ***
Party membership	-1.517	***	-0.577		-		-0.879		-0.664
Leftright	0.062		0.345	**	0.454	**	0.100		0.226
Leftright^2	-0.003		-0.035	**	-0.048	**	-0.005		-0.026
Satisfaction democracy	-0.278	*	-0.131		-0.054		0.360	*	0.054
Satisfaction government	-0.018		-0.026		0.089		-0.087		0.025
Previous vote government	1.874	***	0.600	†	0.977	*	1.501	**	-0.166
Satgov x Prevgov	-0.817	***	-0.228		-0.552	**	-0.693	**	0.005
Distance first-second party	-0.454	***	-0.552	***	-0.564	***	-0.352	***	-0.638 ***
Gender	-0.084		0.126		0.224		-0.235		0.139
Age	-0.007		-0.016	**	0.002		0.001		0.013 †
Education	-0.147	*	-0.139	*	0.050		-0.067		-0.034
Income	0.015		-0.002		-0.025		0.000		0.012
Religiosity	-0.402	**	-0.403	**	0.206		-0.162		0.100
Constant	1.850	***	1.833	***	-0.627		-0.596		-1.281
N	1628		1485		1026		1119		990
Hosmer and Lemeshow	0.086		0.127		0.377		0.419		0.76
-2 Log likelihood	1709.1		1639.8		1075.3		734.4		778.9
Nagelkerke R^2	0.324		0.310		0.284		0.176		0.199

VAA use: 0 = no, Party membership: 0 = no, Previously voted for government party: 0 = no, Gender: 0 = male, Religiosity: 0 = no. Entries for Hosmer and Lemeshow test are P-values. Tests of significance (two-sided) are denoted as: *** P < 0.001, ** P < 0.01, * P < 0.05, † P < 0.10.

4.3 Preference formation

The role of VAAs in preference formation is tested in two ways. According to hypothesis 2a, undecided voters are more likely to consult a VAA than decided voters (other things being equal). Hypothesis 2b relates VAA use and VAA advice to party choice: undecided voters are more likely to vote for a specific party if this has been recommended by a VAA (ceteris paribus).

Vote uncertainty is derived from pre-electoral vote intentions.[28] Four groups are distinguished, based on intended turnout and party choice: (1) decided voters (intend to vote and certain about party choice), (2) undecided voters (intend to vote, but uncertain about which party to vote for), (3) non-voters and (4) people who hesitate to cast their vote. Table 9 presents bivariate results with respect to hypothesis 2a. Both in 2006 and 2010, over 50% of the undecided voters consulted a VAA. This is the highest VAA use rate among all categories. The significant Chi-square test results ($P < 0.001$) confirm that these differences are not likely to happen by chance. With respect to the three remaining categories, we find a consistent pattern, with in decreasing order of VAA use: decided voters, people who hesitate whether to cast their vote, and non-voters. Overall, these bivariate results support hypothesis 2a.

Table 9: VAA use (%) by pre-electoral vote uncertainty

VAA use	Turnout	**2006**				**2010**			
		Yes	Yes	No	DK	Yes	Yes	No	DK
	Party	D	U	-	-	D	U	-	-
No		64.8	49.8	88.2	70.1	62.1	46.1	85.6	67.2
Yes		35.2	50.2	11.8	29.9	37.9	53.9	14.4	32.8
N		1348	719	93	184	1175	709	90	174
	χ^2	81.715				χ^2	83.523		
	Df	3				Df	3		
	P	< 0.001				P	< 0.001		

D = decided, U = undecided. For DPES 2010, Don't know (DK) also includes No answer.

Based on the logistic regression results, we generally find supportive evidence with respect to hypothesis 2a (Table 10). In 2006, the B-coefficient for undecided voters is in the expected positive direction, although falling short of statistical significance at the 0.05 level. By contrast, intended non-voters were significantly less likely to use a VAA than decided voters, controlling for other factors. The same pattern for non-voters versus decided voters was seen in 2010. In line with the results from 2006, the evidence suggests that undecided voters had a significantly higher probability of consulting a VAA than decided voters in 2010 (confirming hypothesis 2a), whereas people hesitating to cast their vote were less likely to do so. Furthermore, political knowledge and level of education both increase the likelihood of VAA use, while VAA use decreases with age and distance PTV. Age is the most important predictor of VAA use. Religious people are less likely to consult a VAA than non-religious people. In 2010, VAA use was higher among females than males. These results generally confirm the existing evidence that the typical VAA user is young, highly educated and knowledgeable about politics, although no clear relationship with respect to gender has been found (cf. Hooghe &

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[28] Since DPES 2012 is a post-electoral study only, we cannot present results for 2012.

Teepe, 2007; Ladner et al., 2012; Schultze, 2014; Van de Pol et al., 2014; Wall et al., 2009). Left-right self-placement does not significantly affect VAA use in 2006 and 2010. We also tested for any curvilinear effects of people's left-right position, but these were not found empirically.[29]

Table 10: Logistic regression of VAA use, 2006-2010

	2006			2010		
	B	SE		B	SE	
Vote intention: yes; party: undecided	0.240	0.130	†	0.328	0.129	*
Vote intention: no	-1.309	0.433	**	-1.405	0.380	***
Vote intention: DK	-0.417	0.230	†	-0.585	0.230	*
Political interest	0.082	0.058		0.044	0.059	
Political knowledge	0.059	0.022	**	0.071	0.020	***
Party identification	-0.006	0.056		-0.224	0.057	***
Party membership	-0.078	0.244		-0.384	0.282	
Leftright	-0.021	0.027		0.008	0.024	
Satisfaction democracy	0.144	0.099		0.151	0.102	
Satisfaction government	0.012	0.066		-0.003	0.069	
Distance first-second party	-0.081	0.035	*	-0.085	0.041	*
Gender	-0.143	0.107		0.469	0.115	***
Age	-0.060	0.004	***	-0.058	0.004	***
Education	0.187	0.055	***	0.260	0.056	***
Income	0.017	0.010	†	0.013	0.010	
Religiosity	-0.270	0.107	*	-0.277	0.112	*
Constant	1.254	0.347	***	1.089	0.379	**
N	1988			1873		
Hosmer and Lemeshow	0.092			0.213		
-2 Log likelihood	2195.8			2071.2		
Nagelkerke R²	0.30			0.317		

Reference category for dummies vote intention: 0 = decided voter, Party membership: 0 = no, Gender: 0 = male, Religiosity: 0 = no. Entries for Hosmer and Lemeshow test are P-values. Tests of significance (two-sided) are denoted as: *** P < 0.001, ** P < 0.01, * P < 0.05, † P < 0.10.

According to hypothesis 2b, undecided voters are more likely to vote for a specific party if this has been recommended by a VAA. It follows from this hypothesis that we restrict our analyses to VAA users only. In the left panel of Table 11, the results for undecided voters who used a VAA are shown. Recall that undecided voters are those people who intend to vote, but are not sure which party to vote for. It is evident that the VAA recommendation has a considerable impact on the actual party choice, although we do not control for third factors here. The percentage vote for each party is higher among those who were recommended to vote for this party relative to those who were not. This pattern also emerges from the right panel of Table 11, which displays results for all VAA users. Here, too, we can observe that receiving VAA advice to vote for a party increases the likelihood to

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[29] It seems that people in the middle of the left-right spectrum are more likely to use a VAA. The main effect and quadratic term, however, were only marginally significant in 2006 (0.05 < P < 0.10) and failed to meet any conventional level of statistical significance in 2010 (P > 0.50).

vote for this party, consistent with findings from Wall et al. (2014). The relationship between VAA recommendation and party choice is most visible for larger parties (CDA, PvdA, VVD). Smaller parties (e.g. CU, SGP, PvdD) were less able to attract votes among those recommended to do so. Future studies could improve on this analysis by using more advanced multivariate methods. One possible avenue is to restructure the dataset by creating user-party dyads, in which each respondent has a separate record for each party. One could compare "voted" dyads for recommended and not-recommended dyads (Wall et al., 2014).

Table 11: Party choice by vote uncertainty and VAA recommendation, pooled data 2006-2010

Vote for party (% yes)	Undecided VAA users				All VAA users			
	Recommended by VAA				Recommended by VAA			
	No	Yes	Total		No	Yes	Total	
CDA	9.7	43.5	18.0		9.1	47.7	16.9	
PvdA	9.0	41.8	17.3		9.2	46.2	18.3	
VVD	12.0	50.0	18.2		11.6	59.8	20.2	
GL	3.2	35.8	6.9		3.6	39.2	7.7	
SP	9.5	38.6	17.2		7.6	41.4	15.6	
D66	4.5	30.0	7.0	~	3.4	32.5	6.2	
CU	1.4	13.1	2.8	~	1.3	20.4	3.5	
SGP	0.1	3.7	0.3	~	0.4	13.3	0.9	~
PvdD	0.6	16.0	1.7	~	0.2	10.3	0.9	~
PVV	2.5	28.0	9.1		1.9	29.7	8.7	
N (for each party)	715				1713			

Reading note: Among undecided voters who received a VAA recommendation to vote for CDA, 43.5% voted for CDA. Of those who did not receive such VAA advice, 9.7% voted for CDA.

All entries are significant at P < 0.001, with Chi-square test of independence with df = 1. The symbol ~ denotes a violation of the expected cell frequency condition (max. 20% of the cells with expected value < 5, and all expected values greater than 1).

4.4 Preference confirmation

Hypothesis 3 states that decided voters are more likely to vote for their preferred party if they receive confirming VAA advice instead of disconfirming VAA advice. It follows from this hypothesis that we restrict our analyses to VAA users only. Recall that decided voters are those who intend to vote and are certain about their party choice. Table 12 shows whether people voted as intended, split by year and the nature of their VAA advice (confirmed: yes/no). In total, 89.8% of those who received confirmatory VAA advice voted as intended, against 69.3% of those who did not see their initial party preference confirmed. This relationship is observed both in 2006 and 2010, providing support for hypothesis 3. The significant Chi-square test outcomes confirm that these differences are not likely to happen at random.

The multivariate test results provide further evidence that receiving confirmatory VAA advice indeed strengthens people's initial party preferences, controlling for other factors (Table 13). Moreover, people with high political knowledge, a strong party identification and a single party preference are more likely to vote as previously stated ($\alpha = 0.05$). No significant differences are found over time, as shown by the non-significant dummy for year. A model restricted to these four significant predictor variables quite adequately accounts for the variation in the dependent variable.

Table 12: Voted as intended (%) among decided VAA users

| | 2006 | | 2010 | | Total | |
| | Received confirmation | | Received confirmation | | Received confirmation | |
Voted as intended	No	Yes	No	Yes	No	Yes
No	26.4	9.0	35.6	11.5	30.8	10.2
Yes	73.6	91.0	64.4	88.5	69.3	89.8
N	212	255	188	244	400	499
χ^2	24.923		36.139		59.950	
Cramer's V	0.231		0.289		0.258	
Df	1		1		1	
P	< 0.001		< 0.001		< 0.001	

Table 13: Logistic regression of voted as intended (decided VAA users), pooled data 2006-2010

	Full model			Restricted model		
	B	SE		B	SE	
Vote confirmation from VAA	1.395	0.204	***	1.376	0.194	***
Year	0.224	0.223				
Political interest	-0.074	0.105				
Political knowledge	0.094	0.039	*	0.065	0.029	*
Party identification	0.438	0.106	***	0.432	0.098	***
Party membership	0.964	0.763				
Leftright	-0.014	0.047				
Satisfaction democracy	-0.350	0.201	†			
Satisfaction government	0.158	0.116				
Distance first-second party	0.576	0.098	***	0.512	0.087	***
Gender	0.084	0.209				
Age	-0.009	0.008				
Education	0.028	0.109				
Income	-0.008	0.018				
Religiosity	0.035	0.200				
Constant	-0.515	0.729		-0.989	0.258	***
N	848			899		
Hosmer and Lemeshow	0.696			0.482		
-2 Log likelihood	671.3			734.3		
Nagelkerke R²	0.269			0.244		

Vote confirmation from VAA: 0 = no, Year: 2006 = 0, Party membership: 0 = no, Gender: 0 = male, Religiosity: 0 = no. Entries for Hosmer and Lemeshow test are P-values. Tests of significance (two-sided) are denoted as: *** P < 0.001, ** P < 0.01, * P < 0.05, † P < 0.10.

4.5 I&O panel study

This Section addresses the effects of VAAs on party choice in the 2015 Dutch provincial elections. The findings are summarized for each dimension of party choice. In national parliamentary elections, VAA use hovered around 40% (Section 4.1). Based on the I&O panel study, VAA use during the 2015 provincial election campaign is estimated at 28.6%.[30] This means that about 3.8 million people (18+) consulted one or more VAAs in the Netherlands. If we accept a margin of error of 3%, the empirical evidence suggests that at least 1 out of 4 people aged 18 years and older used a VAA. This translates into 3.3 million users. This figure ties in with user statistics reported by both StemWijzer (1.7 million) and Kieskompas (1.5 million).[31]

4.5.1 Preference change

Based on I&O panel data, VAA users are more likely to switch vote between elections than non-users. The difference is 14 percentage points, which is the same regardless of whether one starts from the parliamentary elections in 2012 or the provincial elections in 2011.[32] These bivariate results are in line with hypothesis 1a. In-campaign vote switching is measured at four different intervals. It is examined whether people actually voted (in wave 5) as previously stated in the pre-election wave. Figure 4 shows that VAA users are more likely to switch vote than non-users, although the difference decreases with each pre-election wave. Starting from wave 1, the difference is 11%, which gradually goes down to 5.6% at wave 4 (all significant at the 0.001 level). The overall rate of vote switching also decreases steadily, as Election Day approaches. During the election campaign, about 24% changed their vote intention at least once and voted accordingly on Election Day. Among VAA users, this switching rate is 32%, whereas 21% of the non-users changed their mind at least once.[33] These results confirm hypothesis 1b.

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[30] This is a weighed estimate to correct for deviations from the Dutch population. The weighing was carried out with respect to gender, age, education, region and party membership. The unweighed estimate is 29.1%.

[31] StemWijzer: http://www.stemwijzer.nl/Nieuws2/1-7-miljoen-gebruikers-voor-StemWijzer (Accessed 4 May 2015). User statistics for Kieskompas are based on http://nos.nl/artikel/2025467-stemwijzer-op-het-laatste-moment-populair.html and its Twitter account (https://twitter.com/Kieskompas) (Both accessed on 4 May 2015).

[32] Chi-square test of independence (TK 2012 – PS 2015), χ^2 = 126.5, N = 6203, df = 1, P < 0.001. Chi-square test of independence (PS 2011 – PS 2015), χ^2 = 80.2, N = 4508, df = 1, P < 0.001.

[33] Chi-square test of independence, χ^2 = 79.8, N = 5698, df = 1, P < 0.001.
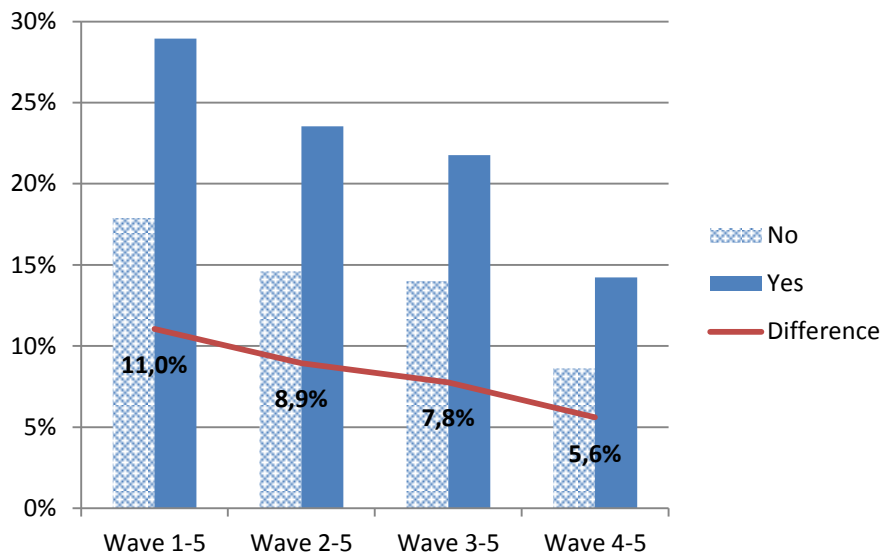
Figure 4: In-campaign vote switching, VAA users vs. non-users (%)

Reading note: Between wave 1 and wave 5, vote switching among VAA users was 28.9%, against 17.9% among non-users. The difference is 11%.

Vote switching is positively affected by VAA use. Does this relationship hold, while controlling for third factors? VAA users are indeed more likely to change vote than non-users ($\alpha = 0.001$), tested against a set of control variables (Table 14). This is true for both inter-election and in-campaign vote switching. For VAA users, the odds of vote switching are 1.6 times larger than the odds for non-users to change their vote. Due to the absence of party identification, we find that party membership has a strong negative impact on vote switching. It seems that party membership is to some extent a substitute for party identification. In DPES 2006 and 2012, an interaction effect occurred between previous support for government and current satisfaction with government. This effect is also observed in this sample. The effect of government satisfaction on vote switching is conditional on previous support for a government party. For government supporters there is clearly a negative relationship between satisfaction and vote switching, while this effect is not observed among opposition supporters. Consistent with DPES 2010-2012, we find a quadratic effect of left-right self-placement on vote switching. If one moves towards the centre, vote switching increases. Furthermore, voters whose sympathies lie with one party only are the least likely to change their vote, as evidenced by the negative coefficient for Distance. One can conclude from DPES and the I&O panel study that distance being measured by PTV or sympathy ratings does not alter the direction of the relationship. Although sharing a considerable degree of overlap, distance PTV and sympathy ratings also have a unique portion of variance.[34] It seems that on average the distance between first and second highest party is smaller for sympathy scores than PTV questions (Appendix VII). The spread is also more limited for the sympathy-based distance measure. Asking sympathy questions therefore attenuates differences between party ratings. People seem to have a rather close sympathy for two or multiple parties, but they tend to draw a sharper distinction when it comes to vote propensities.

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[34] Pearson's $r = 0.469$, $r^2 = 0.22$, N = 2462, P < 0.001. The PTV questions were asked in one wave only. The sympathy questions were included in subsequent waves. Therefore, a small timing effect cannot be ruled out.

Table 14: Logistic regression of vote switching – I&O panel study

	TK2012 – PS2015			PS2011 – PS2015			In-campaign		
	B	SE		B	SE		B	SE	
VAA use	0.483	0.074	***	0.478	0.085	***	0.469	0.081	***
Political interest	-0.006	0.048		0.044	0.055		-0.007	0.053	
Party membership	-1.371	0.141	***	-1.273	0.145	***	-1.401	0.168	***
Leftright	0.338	0.060	***	0.283	0.065	***	0.247	0.065	***
Leftright^2	-0.038	0.006	***	-0.032	0.007	***	-0.026	0.006	***
Satisfact. dem.	-0.085	0.055		-0.158	0.063	*	-0.091	0.059	
Satisfact. gov.	-0.040	0.062		-0.082	0.071		-0.020	0.068	
Prevgov.	2.770	0.137	***	1.505	0.145	***	0.628	0.134	***
Satgov x Prevgov	-1.520	0.094	***	-0.921	0.101	***	-0.356	0.093	***
Dist	-0.308	0.031	***	-0.217	0.033	***	-0.457	0.038	***
Gender	-0.088	0.072		-0.083	0.083		0.048	0.079	
Age	-0.008	0.003	**	-0.005	0.003		0.003	0.003	
Education	-0.048	0.024	*	-0.069	0.027	**	-0.067	0.026	**
Constant	-0.350	0.288		0.003	0.331		-0.844	0.315	**
N	5211			3614			4568		
Hosmer and Lemeshow	0.009			0.461			0.461		
-2 Log likelihood	5412.4			4106.5			4570.7		
Nagelkerke R²	0.274			0.184			0.144		

VAA use: 0 = no, Party membership: 0 = no, Previously voted for government party: 0 = no, Gender: 0 = male, Entries for Hosmer and Lemeshow test are P-values. Tests of significance (two-sided) are denoted as: *** P < 0.001, ** P < 0.01, * P < 0.05, † P < 0.10.

4.5.2 Preference formation

Results from DPES confirmed that undecided voters are more likely to consult a VAA than decided voters (hypothesis 2a). Vote uncertainty is measured slightly differently in the I&O panel study. Instead of three categories (yes, no, don't know), turnout intention is categorised into five categories.[35] The empirical results presented in Table 15 are in support of hypothesis 2a. The highest VAA use rates are found among undecided people who are certainly going to vote (52.0%) and those who are probably going to vote, but who are also not sure which party to vote for (39.9%). The former percentage is quite similar to the use rates reported in DPES for undecided voters (between 50% and 54%). VAA use ranges from 20% to 27% for decided voters and those indicating they are probably not going to vote. VAA use falls below 20% for the remaining categories. The I&O panel study also allows us to look at how many VAAs are consulted by each user. Not only do undecided citizens use a VAA more often than decided citizens, they also consult more VAAs (Table 15). Restricting our analysis to VAA users only, we observe that within each category of turnout intention the number of people using one VAA generally exceeds the number of those who use two or more VAAs. Among undecided voters probably going to vote, this ratio is 1, whereas the number of people

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[35] 1 yes, certainly; 2 yes, probably, 3 probably not; 4 certainly not; 5 DK/NA (Appendix IV).

using one VAA is outstripped by 'heavy' users (≥ 2 VAAs) within the category of undecided voters who are certainly going to vote.

Table 15: VAA use (%) by pre-electoral vote uncertainty

	Turnout	Yes, cert.	Yes, cert.	Yes, prob.	Yes, prob.	Prob. not	DK	No	Total
VAA use	Party	D	U	D	U	-	-	-	-
No		72.7	48.0	74.1	60.1	80.0	80.9	90.4	71.0
Yes		27.3	52.0	25.9	39.9	20.0	19.1	9.6	29.0
—1 VAA		*16.4*	*24.4*	*16.1*	*19.9*	*14.7*	*11.3*	*9.0*	*16.9*
—2 or more		*10.9*	*27.5*	*9.8*	*19.9*	*5.3*	*7.8*	*0.7*	*12.1*
Ratio		1.5	0.9	1.7	1.0	2.8	1.4	13.5	1.4
N		4896	708	707	321	265	115	301	7313

χ^2	281.114	
Df	6	
P	< 0.001	

D = decided, U = undecided.

The influence of vote uncertainty on VAA use holds, while controlling for third variables (results not shown here). Undecided voters are more likely to consult a VAA than decided voters willing to cast their vote, whereas people who are (probably) not going to vote are significantly less likely to do so.

Hypothesis 2b states that undecided voters are more likely to vote for a specific party if this has been recommended by a VAA. The same pattern as observed in DPES is found in the I&O panel study. Those who have been recommended to vote for a specific party are more likely to actually vote for this party relative to those who did not get this advice (results not shown here). Although these bivariate results support hypothesis 2b, it also underscores the need for further multivariate research to control for third factors.

4.5.3   Preference confirmation

According to hypothesis 3, decided voters are more likely to vote for their preferred party if they receive confirming instead of disconfirming VAA advice. From Table 16, it can be seen that nearly 83% of decided VAA users voted according to their initial party preferences. This percentage is higher among those certainly going to vote – as stated in the pre-election interview – (84.0%), compared to those who would probably go out to vote (73.8%). If VAAs have a role in terms of preference confirmation, we would expect the probability to vote as intended to be higher among those who receive confirming VAA advice instead of disconfirming advice. The empirical evidence shows that this is indeed the case. For decided voters who indicated they would certainly vote, 93.5% voted as intended after receiving confirming advice, while 78.5% stuck to their initial party choice despite getting a different VAA recommendation. Among decided voters probably going to vote and receiving confirming VAA advice, 83.3% voted as intended. If this VAA advice contradicted their initial preferences, 68.3% voted as intended. In statistical terms, this relationship is somewhat weaker than for those certainly going to vote, but still significant at the 0.05 level.

Table 16: Voted as intended (%) by vote uncertainty and nature of VAA advice

| | Vote: yes, certainly party: decided | | | Vote: yes, probably party: decided | | | Total | | |
| | Received confirmation | | | Received confirmation | | | Received confirmation | | |
	No	Yes	Total	No	Yes	Total	No	Yes	Total
No	21.5	6.5	16.0	31.7	16.7	26.2	22.6	7.6	17.1
Yes	78.5	93.5	84.0	68.3	83.3	73.8	77.4	92.4	82.9
N	834	480	1314	104	60	164	938	540	1478
χ^2	51.081			χ^2	4.463		χ^2	54.413	
Df	1			Df	1		Df	1	
P	< 0.001			P	0.035		P	< 0.001	

Please note: only decided VAA users are included.

Table 17 demonstrates that people who receive confirming VAA advice are significantly more likely to vote for their preferred party, in accordance with hypothesis 3. For people who received confirming VAA advice, the odds of voting as intended are 3.57 times larger than the odds for those receiving disconfirming advice. This positive effect was also observed in the pooled dataset from DPES 2006-2010. The dependent variable is also strongly affected by distance on the sympathy scale. The larger the difference between the first and second party, the more likely one is to vote as intended. People who have a strong preference for a single party have thus the highest probability to stick to their initial preferences. The probability to vote as intended is higher among party members and voters who are politically interested (at the 0.05 level). These variables failed to meet statistical significance in DPES, but this is partly explained by the fact that political knowledge and party identification were included as predictor variables in the DPES logistic regression model. This example shows that the effect of independent variables on the outcome variable in multiple regression models is influenced by including or omitting other variables.

Table 17: Logistic regression of voted as intended among decided VAA users

	B	SE	Exp(B)	
			Final model	
Vote confirmation from VAA	1.272	0.204	3.570	***
Political interest	0.264	0.113	1.302	*
Party membership	0.974	0.407	2.649	*
Leftright	0.014	0.037	1.014	
Satisfaction democracy	-0.203	0.134	0.817	
Satisfaction government	0.100	0.116	1.105	
Distance first-second party	0.369	0.087	1.447	***
Gender	0.097	0.168	1.102	
Age	0.003	0.007	1.003	
Education	0.088	0.061	1.092	
Constant	-0.108	0.638	0.898	
N	1250			
Hosmer and Lemeshow	0.943			
-2 Log likelihood	1017.6			
Nagelkerke R²	0.128			

Vote confirmation from VAA: 0 = no, Party membership: 0 = no, Gender: 0 = male. Entries for Hosmer and Lemeshow test are P-values. Tests of significance (two-sided) are denoted as: *** $P < 0.001$, ** $P < 0.01$, * $P < 0.05$, † $P < 0.10$.

5 Discussion

The main research question was how the use of Voting Advice Applications (VAAs) influenced people's party choice in Dutch national and provincial elections. In this Section, we summarise and discuss the findings from DPES and the I&O panel study in the context of the available literature on VAA effects. In addition, we address the main limitations and offer some directions for future research. Finally, the scope and relevance of this research are discussed.

5.1 Summary and conclusions

The relationship between VAA use and party choice has been studied in three ways. This study focused on three effects of VAAs on party choice: preference change, preference formation and preference confirmation (Ruusuvirta & Rosema, 2009). This conceptual model recognises that people differ in terms of vote certainty, and use and experience VAAs in different ways (Hanel & Schultze, 2014; Van de Pol et al., 2014).

The first effect of VAAs on party choice is preference change or vote switching. Both the results from DPES and the I&O panel study confirm that VAA users are more likely to change their vote than non-users (hypothesis 1a-1b). Previous studies predominantly focused on between-election vote switching (e.g. Andreadis & Wall, 2014; Ladner et al., 2012), while in-campaign vote switching has been studied less extensively in relation to VAA use (Walgrave et al., 2008). This study shows that the use of VAAs affects both types of vote switching, although the impact is larger for vote switching between elections. In addition to VAA use, we found that party identification consistently decreases the likelihood of vote switching, which has also received much support in previous research (Andreadis & Wall, 2014; Ladner et al., 2012). People with a single party preference (i.e. a large distance on the PTV or sympathy scale) are less likely to switch vote than those with multiple vote propensities. These findings are in line with earlier research (Ladner et al., 2012). Another finding is that vote switching is generally highest among people in the middle of the left-right spectrum, whereas switching is less frequent towards the end of the poles. This provides an explanation for the non-significant linear effect of left-right self-placement as found by Andreadis and Wall (2014). If one seeks to examine vote switching in the Netherlands, it is thus recommended to estimate a model with and without a quadratic term.

The second effect of VAAs on party choice is through preference formation. This research shows that VAAs indeed help undecided citizens to reach a vote choice. Firstly, we see that undecided citizens are the most frequent VAA users relative to decided citizens and non-voters (hypothesis 2a). This suggests that people consult a VAA, *because* they are not sure which party to vote for. A VAA offers insight into party positions and how close they are to one's own viewpoints. This results in a personalised vote recommendation, which might be especially attractive to undecided voters. By only focusing on frequency of VAA use to determine preference formation, we would ignore the possibility that VAA users might not take the advice seriously. As this research shows, however, undecided voters are more likely to vote for a specific party if this has been recommended by a VAA (hypothesis 2b). This relationship could be further tested with more advanced multivariate models to analyse voter-party dyads.

Preference confirmation constitutes the third main effect of VAAs on party choice. VAAs may strengthen people's existing party preferences. Both DPES and the I&O panel study demonstrate the

existence of this effect. Among VAA users, decided voters are more likely to vote for their preferred party after receiving confirming (instead of disconfirming) VAA advice, in line with hypothesis 3. This effect evidences a distinct user type, which has been termed checkers by Van de Pol et al. (2014). Checkers are interested in politics, are certain about their vote choice and they score relatively high on indicators of internal and external political efficacy. Apart from the nature of VAA advice, the rate of 'voting as intended' increases with political knowledge, a stronger party identification and greater distance between first and second highest rated party. In the absence of party identification and political knowledge, political interest and party membership partially act as a substitute to predict whether people will vote as intended.

5.2 Limitations and future research

Although this study relied on multiple datasets spanning different election years and contexts, it has a number of limitations. Firstly, this study's treatment (VAA use) has not been randomly assigned, which introduces self-selection bias (Gerring, 2012). This poses a threat to causal inference, since 'treatment' and 'control' group might systematically differ in other ways than the presence of the treatment. Several authors have already stressed the need for more experimental research (Ladner et al., 2012; Pianzola, 2014a), with random assignment and manipulation of the treatment. This aim, however, needs to be balanced with other research goals and criteria, such as maintaining an acceptable degree of external validity to allow for generalization beyond the sample or research setting at hand. Random assignment and manipulation also involve an ethical dimension, since it might not be deemed proper to deny people free access to VAAs by virtue of participation in a research experiment. It might be quite problematic to control whether members assigned to the treatment group really use a VAA or members of the control group stay away from VAAs (problem of noncompliance) (Gerring, 2012). Nevertheless, an experiment involving random assignment has the potential to rigorously test the causal relationships found here and in the literature to date.

A second limitation of this research relates to the sampling procedure in the I&O panel study, limiting the degree of external validity. Although panellists have been recruited through various household and address samples in other research projects, it does not constitute a random sample of the Dutch population. This sample is to some extent not representative of the Dutch population, most importantly with respect to gender, age and education level. The inferences drawn from this sample might not be valid for the Dutch population (of VAA users). It bears stressing, however, that the I&O panel study has been used mainly with the purpose of validating the findings from DPES. Future research could improve on this study by using weighing procedures or more advanced modelling to correct this self-selection bias, such as entropy balancing (Gemenis & Rosema, 2014) or econometric selection models (Pianzola, 2014a).

A third limitation of this study relates to in-campaign vote switching. The pseudo R^2 measure for in-campaign vote switching was lower than for inter-election vote switching, indicating a poorer model fit. Models for in-campaign vote switching did not include campaign-specific factors, such as media coverage of issues (Kleinnijenhuis & De Ridder, 1998), party leaders' evaluations (Takens, Kleinnijenhuis, Van Hoof, & Van Atteveldt, 2015) and framing of campaign messages (Druckman, 2004).

A fourth limitation concerns the binary nature of the dependent variable, specifically vote switching. Although it is important to establish whether people switch vote or not, it does not reveal in which

direction voters move. Research indicates that Dutch voters move within one of two blocks: a traditionally left-wing block of parties and a right-wing block, with D66 fulfilling a pivotal role (Van der Meer, Lubbe, van Elsas, Elff, & van der Brug, 2012). Other research focused on the ideological distance of party switching, showing that politically sophisticated voters tend to bridge a smaller ideological distance between elections. This suggests that political knowledge has a confining impact on vote choice (Dassonneville & Dejaeghere, 2014). The analysis of vote switching could be extended to (1) within-block and between-block switching behaviour, and (2) distance of party switching. This might enhance our understanding of how VAAs cause people to move in different directions of the ideological space.

5.3 Relevance

In an age of declining party identification and increased volatility, VAAs fulfil an important function in guiding people's vote choice. This function manifests itself in all three areas of vote decision-making: preference change, preference formation and preference confirmation. Not only do VAAs cause people to switch vote more often than non-users (preference change), but VAAs also help citizens to reach a vote choice (preference formation) or strengthen them in their initial party preferences (preference confirmation). This real-world impact warrants a thorough examination of the set-up, methodology and functioning of VAAs, with research already being conducted in this field. This also accords with the attempt to formulate a set of minimal requirements to be respected by all VAA designers, the so-called Lausanne Declaration on VAAs.[36] Results from this research attest to the relevance of VAAs as a vote cue in a volatile electoral context. Besides traditional vote predictors, such as party identification, class and religion, models of party choice would gain from incorporating VAA use as independent variable.

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[36] The Lausanne Declaration can be found in Garzia & Marschall (2014), pp. 227-228.

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Appendices

Appendix I: DPES response rates

Edition	Net sample	Response				
		After 1st wave		*After 2nd wave*		
		N	% of net sample	N	% of net sample	% of first wave
DPES 2006	3920	2806	71.6	2521	64.3	89.8
DPES 2010	3943	2621	66.5	2247	57.0	85.7
DPES 2012	2710	1677	61.9	-	-	-

Sources: Schmeets & Van der Bie (2008, p. 10), Van der Kolk et al. (2013), Linssen & Van den Brakel (2014).

Response figures include CATI (Computer Assisted Telephone Interview) and PAPI (Paper and Pencil Interview). People who refused to cooperate and those who could initially not be contacted were approached later again for a shortened questionnaire, either by telephone or mail. This was done in DPES 2006 and 2010, but not in DPES 2012.

The net sample refers to the effective sample, which excludes errors in the sampling frame (died, moved abroad, institution/elderly home, unknown/other reasons).

Appendix II: DPES and official election results

Party	DPES 2006	TK 2006	Dif	DPES 2010	TK 2010	Dif	DPES 2012	TK 2012	Dif
CDA	27.2	26.5	0.7	13	13.6	-0.6	8.7	8.5	0.2
PvdA	21.2	21.2	0.0	19.9	19.6	0.3	25.1	24.8	0.3
VVD	14.3	14.7	-0.4	21.5	20.5	1.0	28.1	26.6	1.5
SP	17.7	16.6	1.1	11.4	9.8	1.6	10.3	9.7	0.6
GroenLinks	4.7	4.6	0.1	7.1	6.7	0.4	2.7	2.3	0.4
D66	1.7	2.0	-0.3	8.6	6.9	1.7	9.2	8.0	1.2
ChristenUnie	4.2	4.0	0.2	3.4	3.2	0.2	2.7	3.1	-0.4
SGP	1.2	1.6	-0.4	1.4	1.7	-0.3	2.0	2.1	-0.1
Partij voor de Dieren	1.5	1.8	-0.3	1.1	1.3	-0.2	2.0	1.9	0.1
PVV	5.2	5.9	-0.7	11.9	15.4	-3.5	6.6	10.1	-3.5
50Plus							1.9	1.9	0.0
Other party	0.9	1.2	-0.3	0.7	1.1	-0.4	0.9	0.9	0.0

Sources: Kiesraad (2015) and own calculations based on DPES data. Blank and invalid votes are excluded.

Appendix III: DPES variables coding

Variable	Question text	Coding (this research)	Remarks
Study variables			
Vote intention	On [date], elections for the Second Chamber will be held. Do you intend to vote, or do you not know yet?	0 = no, 1 = yes, 2 = DK yet	Not in DPES 2012.
Vote intention - party	Which party do you intend to vote for on [date]?	1-*n* (list of parties)	Not in DPES 2012. Routing, if vote intention = 1.
Most recent election - voted	Did you vote in the parliamentary elections on [date]?	0 = no, 1 = yes	
Most recent election - party	Which party did you vote for?	1-*n* (list of parties)	Routing, if most recent election – voted = 1.
Previous election - voted	The previous elections for the Second Chamber were held in [year]. Did you vote in these elections; or not; or were you not entitled to vote?	0 = no, 1 = yes, 2 = not entitled to vote	
Previous election - party	For which party did you vote then?	1-*n* (list of parties)	Routing, if previous election – voted = 1.
Previous election - gov party	Did you previously vote for a government party?	0 = no, 1 = yes, 98 = not entitled to vote	Constructed from Previous election - party
VAA - know	Do you know one or more tests of political preference on the Internet, where people can find out which party they agree with most?	0 = no, 1 = yes	
VAA - fill	Did you fill in seriously one or more tests of political preference prior to the elections?	0 = no, 1 = yes	Routing, if VAA know = 1.
VAA - advice	What advice did the test of political preference give you?	1-*n* (list of parties)	Routing, if VAA fill = 1. Multiple answers possible.
Political control variables			
Party identification - strength	Scale construction. Refer to DPES documentation for exact question wordings of individual items.	0-4 (0 = low, 4 = high)	Don't know categories merged with respective preceding categories.
Party membership	Are you member of a political party?	0 = no, 1 = yes	Not in DPES 2012.
Political interest	Scale construction. Refer to DPES documentation for exact question	0-4 (0 = low, 4 = high)	

Variable	Question text	Coding (this research)	Remarks
	wordings of individual items.		
Political knowledge	Scale construction. Refer to DPES documentation for exact question wordings of individual items.	0-12 (0 = low, 12 = high)	For DPES 2012: 0-4 (0 = low, 4 = high)
Left right self-rating	When you think of your own political beliefs, where would you place yourself on a scale from 0 to 10?	0-10 (0 = left, 10 = right)	
General satisfaction with government	How satisfied or dissatisfied are you with what the government has done during the past [n] years?	0-4 (0 = very dissatisfied, 4 = very satisfied)	
Satisfaction with democracy NL	On the whole, are you very satisfied, fairly satisfied, not very satisfied, or not at all satisfied with the way democracy works in the Netherlands?	0-3 (0 = not at all satisfied, 3 = very satisfied)	
Distance	Distance between highest and second-highest rated party PTV	0-9 (0 = minimum, 9 = maximum)	Constructed from Propensity-to-Vote (PTV) questions for each party; 1-10 (1 = Never, 10 = Certainly some day).

Socio-demographic control variables

Variable	Question text	Coding (this research)	Remarks
Age	Age of respondent	Age in years	Recoded from year of birth (if applicable).
Education	Highest education completed by respondent	0 = elementary, 1 = (lower) vocational, 2 = secondary, 3 = middle level vocational or higher level secondary, 4 = higher level vocational or university	
Gender	Gender of respondent	0 = male, 1 = female	
Income	Disposable household income (after taxes)	2006, 2010: vigintiles, i.e. 20 groups of equal frequency; 2012: deciles, i.e. 10% groups	
Religiosity	Do you consider yourself to be religious?	0 = no, 1 = yes	

Appendix IV: I&O panel study variables coding

Variable	Question text	Coding (this research)	Remarks
Study variables			
Vote intention	On March 18, 2015, elections for the Provincial Council will be held. Do you intend to vote?	1 = yes, certainly, 2 = yes, probably, 3 = probably not, 4 = certainly not, 5 = DK / refusal	
Vote intention - party	Which party do you intend to vote for on March 18, 2015?	1-*n* (list of parties)	Routing, if vote intention <> 4 (except wave 1).
Most recent election – voted	Did you vote in the elections for the Provincial Council on March 18, 2015?	1 = yes, 2 = no, 3 = not entitled to vote, 4 = DK / refusal	
Most recent election - party	Which party did you vote for in the Provincial Council elections?	1-*n* (list of parties)	Routing, if most recent election voted = 1.
Previous election – voted and party	Did you vote in the parliamentary elections in September 2012 [2011 provincial elections], and if so, which party?	1-*n* (list of parties), with did not vote, blank / invalid, not entitled to vote, DK	
Previous election - gov party	Did you previously vote for a government party?	0 = no, 1 = yes, 98 = not entitled to vote	Constructed from Previous election voted and party
VAA - fill	Did you fill in seriously one or more VAAs?	0 = no, 1 = yes	The following instruction was provided beforehand: "In the run-up to the Provincial Council and district Water Board elections, several VAAs, such as StemWijzer and Kieskompas, were launched."
VAA - type	Which of the following VAAs did you fill in?	1-*n* (list of VAAs)	Routing, if VAA fill = 1.
VAA - advice	What advice did this VAA give you?	1-*n* (list of parties)	Routing, if VAA type = yes. Asked separately for each VAA. Single coded, but for Kieskompas: multiple choice.
Political control variables			
Party membership	Are you member of a political party?	0 = no, 1 = yes	
Party membership – party	Which party?	1-*n* (list of parties)	Routing, if Party membership = 1. Multiple choice.
Political interest	To what extent are you interested in political issues?	0-3 (0 = not at all, 3 = very interested)	

Variable	Question text	Coding (this research)	Remarks
Left right self-rating	When you think of your own political beliefs, where would you place yourself on a scale from 0 to 10?	0-10 (0 = left, 10 = right)	
General satisfaction with government	How satisfied or dissatisfied are you with what the current government (Rutte-II cabinet) has done over the past years?	0-3 (0 = not at all satisfied, 3 = very satisfied)	
Satisfaction with democracy NL	On the whole, are you satisfied or dissatisfied with the way democracy works in the Netherlands?	0-3 (0 = not at all satisfied, 3 = very satisfied)	
Distance	Distance between highest and second-highest rated party on sympathy scale	0-10 (0 = minimum, 10 = maximum)	Constructed from sympathy scores for each party; 0-10 (0 = Very unsympathetic, 10 = Very sympathetic).

Socio-demographic control variables

Age	Age of respondent	Age in years	Recoded from year of birth (if applicable).
Education	Highest education attended by respondent	7 categories, ranging from 0 = none / elementary, to 6 = master's degree university / postgraduate	
Gender	Gender of respondent	0 = male, 1 = female	

Appendix V: I&O panel study response rates

Number of respondents per wave – I&O panel study

Wave	Timing	Fieldwork	Gross sample	Net sample	Response rate (%)
1	Pre-electoral	19 December 2014 – 4 January 2015	22000*	9045	41.1
2	Pre-electoral	29 January 2015 – 8 February 2015	11000*	3960	36.0
3	Pre-electoral	26 February 2015 – 9 March 2015	20972	7619	36.3
4	Pre-electoral	13 March 2015 – 16 March 2015	22134	6681	30.2
5	Post-electoral	19 March 2015 – 31 March 2015	22028	8111	36.8

* These are estimates, because the panel was restructured at that time. In the second wave, a subsample was invited.

Number of times participated – I&O panel study

#	N	%	Cum %
1	4080	30.0	30.0
2	2730	20.1	50.1
3	2589	19.1	69.2
4	2816	20.7	89.9
5	1369	10.1	100.0
	13584	100	

Reading note: 4080 panellists participated in one wave, 2730 participated in two waves and so on.

Appendix VI: Sample characteristics I&O panel study

	I&O PS15	NL	Dif (abs)
	%	%	%
Gender			
Men	58.6	49.1	9.5
Women	41.4	50.9	-9.5
Age			
18-24	2.4	10.9	-8.6
25-34	5.2	15.3	-10.1
35-44	10.7	16.8	-6.1
45-54	19.8	19.0	0.8
55-64	28.6	16.3	12.4
65-74	26.2	12.5	13.7
75+	7.1	9.3	-2.2
Education			
Low (none, elementary)	0.8	10.7	-9.9
Low (lower vocational: vmbo-b, vmbo-k, mbo-1)	7.3	16.3	-9.0
Low (lower vocational: vmbo-gl, vmbo-tl)	10.7	5.8	4.9
Middle (vocational: mbo-2 though mbo-4)	20.2	33.1	-12.9
Middle (higher secondary, university foundation courses)	10.7	9.7	1.0
High (applied university, bachelor's degree)	32.8	15.9	16.9
High (master's degree, postgraduate)	17.4	8.6	8.8
Region			
Groningen	2.4	3.5	-1.1
Friesland	1.1	3.8	-2.7
Drenthe	4.7	2.9	1.7
Overijssel	7.2	6.8	0.4
Flevoland	1.6	2.4	-0.8
Gelderland	9.6	12.0	-2.4
Utrecht	7.6	7.4	0.1
Noord-Holland	18.1	16.3	1.8
Zuid-Holland	31.4	21.3	10.2
Zeeland	2.2	2.3	-0.1
Noord-Brabant	9.9	14.7	-4.9
Limburg	4.4	6.7	-2.3
PS 2015 elections			
VVD	15.6	15.9	-0.3
CDA	14.4	14.7	-0.3
D66	13.7	12.5	1.2
PVV	6.5	11.7	-5.2
SP	11.7	11.6	0.0

	I&O PS15	NL	Dif (abs)
	%	%	%
PvdA	12.3	10.1	2.3
GL	8.3	5.4	2.9
CU	5.0	4.0	1.0
PvdD	3.5	3.5	0.1
50Plus	3.7	3.4	0.3
SGP	2.6	2.8	-0.2
CU-SGP	0.0	0.7	-0.7
Other party	2.7	3.7	-1.0

Source population data: CBS / Statistics Netherlands.

Appendix VII: Distance sympathy and PTV
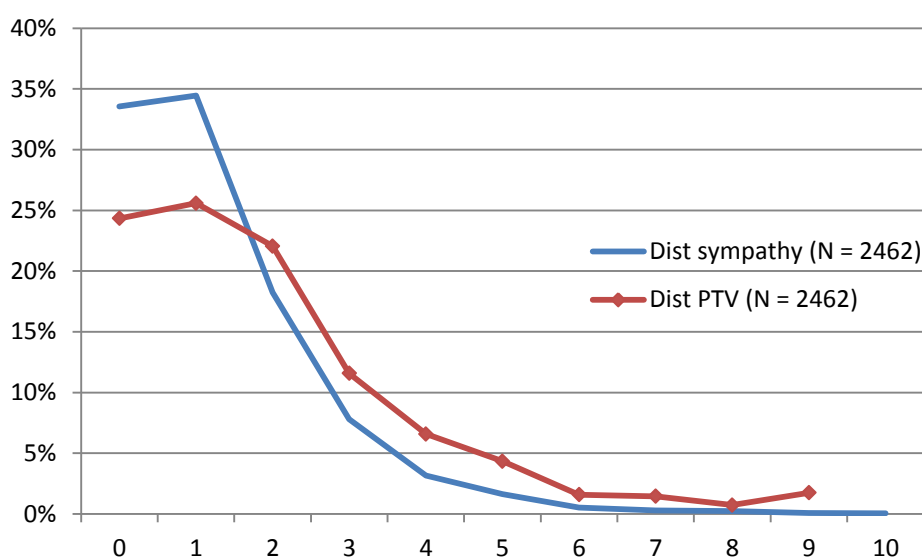
Direct comparison

	Distance sympathy	Distance PTV
Mean	1.23	1.94
Median	1.00	2.00
SD	1.33	1.93
Minimum	0	0
Maximum	10	9
N	2462	2462

Please note: 2462 panellists have a valid score on both distance sympathy and PTV. The PTV questions were asked in one wave only. The sympathy questions were included in subsequent waves. Therefore, a small timing effect cannot be ruled out. Distance sympathy is calculated from sympathy ratings (0-10), whereas distance PTV is based on PTV questions (1-10).

All scores

	Distance sympathy	Distance PTV
Mean	1.15	1.89
Median	1.00	1.00
SD	1.26	1.94
Minimum	0	0
Maximum	10	9
N	9279	3905