# Voting Advice Applications: How Useful? For Whom?

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## Abstract

The use of Voting Advice Applications (VAAs) has increased steadily in recent years. VAAs have been developed for elections taking place in individual countries as well as for region-wide European Union elections. In this paper, we study the determinants of the perceived usefulness of VAAs, using data from the EU Profiler—a voting advice application developed by the European Union Democracy Observatory (EUDO), first applied to the 2009 European Parliamentary Elections. We do so using a multilevel latent variable approach that allows learning about underlying evaluations based on ratings of multiple components of the EU Profiler, and also allows taking into account country-level heterogeneity in evaluations of the system. The results of this study improve our understanding of the benefits of VAAs for different segments of the population, and should be of interest to scholars and policy-makers interested in improving the experience of individuals who use VAAs to inform their voting decisions.

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## 1- Introduction

In recent years, the use of the Internet has spread to all aspects of individual lives, and also to politics (Farrell 2012). Through existing Web applications, individuals are able to engage in a variety of online political activities, including: acquiring and sharing political information; participating in online discussions of political issues; mobilizing others to vote and participate in offline activities; and donating to political campaigns and organizations. Some countries already allow their citizens to vote online (Alvarez et al. 2009). Understanding political behavior in the Internet age requires addressing a variety of new questions: Who uses the Internet for political purposes? How effective are online tools for making more informed citizens and helping voters make "correct" choices? How do online experiences affect political attitudes and offline political behavior? In this paper, we do not attempt to answer all these questions, but focus on studying user attitudes toward a new type of Web application that is being increasingly used in several countries and regions and may have considerable importance for real world politics: Voting Advice Applications (VAAs).

VAAs provide information to voters about the issue positions of political parties and candidates running for office (Cedroni and Garzia 2010; Vassil 2011). VAAs match voters to the party or candidate representing their optimal choice, based on information provided by the individual and parties, and an algorithm used to compute issue distances; and subsequently offer a "voting advice" consisting of a list of candidates ranked in terms their distance to the user. More complex applications may provide not only a summary measure of the issue distance between the voter and each party or candidate, but also information about the relative standing of voters and parties for subsets of issues, or for specific issues the voter cares particularly about. In

addition to offering advice, VAAs may also play a purely informational role by delivering raw or synthesized information about issue positions of parties and candidates.

As VAAs continue to be developed and applied, it becomes increasingly important to understand their impact on political attitudes and behavior of individual citizens, political parties and candidates. Scholars have already began studying a variety of questions related to the use of VAAs, such as what factors determine the use of these applications, and what is the impact of VAAs on turnout and voter choice. In line with what has been found for other forms of online engagement (Norris 2003), VAA users tend to be younger, more educated, and have higher income levels, relative to the rest of the population, and are also more likely to engage in offline political activities (Vassil 2011). Among those individuals who have used VAAs, voting advices are more likely to affect the choices of younger individuals who have not yet developed strong partisan attachments, as well as individuals with lower levels of educational attainment (Vassil 2011).

In this paper we are interested in studying the determinants of the usefulness of voting advice applications for individual users. In order to do so, we need to first of all define what it means for a VAA to be "useful." One possible way to define usefulness could be based on whether the voting advice convinced users to change their intended vote in the direction suggested by the system. A limitation of this criterion is that it implies that only those users with a-priori "incorrect" choices—where incorrect is defined as different from what later was suggested by the system—could be classified as perceiving a utility from the VAA. However, VAAs may be useful in ways other than correcting a sub-optimal choice. In the past, it has been shown that greater uncertainty regarding the position of a candidate is associated with lower utility associated with voting for that particular alternative (Alvarez 1997). Congruence between

a-priori voting intentions and voting advices generated by the VAA may contribute to reassuring voters about their choices and contribute to reducing voter uncertainty about the benefit of voting for their preferred party; thus leading to greater users' satisfaction with their own decisions. In this paper, instead of looking at the discrepancy between a-priori choices and voting advices, we focus on users' own ratings of different components of the VAA.[1] We define a VAA as more useful if users assign higher ratings to the different components of the system; and use a latent variable approach to determine what factors affect the perceived overall usefulness of the VAA.

We study this question using novel data from the EU Profiler project; a unique VAA developed by the European Union Democracy Observatory (EUDO) and first applied to the 2009 European Parliamentary Elections. The 2009 implementation of the EU Profiler was unique in three instances. First, it was unique due to the method used to locate parties in the policy space – political parties across the entire European Union, competing for seats in the European Parliament, were asked to self-position themselves within 30 policy areas (see Trechsel and Mair 2011). Second, the EU Profiler project was unique due to its design: in addition to offering a summary measure of the distance between each voter and the different parties, the system produced two-dimensional and multi-dimensional visualizations of the relative standings of users and parties across subsets of issues. Additionally, users had access to documents that verified the issue positions assigned to parties on the different issues and were able to indicate issue saliency

[1] Since individuals interact anonymously with the VAA through the Internet, we do not expect self-reports of the perceived usefulness of the system to be affected by problems such as social-desirability bias. This expectation is supported by recent findings that suggest that responses provided through Internet surveys are less likely to suffer from misreporting due to social desirability issues (Holbrook and Krosnick 2010).

by attributing different weights to each issue. Finally, users could not only compare their own positions with those of the political parties running in their respective electoral contexts – usually the user's country of residence, but with all 274 political parties running in the 2009 European Parliamentary Elections and that were taken into account by the VAA. Third, the EU Profiler was unique due to the massive number of individuals that used it ahead of the 2009 EP election (in total, 919,422 advices were generated by the EU Profiler within the 6 weeks prior to the June 8 election day), and due to the amount of information that was collected regarding issue positions of parties and users, as well as socio-demographic attributes and political attitudes of a sample of users.

We use EU Profiler data to study the determinants of perceived usefulness of the system. In order to simultaneously analyze users' ratings of multiple components of the EU Profiler, we develop and apply a multilevel latent variable modeling approach that allows learning about overall evaluations of the system based on ordered ratings of individual components of the VAA. The multilevel latent variable approach is helpful because it allows reducing the dimensionality of the problem—instead of looking at the determinants of user ratings of each separate component of the system it allows focusing on an overall measure—without making strong assumptions about the contribution of each component of the system to the overall evaluation. Furthermore, our methodological approach takes into account country-level heterogeneity by allowing model parameters to vary across countries. The flexibility of our procedure enables us to study a set of interesting questions, such as whether individual and overall ratings vary systematically across countries—for instance, whether everything else constant, individuals living in certain countries are consistently more likely to assign higher (or lower) ratings to all components of the system.

VAA users tend to display a minimal level of political and/or technological curiosity to go online and fill out the issue questionnaire. They therefore belong to a particular sub-set of the electorate, further characterized by its members having access to the Internet and partaking in the application. However, there remains a large amount of heterogeneity among VAA users in almost every other aspect: numerous studies show that users range across age, gender, race, class, income, political interest, attitudes and behavior. Clearly, some categories of users are overrepresented in comparison to real distributions across the electorate. Despite these apparent distortions we still find sufficiently large levels of user heterogeneity to make the assessment of what type of users find VAAs more useful than others worthwhile. In order to proceed with this assessment we formulate five central hypotheses that we submit to the empirical test in the reminder of this paper.

Our first hypothesis deals with technology and politics. A growing literature, at the crossroads between the social sciences and engineering, computer science and technological design investigates the impact of novel technology and political behavior. Many technological innovations—from paper to the printing press, from electricity to the telephone, from the development of postal services to the Internet—have, over time, affected the way electoral processes in democracies are at work. Elections have become technologically enhanced, be it for voter registration processes, the casting of votes, the counting of the latter or the reporting of electoral results. Most modern forms of voting entail remote voting over the Internet, available to the electorate as a whole, such as, for example, in Estonia. Studies show that attitudes towards technology and general openness to experimentation and innovation are reliable predictors of attitudes towards technology-induced changes in the electoral process (Alvarez et al. 2009, Trechsel 2007, Vassil et al. 2012). By analogy we hypothesize that the utility of VAA usage

should be higher among users who are predisposed to accept technological innovation in electoral processes. Thus, our first hypothesis reads as follows:

> H1: The stronger a user believes new technologies should be used to facilitate political participation, the higher the perceived utility from VAA usage.

One of the advantages of VAAs often advertised by its designers is their ability to simplify the complexities of electoral competition for its users. By offering summaries of political stances taken up by political parties, VAAs help users find political information in a standardized and simplified way. Furthermore, they often allow users to assess their own position vis-à-vis the partisan offer through easily accessible graphical representations. These features should be, hypothetically, particularly dear to users who think that politics is complicated from the outset. We therefore hypothesize that:

> H2: The more users think politics is complicated, the higher the perceived utility from VAA usage.

While H2 links the need for simplified and easily accessible information on the campaign with VAA usefulness, our third hypothesis connects the latter to political engagement, interest in politics in general and the EP elections campaign in particular. This is not contradictory. One might find politics indeed complicated while simultaneously expressing high levels of interest in politics. Clearly this is the case for most political scientists. Overall, users interested in politics and in European affairs, including EP elections, might be particularly keen on acquiring all sorts of information on political parties running in these elections. This includes information produced by VAAs. We therefore formulate our third hypothesis as follows:

H3: The higher levels of political engagement among VAA users—reflected in greater interest in politics and in the European Parliamentary Elections campaign—the higher the perceived utility from VAA usage.

These first three hypotheses, if verified, make the usefulness of VAAs primarily dependent on users' rather abstract and general political and technological attitudes. Is this enough? Let's recall that VAAs produce clear political messages, showing a user where she stands in the political spectrum, where her closest party lies, what parties are furthest away from her preferences and so on. For users with prior ideological views or partisan preferences, such VAA-generated, tailor-made information may be of variable usefulness, depending on where exactly they politically position themselves. We therefore formulate two complementary hypotheses that go in this direction. Hypothesis number four looks at ideology, while hypothesis number five deals with partisan preferences.

Users of VAAs populate the entire left-right political spectrum, from extremist left-wing oriented citizens to those identifying with the extreme right. When it comes to usefulness of VAAs one could imagine that the more extreme one's ideological position, independently from the side of the left-right scale, the less helpful a VAA may prove to be for its user. Taking up extreme ideological positions generally translates with less political uncertainty and more clear-cut and robust partisan preferences. Users located at the ideological extremes, with strong partisan attachments and ideological commitments might therefore be less responsive to the advice produced by the VAA. The usefulness of VAAs might therefore be reduced for these users. Similarly, we think it is sound to expand this reasoning to users located at the center of the left-right scale. The absence of a clear-cut tendency on this major dimension of politics—for sure in the European context (Mair 2007)—may reduce the usefulness of a VAA advice. Most VAAs

indeed explicitly contain some kind of left-right socio-economic dimension and users with central tendencies on this scale may therefore be less convinced about the usefulness of these tools. We therefore expect a rather non-linear relationship between ideology and VAA usefulness, where users with moderate left or right ideological views may find the oucome of a VAA more useful than their peers in the center and at the extremes of the spectrum. Hence we formulate our forth hypothesis as follows:

> H4: There is a non-linear, camelshape-like relationship between ideology and perceived usefulness of VAAs: on the left-right scale, centrally- and extremely-located users perceive lower utility from the VAA relative to users with moderate left or right positions.

With our fifth and last hypothesis we link the usefulness of VAAs to their direct output in partisan terms. The large majority of voting advice applications produce, amongst others, a list of political parties, ordered from the best-matching party to the least well-matching one. In most cases, the overlap between users' issue preferences and those of the parties running in the election are simply expressed in terms of percentage points. The higher this overlap, the better the match, with 100 percent overlap showing identical positions taken up by a party and the user of the VAA. In earlier contributions we have theorized on the quality of the overlap between the number one party proposed to a user by a VAA (the party that comes closest to the user's preferences). If a user finds a strongly matching party he or she can vote for, and if this party makes it into Parliament, then the user can at least potentially feel that her views are represented in politics. Therefore, the larger the overlap, the better the potential representation of the user's issue preferences in Parliament. Inversely, when a user cannot find any well-matching party among those running in the elections, the VAA result explicitly shows its user that no party

will—based on the electoral promises made—effectively represent his or her issue preferences. The larger the discrepancy between the best matching party and a perfectly matching party, the larger the user's deficit in terms of potential representation. An earlier study could show that greater levels of this "representative deficit" may indeed estrange a user from the electoral competition and discourage her from voting altogether (Dinas et al. 2012). Higher levels of the representative deficit may therefore also negatively affect the perceived usefulness of the tool. If one cannot find a matching party, the user might perceive that this might also have to do with the tool itself, rather than exclusively with one's preferences and those of the political parties running in the elections. Our fifth hypothesis therefore reads as follows:

> H5: The stronger the representative deficit, as expressed by the output of the VAA, the lower the perceived utility from VAA usage.

The structure of the paper is as follows. First, we describe the data used in our analysis and provide summary statistics about the relationship between individual attributes and ratings of individual components of the EU Profiler. After that, we describe our methodological approach and proceed to a discussion of the results. We conclude with a discussion of the relevance of our results for improving our understanding of the discrepancies between users' perceptions of the usefulness of VAAs.

## 2- Data and Descriptive Statistics

We focus on user evaluations of seven different features of the output produced by the EU Profiler:

1. *Party documents:* Access to party-produced documents justifying each party's policy position.
2. *National party comparison:* Within-country comparison of party policy positions.
3. *Pan-European party comparison:* Cross-national comparison of party policy positions.
4. *Weights:* Policy positions weighed in accordance to the importance given by the user to each policy issue.
5. *Compass:* A two-dimensional plot showing user and party positions on a horizontal left-right axis and vertical Pro-Anti EU integration dimension.
6. *Spider:* A multi-dimensional plot showing the overlap between users and parties on seven policy areas.
7. *List:* A uni-dimensional congruence list summarizing the distance between users and the different parties across all policy areas.

Individuals were asked to rate the usefulness of these features on a 1-4 scale, where 1 indicates "useless;" 2 indicates "not very useful;" 3 indicates "somewhat useful;" and 4 indicates "very useful.". Table 1 gives the proportion of respondents choosing each rating for each of the seven components, as well as average ratings. According to this table, the feature exhibiting a higher frequency of "very useful" evaluations is the national party comparison, followed by the congruence list, and the spider plot. The feature being characterized the most frequently as

"useless" is the ability to weigh issues, followed by the pan-European party comparison, and the compass plot.

[TABLE 1 ABOUT HERE]

Let us underline the very high overall levels of usefulness. With the exception of the pan/European comparison feature, all other features score above 80 percent when cumulating the "somewhat useful" and the "very useful" response categories. Even though at this stage it is not our intention to go deeper into this result, we might want to keep in mind that large majorities of respondents were positively impressed by the Voting Advice Application's features.

Predictably, all evaluations are positively correlated, although not perfectly so (see Table 2). The feature of the system whose ratings exhibit the lowest correlation with ratings of other components of the system is the pan-European party comparison. While many users care about visualizations produced by the system, party documents, and ability to weigh issues, many do so only to the extent that it allows them to compare national parties, and do not care so much about cross-national party comparisons. This is not really surprising for the simple reason that these pan-European comparisons only serve a ludic purpose. Finnish users living in Finland, for example, cannot vote for any Portuguese party, even if the latter shows higher levels of overlap with the user than any of the Finnish parties competing in the European Parliamentary elections. Despite the practical incapacity of users to vote for parties not running in their respective electoral district, the EU Profiler project wanted to offer this pan-European comparison as some kind of "gimmick" and to show users that a pan-European electoral district might offer advantages to voters, effectively de-nationalizing European Parliamentary elections. The

practical usefulness of this feature is, however, very limited.[2] Another feature of the system whose ratings exhibit relatively low correlation with ratings assigned to other components of the system is the ability to weigh issues—a feature that, coincidentally, also exhibits the second-lowest average rating, following the pan-European party comparison. While users seem to care a great deal about "raw" information contained in party-produced documents, as well as summary measures of issue distances shown in visualizations produced by the VAA, they do not seem to attribute much importance to the ability to weigh issues in terms of perceived importance.

[TABLE 2 ABOUT HERE]

In the multivariate section, we model evaluations of these seven attributes, as a function of a number of individual attributers, including: socio-demographic characteristics (gender, age, education, and income); an additive index of news consumption; belief that politics is complicated; belief that it is important to adopt new technologies; self-reported interest in politics and the European Parliamentary Elections campaign; indicators of ideology strength and direction; and a measure of the "representative deficit". The latter variable measures the lack of overlap between the user's policy positions and the policy positions of the party closest to the user according to the congruence list produced by the EU Profiler. A high representative deficit

[2] Note that in the aftermath oft he 2009 EP elections, UK MEP Andrew Duff proposed a new formula for attributing seats within the EP, containing a small number of seats being filled with pan-European candidates, elected at the European level in the 2014 elections. Despite its initial success in different instances within the European Parliament, this modification of the „rules of the game" will not see the light in 2014.

suggests that no party within the political offer closely represents the user's policy preferences (Dinas et al. 2012).

Table 3 gives the relationship between individual attributes and average ratings assigned to each feature of the EU Profiler. A clear demographic pattern emerges from this table; female, younger, higher-educated, and wealthier users are likely to assign higher ratings to most features of the VAA. Also, those who follow news about the election by watching TV programs, reading about it on newspapers, or look up information about it on the web, are considerably more likely to assign higher ratings to all features of the EU Profiler, as are those who report being more interested in politics or in the EP elections campaign. As one would expect, those who think that it is important to adopt new technologies, such as the Internet, to facilitate political participation, are also more likely to assign higher ratings. Moving down the table, there is no clear relationship between belief that politics is complicated and users' evaluations – although it is usually the case that those who think politics is "never" or "frequently" complicated extract lower benefits from using the VAA. With respect to the impact of ideology positions, the bivariate relationship between this variable and ratings of each component of the system is consistent with the camel-like shape hypothesized in the introduction: individuals with extreme and centrally-located positions tend to make poorer evaluations relative to individuals with moderate left-or-right positions. Lastly, bivariate relationships are also clearly consistent with the idea that individuals experiencing larger levels of the representative deficit assign lower ratings to all components of the system.

[TABLE 3 ABOUT HERE]

## 3- Methodology

The purpose of our multivariate analysis is to study the determinants of users' valuations of the EU Profiler. We do so using data included in the extra-questionnaire, where users were asked to assign discrete ratings to the seven features of the EU Profiler discussed in the previous section.

To learn about individuals' latent valuation of the VAA, we assume that those who perceive higher overall utility are more likely to assign higher ratings to all components of the VAA. The rating assigned to each of the seven components is termed an "item" in our multivariate analysis—thus, for each user we observe seven items, which can be used to learn about the individual's latent overall valuation of the VAA.

In the measurement stage, we estimate the latent perceived usefulness of the VAA using a factor-analytical approach; modeling the choice probability of the rating assigned to each component of the system, using ordered logistic specification. Specifically, we assume that user *i* assigns rating $y_{ij}$ to component *j*, with $y_{ij} \in \{1,2,3,4\}$ and $j \in \{1, \cdots, 7\}$, according to the following criterion:

$$y_{ij} = \begin{cases} 4 \;\; if \;\; y_{ij}^{*} \geq C_{3r[i]j} \\ 3 \;\; if \;\; C_{3r[i]j} > y_{ij}^{*} \geq C_{2r[i]j} \\ 2 \;\; if \;\; C_{2r[i]j} > y_{ij}^{*} \geq C_{1r[i]j} \\ 1 \;\; if \;\; y_{ij}^{*} < C_{1r[i]j} \end{cases}$$

where $C_{kr[i]j}$, with $k \in \{1,2,3\}$, are the cutoff values of the ordered logistic regressions, which vary by item *j* and country of residence of individual *i*, *r[i]*; and $y_{ij}^*$ is the continuous utility perceived by user *i* from component *j*.[3]

For each item *j*, and individual *i*, we specify the continuous utility $y_{ij}^*$ as a function of a latent overall valuation of the VAA that varies at the individual level, $x_i$, a discrimination parameter, $disc_{r[i]j}$, which varies across items and by country of residence of individual *i*, $r[i]$, and a difficulty parameter, $diff_{r[i]j}$, which also varies across items and by country of residence of individual *i*, $r[i]$. The discrimination parameter can be interpreted as the extent to which the latent overall valuation of the VAA influences the rating assigned by the user to component *j* of the VAA.

$$y_{ij}^* = disc_{r[i]j}\ x_i - diff_{r[i]j}$$

In the explanatory stage, we assume that the latent overall valuation of the VAA follows a normal distribution with mean $\mu_i$ and standard deviation fixed at one, and model the mean of the distribution as a linear function of *K* individual attributes $z_{ik}$, with $k \in \{1, \cdots, K\}$, such that:

$$\mu_i = \beta_{1r[i]}\, z_{i1} + \cdots + \beta_{Kr[i]}\, z_{iK}$$

[3] In estimating the model, we assume that the probability that user *i* assigns rating *h* to component *j* equals: $P(y_{ij} = h) = p_{ijh}$, such that $p_{ijh} \geq 0\ \forall h$ and $\sum_h p_{ijh} = 1$. Let *Q* denote the cumulative distribution function of $y_{ij}$: $Q(h) = P(y_{ij} \leq h) = q_{ijh}$, such that $q_{ijh} = \sum_{l \leq h} p_{ijl}$. For each item *j*, and individual *i*, we write the cumulative distribution $q_{ij}$ as a function of three cutoff values$C_{kr[i]j}$ and the linear predictor $y_{ij}^*$.

where $\beta_{kr[i]}$'s indicate the coefficients of the linear equation, which vary as a function of the country of residence of individual *i*, *r[i]*.

In order to fully account for the uncertainty associated with the latent variable estimated in the measurement stage, and obtain more accurate measurement of the precision of the effect of individual attributes on the latent variable, we simultaneously estimate the measurement and explanatory parts of our model.

We specify hierarchical priors for all parameters, which vary across countries. Specifically, we assume ordered logit cutoffs ($C_{hr[i]j}$'s), discrimination parameters ($disc_{r[i]j}$), difficulty parameters ($diff_{r[i]j}$), and coefficients of the linear model used to explain the latent variable ($\beta_{kr[i]}$'s) follow normal distributions with common hyperparameters across countries. Specifically, we set:[4]

$$C_{hr[i]j} \sim N\left(\mu_{C_{hj}}, \sigma_{C_{hj}}\right), for\ h \in \{2,3\}, j \in \{1, \cdots, 7\}, and\ \forall r[i]$$

$$disc_{r[i]j} \sim N\left(\mu_{disc_j}, \sigma_{disc}\right), for\ j \in \{1, \cdots, 7\}\ and\ \forall r[i]$$

$$diff_{r[i]j} \sim N\left(\mu_{diff_j}, \sigma_{diff}\right), for\ j \in \{1, \cdots, 7\}\ and\ \forall r[i]$$

$$\beta_{kr[i]} \sim N\left(\mu_{\beta_k}, \sigma_{\beta_k}\right), for\ k \in \{1, \cdots, N\}\ and\ \forall r[i]$$

[4] It is not possible to independently identify cutoff values and the difficulty parameter, which acts as a constant. As is common in order logit models, we need to impose an identification restriction. The most common restrictions are excluding the constant or setting the first cutoff to zero; we chose the latter route.

Finally, we specify uninformative prior distributions for hyperparameters of the last three distributions. Specifically, we assume that $\mu_{C_{hj}}$, $\mu_{\delta_j}$, and $\mu_{\beta_k}$, have normal prior distributions with mean zero and variance 100, and that $\sigma_{C_{hj}}$, $\sigma_{\delta_j}$, and $\sigma_{\beta_k}$, have uninform prior distributions with mean zero and variance 100.

We estimate the model using *R* and *JAGS*—a software package for Bayesian estimation—implemented through R's package *rjags*.[5]

## 4- Results

The perceived usefulness of the voting advice application is not known a priori, but is a "latent variable" that can be estimated based on the data. As is the case with any unknown quantity estimated using statistical methods, this latent variable has an associated non-negligible level of uncertainty; when this uncertainty is large relative to the mean value of latent usefulness for any particular user, the overall perceived usefulness of the VAA for this user may become indistinguishable from zero. The reason why we estimate a latent variable model, rather than simply using an additive index as dependent variable, and why we conduct a simultaneous estimation of the measurement and explanatory parts of our model, is because we wish to accommodate this uncertainty—as disregarding it may lead to unreliable estimates of the effect of individual attributes on the overall valuation of the system. The "measurement" part of our model is the factor analytical model used to estimate the latent variable; and the "explanatory"

[5] JAGS software and documentation are available at http://sourceforge.net/projects/mcmc-jags/files/.

part of our model is the linear specification used to model the latent variable as a function of observable individual attributes.

Figure 1 shows the distribution of the estimated latent variable across the sample of users considered in the analysis; the distribution is centered around zero, and relatively symmetric to either side. In Figure 2, we compare the relationship between mean values of the latent variable for each individual, and a linear transformation of an additive index computed by adding up the ratings assigned to each component of the VAA. Although there is a very close relationship between the latent variable and the additive index, it is important to take into account that the additive index disregards the uncertainty about the usefulness of the VAA for each individual. In Figure 3, we show individual-level confidence intervals for the latent variable, for 50 randomly-selected users; this plot shows that, due to the uncertainty associated with the latent construct, the underlying valuation of the system is indistinguishable from zero for many users. Thus, the results of the measurement part of our model suggest that it is indeed important to employ a model specification that takes into account the fact that the perceived usefulness of the VAA is not known for certain for any particular user, but carries a considerable associated level of uncertainty.

[FIGURE 1 ABOUT HERE]

[FIGURE 2 ABOUT HERE]

[FIGURE 3 ABOUT HERE]

Although values of the latent variable can be used to compare the relative usefulness of the VAA for different individuals, standalone values have no innate meaning. The meaning of each latent valuation can be better understood by taking into account other information produced

by the model—the difficulty and discrimination parameters associated with different components of the EU Profiler—and by mapping latent utilities into choice probabilities.

[FIGURE 4 ABOUT HERE]

As mentioned in the previous section, difficulty parameters capture the extent to which specific components are always assigned lower (or higher) ratings independent of the latent valuation, and discrimination parameters capture the extent to which the rating of each component of the VAA provides information about the overall usefulness of the system. Figure 4 gives confidence intervals for difficulty and discrimination parameters for an average country. According to this figure, the features of the system with the highest associated level of difficulty—that is, which tend to receive lowest ratings regardless of the overall valuation of the system—are the use of the system for comparing parties across the EU, and the ability to weigh issues based on relative importance. Coincidentally, these two features are also the ones offering the lowest level of discrimination, a result in line with the statistics reported in Section 3—where we noted that ratings assigned to these two features exhibit the lowest correlation with ratings assigned to other components of the system. In turn, the feature with the lowest level of difficulty—which tends to receive the highest rating regardless of the overall valuation of the system—is the use of the VAA for comparing national parties, a feature which incidentally also offers the highest level of discrimination.

Together with estimates of the latent variable and ordered-logit cutoffs, estimates of discrimination and difficulty parameters can be used to simulate choice probabilities for ratings associated with each component of the VAA. Table 5 gives mean values and confidence intervals for the probability of choosing the highest rating for each component of the VAA. We

find that the feature of the system with highest probability of receiving the top rating is the ability to compare national parties; in contrast, the features with the lowest probability of receiving the highest rating are the compass plot, the ability to weigh issues based on importance, and the availability of party documents.

[TABLE 4 ABOUT HERE]

However, it is important to take into account that while some features of the system (such as the use of weights) almost-always exhibit low ratings, the rating assigned to other features (such as the compass and the party documents) are highly sensitive to the overall valuation of the VAA. To illustrate this finding, we constructed Figure 5, which shows the relationship between the latent variable and the probability of choosing the highest rating for each component of the VAA. According to this plot, the rating of the use of weights is relatively poor among people with low overall valuation for the system, and remains relatively poor among those who value the system highly. While the rating of party documents is also relatively poor among people with low overall valuation for the system, it increases markedly relative to the rating assigned to other features of the VAA as the overall valuation of the system increases, and becomes large among people who value the system highly.

[FIGURE 5 ABOUT HERE]

Now we turn to the results of the explanatory part of our model, which we use to test the hypotheses outlined in the introduction. We find that the overall perceived usefulness of the voting advice application is significantly related to most individual attributes included in the model. Figure 3 gives confidence intervals for the coefficients of the linear specification used to explain the latent valuation for the VAA as a function of standardized individual attributes.

According to this plot, most coefficients are significantly different from zero, and most signs are in line with expectations. Female gender, education, income, importance of using new technologies to promote political participation, interest in politics, interest in the EP elections campaign, and moderate left-or-right ideologies are positively related to the overall valuation of the VAA. Contrarily, age, extreme-left or extreme-right positions, and the representative deficit, are negatively related to the overall valuation of the VAA. These same findings are also reflected in Table 5, which gives confidence intervals for the effect of marginal changes in individual attributes on the latent variable.

[FIGURE 6 ABOUT HERE]

[TABLE 5 ABOUT HERE]

The magnitude of marginal changes in the latent variable does not have an intuitive interpretation. To ease the interpretation of our findings, we used the parameters produced by both parts of our model—that is, latent variable, order-logit cutoffs, difficulty and discrimination parameters, and coefficients of the linear model—to simulate changes in choice probabilities of ratings of different components of the VAA caused by marginal changes in individual attributes. The results of this simulation are reported in Table 6.

Starting with the impact of socio-demographic attributes, we find that changes in age lead to the largest changes in choice probabilities, especially for those components of the system exhibiting the highest levels of discrimination. For instance, increasing age from 40 to 53 leads to an almost 10 points decrease in the probability of assigning the highest rating to the national party comparison, but only a 4 points decrease in the probability of assigning the highest rating to the use of weights—as we discussed in previous paragraphs, ratings of this feature of the

system are not as closely related to the overall valuation. Regarding the relationship between other socio-demographic attributes and the likelihood of assigning the highest rating to the national party comparison, we find that females are close to 4 points more likely to assign the highest rating, followed by an increase in education from upper-secondary to post-secondary (close to 3 points increase), and an increase in income from €2,000-3,000 to €3,000-4,000 (close to 1 point increase). For other components of the system, the impact of socio-demographic attributes is usually smaller in magnitude but still statistically significant.[6] In addition to socio-demographic attributes, we control for the effect of exposure to media outlets; in contrast to what we found for socio-demographic attributes, we find that an increase in exposure—as measured by our index of news consumption—has small and usually non-significant effects on choice probabilities.

[TABLE 6 ABOUT HERE]

[6] Our model specification assumes that individual attributes affect choice probabilities indirectly through their impact on the latent variable, and that there is a positive relationship between the rating assigned to different components of the system and the latent variable—although the intensity of this relationship may vary across features of the VAA. As a result of these assumptions, the sign of the effect on the latent variable of a marginal change in an individual attribute is similar to the sign of the effect on choice probabilities of the same marginal change in the individual attribute, for all features of the VAA—although the magnitude of the effect on choice probabilities may vary across features of the VAA. This explains why effect magnitudes vary across the columns of Table 5, but signs do not.

The focus of our paper is on the effect of a number of attitudinal factors used to test the five hypotheses discussed in the introduction. Beginning with the first hypothesis, we find that individuals who believe new technology should be used to facilitate political participation perceive higher utility from using the VAA—the effect on choice probability is largest for the national party comparison (7 points) and smallest for the use of weights (3 points). Thus, general attitudes toward the application of new technologies to politics exhibit the expected relationship with attitudes toward VAAs. Moving to the second hypothesis, in keeping with our expectations, we find that individuals who think politics is "regularly" complicated instead of only "occasionally" complicated are significantly more likely to perceive higher utility from the VAA, although effects are relatively small—no larger than 3 points for any feature of the system. Turning to our third hypothesis regarding the effect of political engagement, we find positive and significant effects of interest in politics, but most notably we find that those who are "very" interested in the campaign for EP elections instead of only "somewhat" interested, are between 6 and 10 points more likely to assign the highest rating to most features of the VAA—the exceptions being the use of weights and the pan-EU party comparison where effects do not exceed 5 points but are still considerable.

Our fourth hypothesis concerned the relationship between self-assigned positions on the left-right scale and usefulness of the VAA. Consistently with our expectations, we find that centrally-located users—who are likely to feel weaker partisan attachments and ideology commitments relative to respondents with clear left-right ideology positions—experience lower utility from using the VAA. For instance, centrally-located users are close to 7 points less likely to assign the highest rating to the national party comparison as a result of the most positive overall evaluation of the system, relative to individuals with moderate left positions. Also as

expected, individuals with extreme-left or extreme-right positions—whose strong partisan attachments and ideology commitments are likely to make them less responsive to the advice produced by the VAA—experience lower utility from using the VAA, although the reduction in perceived utility is lower when ideology positions change from moderate to extreme, than when they change from moderate to centrally-located. Additionally, a result that is not captured by the fourth hypothesis is that individuals with moderate-left ideology positions perceive significantly higher utilities from using the VAA relative to individuals with moderate-right positions, and tend to assign significantly higher ratings to all component of the system. Thus, while we did find evidence of a camel-like effect of ideology positions, this shape is clearly not symmetric: the "hump" in the effect of ideology positions is especially pronounced to the left of the ideology spectrum. At this stage it is difficult for us to go further with explaining this pattern. It might be that this has to do with the positions of the parties themselves that might not be similarly clearcut on the left and on the right of the political spectrum. In other words, the very nature of party competition might be unequally distributed from left to right. Hence, the variation in the utility of the VAA might be a function of competition rather than of self/assigned ideological stances. Clearly, however, this is a hypothesis which need further specification and empirical testing and both would go beyond the scope of this paper.

Lastly, our fifth and last hypothesis was that users whose issues positions have little in common with the issue positions of the party that most-closely resembles their preferences according to the EU Profiler advice—that is, those exhibiting greater levels of representative deficit—perceive lower utility from using the VAA; the reason being that individuals with high levels of representative deficit are likely to evaluate any recommendation produced by the VAA as not satisfactory enough. In line with this expectation, we find that when the representative

level increases from its median level to its third quartile, there is a reduction in the overall utility of the VAA which results in between 1 and 3 point reductions in the change of assigning the highest ratings to the different features of the VAA. It is important to note that even though these effects are statistically significant, they are small in magnitude relative to the effect of other individual attributes—such as age, perceived importance of adopting new technologies for facilitating political participation, interest in the EU campaign, and ideology.

## 5- Conclusion

The main purpose of our study was to shed new light on the usefulness of Voting Advice Applications for their respective users. The social success of a VAA and its features is not a given. First, VAAs tend to trigger different reactions from their users, ranging form enthusiasm to indifference and open criticism. So far, however, studies are scarce which report the extent to which a certain VAA is appreciated. In our contribution we could show that the EU Profiler was evaluated as useful by four out of five users, across the entire EU27. This in itself is a strong finding.

Second, we could show that those features that make sense, from a voter's point of view, were strongly correlated in their perceived usefulness. Be it matchlists, spidergrams or compasses, these numeric and graphical representations were almost equally useful for their users. Thanks to these features, a user could identify his or her stance in the partisan landscape within the country-specific electoral context. When it came to the usefulness of the pan-European comparisons, however, their usefulness was clearly lower. We believe that this has to do with the fact that voters in European Parliamentary Elections continue to be bound to their individual countries. Even though a Finnish user might find a Portuguese party better

representing his or her interests, the inability to cast a vote for this Partuguese party renders this pan-European comparison less useful to users. Similarly the possibility of assigning weights to one's policy position was seen as less useful to users, possibly representing more of a gimmick-function.

Third, we tried to explain why some users find the EU Profiler more useful than others. Indeed, we found clear patterns in the perceived usefulness of this particular VAA. Individuals with certain socio-demographic and attitudinal characteristics are more likely to assign higher ratings to all components of the VAA, although some features of the system exhibit less relationship with the overall evaluation of the system. Our methodological approach, yielding a latent variable measuring the usefulness of seven individual features of the VAA as main dependent variable, offered us the possibility to verify and confirm a set of five theory-derived hypotheses: we found that embracing new technologies for fostering political participation is an attitude that positively correlates with perceived usefulness of the VAA. The same goes for users believing that politics were a rather complicated matter. At the same time, a stronger interest in politics in general and in the European Parliamentary elections campaign in particular also significantly heightened the perceived utility of the VAA's features. Electoral politics also play a role in the explanation of the degree of usefulness of VAA features for their users. We found a camel-shaped pattern along the left-right spectrum, with users at the extremes of the left-right scale as well as those positioned at its center perceiving lower levels of usefulness. Finally, the more distant one's policy preferences from the preferences of the political parties partaking in the campaign, the lower the perceived usefulness for VAA users.

These are important results as they underline to what extent usefulness of a voting advice application is determined by a multi-facetted array of factors. Attitudes towards technology,

politics in general and partisan attitudes all contribute to the explanation of the perceived VAA utility. This is rather good news for VAAs as they seem to indeed attract a politically curious clientele that judges the usefulness of the VAA in a nuanced and convincing way.

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## Tables and Figures

### Table 1 - User Evaluations of Components of the EU Profiler

| | % Users Choosing Rating | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | Average Rating |
| Compass | 3.6 | 12.3 | 52.1 | 32.1 | 3.1 |
| Spider | 3.7 | 13.7 | 45.6 | 37.0 | 3.2 |
| List | 3.3 | 11.3 | 46.1 | 39.3 | 3.2 |
| Weights | 3.9 | 15.3 | 50.0 | 30.8 | 3.1 |
| Party Docs | 3.9 | 13.8 | 47.8 | 34.5 | 3.1 |
| Nat Party Comparison | 3.7 | 10.5 | 43.0 | 42.8 | 3.2 |
| EU Party Comparison | 7.8 | 22.8 | 37.6 | 31.7 | 2.9 |

**Table 2 - Correlations between User Evaluations of Components of the EU Profiler**

| | Spider | List | Weights | Party Docs | Nat Party Comparison | EU Party Comparison |
|---|---|---|---|---|---|---|
| Compass | 0.53 | 0.42 | 0.35 | 0.40 | 0.41 | 0.29 |
| Spider | * | 0.37 | 0.29 | 0.36 | 0.39 | 0.29 |
| List | * | * | 0.38 | 0.43 | 0.45 | 0.28 |
| Weights | * | * | * | 0.40 | 0.33 | 0.23 |
| Party Docs | * | * | * | * | 0.55 | 0.35 |
| Nat Party Comparison | * | * | * | * | * | 0.45 |
| EU Party Comparison | * | * | * | * | * | * |

## Table 3 - Individual Attributes and User Evaluations (average ratings)

| | Compass | Spider | List | Weights | Party Docs | Nat Party Comp | EU Party Comp |
|---|---|---|---|---|---|---|---|
| Male | 3.13 | 3.16 | 3.20 | 3.05 | 3.11 | 3.23 | 2.92 |
| Female | 3.13 | 3.17 | 3.25 | 3.13 | 3.18 | 3.29 | 2.97 |
| 28 years old or younger | 3.18 | 3.21 | 3.32 | 3.12 | 3.28 | 3.42 | 3.09 |
| Between 29 and 39 years old | 3.16 | 3.24 | 3.25 | 3.09 | 3.17 | 3.33 | 3.02 |
| Between 40 and 52 years old | 3.11 | 3.16 | 3.19 | 3.08 | 3.09 | 3.19 | 2.87 |
| More than 52 years old | 3.06 | 3.01 | 3.09 | 3.02 | 2.99 | 3.06 | 2.74 |
| Lower 2ry education or less | 3.02 | 2.95 | 3.23 | 3.11 | 3.06 | 3.15 | 2.72 |
| Upper 2ry education | 3.09 | 3.07 | 3.23 | 3.10 | 3.14 | 3.24 | 2.92 |
| Post 2ry education | 3.03 | 3.03 | 3.14 | 3.07 | 3.04 | 3.13 | 2.83 |
| 1st stage 3ry education | 3.14 | 3.19 | 3.21 | 3.07 | 3.14 | 3.26 | 2.95 |
| 2nd stage 3ry education | 3.20 | 3.26 | 3.23 | 3.07 | 3.16 | 3.30 | 3.01 |
| Income less than 1000 Euros | 3.11 | 3.12 | 3.25 | 3.11 | 3.15 | 3.30 | 3.04 |
| Income 1000 to 2000 Euros | 3.12 | 3.13 | 3.22 | 3.11 | 3.15 | 3.25 | 2.97 |
| Income 2000 to 3000 Euros | 3.13 | 3.17 | 3.22 | 3.09 | 3.13 | 3.26 | 2.92 |
| Income 3000 to 4000 Euros | 3.13 | 3.16 | 3.22 | 3.04 | 3.09 | 3.21 | 2.87 |
| Income 4000 to 6000 Euros | 3.12 | 3.17 | 3.18 | 3.04 | 3.12 | 3.21 | 2.86 |
| Income more to 6000 Euros | 3.17 | 3.24 | 3.17 | 3.04 | 3.14 | 3.25 | 2.88 |
| News index: 3 or 4 | 3.00 | 3.05 | 3.12 | 2.96 | 2.96 | 3.07 | 2.71 |
| News index: 5 | 3.07 | 3.12 | 3.18 | 3.06 | 3.08 | 3.20 | 2.79 |
| News index: 6 | 3.13 | 3.17 | 3.22 | 3.07 | 3.13 | 3.26 | 2.90 |
| News index: 7 | 3.16 | 3.19 | 3.23 | 3.10 | 3.16 | 3.29 | 3.01 |
| News index: 8 or 9 | 3.20 | 3.20 | 3.26 | 3.13 | 3.21 | 3.31 | 3.10 |
| Importance adopt new tech 0, 1, 2 | 2.85 | 2.93 | 2.99 | 2.83 | 2.89 | 2.99 | 2.69 |
| Importance adopt new tech 3, 4 | 2.95 | 3.06 | 3.12 | 2.96 | 3.04 | 3.11 | 2.77 |
| Importance adopt new tech 5 | 3.04 | 3.08 | 3.12 | 3.01 | 3.04 | 3.15 | 2.88 |
| Importance adopt new tech 6, 7 | 3.10 | 3.15 | 3.23 | 3.05 | 3.09 | 3.23 | 2.88 |
| Importance adopt new tech 8, 9, 10 | 3.18 | 3.20 | 3.25 | 3.13 | 3.18 | 3.30 | 2.99 |
| Politics never complicated | 3.08 | 3.15 | 3.16 | 3.00 | 3.08 | 3.20 | 2.99 |
| Politics seldom complicated | 3.15 | 3.18 | 3.22 | 3.09 | 3.15 | 3.27 | 2.95 |
| Politics occasionally complicated | 3.15 | 3.19 | 3.25 | 3.11 | 3.17 | 3.28 | 2.93 |
| Politics regularly complicated | 3.09 | 3.10 | 3.21 | 3.11 | 3.12 | 3.23 | 2.83 |
| Politics frequently complicated | 3.12 | 3.07 | 3.18 | 3.09 | 3.05 | 3.19 | 2.82 |
| Very interested in politics | 2.85 | 2.80 | 2.89 | 2.80 | 2.69 | 2.89 | 2.46 |
| Somewhat interested in politics | 3.07 | 3.09 | 3.19 | 3.03 | 3.05 | 3.15 | 2.73 |
| A little interested in politics | 3.13 | 3.17 | 3.23 | 3.10 | 3.13 | 3.26 | 2.88 |
| Not at all interested in politics | 3.15 | 3.19 | 3.21 | 3.08 | 3.16 | 3.28 | 3.05 |
| Very interested in EU campaign | 2.80 | 2.86 | 2.92 | 2.84 | 2.78 | 2.92 | 2.52 |
| Somewhat interested in EU campaign | 3.09 | 3.12 | 3.21 | 3.06 | 3.07 | 3.19 | 2.76 |
| A little interested in EU campaign | 3.16 | 3.18 | 3.24 | 3.11 | 3.18 | 3.29 | 2.98 |
| Not at all interested in EU campaign | 3.20 | 3.24 | 3.25 | 3.12 | 3.21 | 3.33 | 3.17 |
| Ideology strength: 1 (Center) | 3.06 | 3.08 | 3.17 | 3.07 | 3.07 | 3.20 | 2.91 |
| Ideology strength: 2 | 3.18 | 3.20 | 3.22 | 3.08 | 3.17 | 3.28 | 2.93 |
| Ideology strength: 3 | 3.18 | 3.22 | 3.27 | 3.12 | 3.18 | 3.31 | 2.92 |
| Ideology strength:4 | 3.14 | 3.19 | 3.27 | 3.07 | 3.15 | 3.27 | 2.92 |
| Ideology strength: 5 | 3.10 | 3.18 | 3.22 | 3.06 | 3.13 | 3.24 | 3.01 |
| Ideology strength: 6 | 3.06 | 3.06 | 3.13 | 3.04 | 3.06 | 3.16 | 2.96 |
| Ideology direction: Left | 3.16 | 3.20 | 3.24 | 3.10 | 3.17 | 3.29 | 3.01 |
| Ideology direction: Center | 3.06 | 3.08 | 3.17 | 3.07 | 3.07 | 3.20 | 2.91 |
| Ideology direction:: Right | 3.10 | 3.12 | 3.20 | 3.04 | 3.09 | 3.21 | 2.82 |
| Rep deficit lower than Q1 | 3.21 | 3.25 | 3.26 | 3.10 | 3.20 | 3.33 | 3.04 |
| Rep deficit between Q1 and Q2 | 3.19 | 3.21 | 3.26 | 3.10 | 3.18 | 3.32 | 2.95 |
| Rep deficit between Q2 and Q3 | 3.09 | 3.14 | 3.19 | 3.07 | 3.10 | 3.19 | 2.89 |
| Rep deficit larger than Q4 | 3.02 | 3.04 | 3.14 | 3.04 | 3.04 | 3.16 | 2.85 |

Note: See appendix tables for % users choosing each rating by item and category.

**Table 4 - Probability of Choosing Higher Valuation (baseline, hypothetical individual)**

| | 5% | **Mean** | 95% |
|---|---|---|---|
| Compass | 26.0 | **28.0** | 30.2 |
| Spider | 33.5 | **35.6** | 37.7 |
| List | 33.2 | **35.6** | 38.0 |
| Weights | 26.6 | **28.3** | 30.0 |
| Party Docs | 27.4 | **29.7** | 32.3 |
| Nat Party Comparison | 41.8 | **45.1** | 48.4 |
| EU Party Comparison | 30.7 | **32.6** | 34.6 |

**Table 5 - Latent Variable (baseline and marginal changes, hypothetical individual)**

| | 5% | **Mean** | 95% |
|---|---|---|---|
| Baseline | 0.06 | **0.10** | 0.13 |
| Male to Female | 0.02 | **0.07** | 0.11 |
| Age 40 to 53 | -0.21 | **-0.18** | -0.16 |
| Education 4 to 5 | 0.04 | **0.05** | 0.06 |
| Income 5 to 6 | 0.01 | **0.02** | 0.03 |
| News 6 to 7 | 0.00 | **0.01** | 0.03 |
| Adopt New Tech 9 to 11 | 0.11 | **0.13** | 0.15 |
| Politics Complicated 2 to 3 | 0.03 | **0.05** | 0.07 |
| Interest Pol 3 to 4 | 0.00 | **0.03** | 0.06 |
| Interest Camp 3 to 4 | 0.16 | **0.19** | 0.21 |
| Mod to Ext Left | -0.05 | **-0.03** | -0.02 |
| Mod Left to Center | -0.19 | **-0.12** | -0.05 |
| Mod Left to Mod Right | -0.11 | **-0.04** | 0.02 |
| Rep Deficit Median to 3rd Quartile | -0.06 | **-0.05** | -0.03 |

Note: Baseline values were computed for a hypothetical individual with median characteristics – male; 40 years of age; upper-secondary level of education; income equal to €2,000-3,000; news consumption index equal to 6 (in a 3-9 scale); assigns rating 9 to the importance of using new technologies for promoting political participation (in a 1-11 scale); thinks politics is "occasionally complicated", is "somewhat" interested in politics, and also "somewhat" interested in the in the campaign for the European elections; has a moderate-left ideology position; and median level of representative deficit.

**Table 6 - Probability of Choosing Higher Valuation (marginal effects, hypothetical individual)**

| | Compass | Spider | List | Weights | Party Docs | Nat Party Comp | EU Party Comp |
|---|---|---|---|---|---|---|---|
| **Male to Female** | **2.2** | **2.1** | **2.5** | **1.6** | **2.6** | **3.7** | **1.7** |
| *5%* | 0.7 | 0.7 | 0.8 | 0.5 | 0.9 | 1.3 | 0.6 |
| *95%* | 3.7 | 3.7 | 4.2 | 2.7 | 4.4 | 6.2 | 2.9 |
| **Age 40 to 53** | **-5.6** | **-5.6** | **-6.4** | **-4.0** | **-6.5** | **-9.8** | **-4.5** |
| *5%* | -6.4 | -6.5 | -7.3 | -4.6 | -7.5 | -11.3 | -5.1 |
| *95%* | -4.8 | -4.8 | -5.5 | -3.4 | -5.6 | -8.4 | -3.8 |
| **Education 4 to 5** | **1.7** | **1.6** | **1.9** | **1.2** | **2.0** | **2.8** | **1.3** |
| *5%* | 1.2 | 1.1 | 1.3 | 0.8 | 1.4 | 1.9 | 0.9 |
| *95%* | 2.2 | 2.1 | 2.4 | 1.5 | 2.5 | 3.6 | 1.7 |
| **Income 5 to 6** | **0.7** | **0.6** | **0.7** | **0.5** | **0.8** | **1.1** | **0.5** |
| *5%* | 0.3 | 0.3 | 0.4 | 0.2 | 0.4 | 0.6 | 0.3 |
| *95%* | 1.0 | 1.0 | 1.1 | 0.7 | 1.1 | 1.6 | 0.8 |
| **News 6 to 7** | **0.5** | **0.5** | **0.5** | **0.3** | **0.6** | **0.8** | **0.4** |
| *5%* | 0.0 | 0.0 | -0.1 | 0.0 | -0.1 | -0.1 | 0.0 |
| *95%* | 1.0 | 1.0 | 1.1 | 0.7 | 1.2 | 1.7 | 0.8 |
| **Adopt New Technologies 9 to 11** | **4.4** | **4.2** | **4.8** | **3.1** | **5.1** | **7.1** | **3.3** |
| *5%* | 3.6 | 3.5 | 4.0 | 2.5 | 4.2 | 5.9 | 2.8 |
| *95%* | 5.1 | 4.9 | 5.6 | 3.6 | 6.0 | 8.3 | 3.9 |
| **Politics Complicated 2 to 3** | **1.7** | **1.6** | **1.9** | **1.2** | **2.0** | **2.8** | **1.3** |
| *5%* | 1.1 | 1.0 | 1.2 | 0.8 | 1.3 | 1.8 | 0.8 |
| *95%* | 2.3 | 2.2 | 2.5 | 1.6 | 2.7 | 3.8 | 1.8 |
| **Interest in Politics 3 to 4** | **1.1** | **1.1** | **1.2** | **0.8** | **1.3** | **1.8** | **0.9** |
| *5%* | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| *95%* | 2.1 | 2.1 | 2.4 | 1.5 | 2.5 | 3.6 | 1.7 |
| **Interest in the EU Campaign 3 to 4** | **6.5** | **6.2** | **7.1** | **4.5** | **7.6** | **10.4** | **4.9** |
| *5%* | 5.5 | 5.3 | 6.0 | 3.8 | 6.4 | 8.9 | 4.2 |
| *95%* | 7.5 | 7.1 | 8.2 | 5.2 | 8.8 | 11.8 | 5.7 |
| **Mod to Ext Left** | **-1.0** | **-1.0** | **-1.1** | **-0.7** | **-1.2** | **-1.7** | **-0.8** |
| *5%* | -1.5 | -1.4 | -1.6 | -1.0 | -1.7 | -2.5 | -1.1 |
| *95%* | -0.5 | -0.5 | -0.6 | -0.4 | -0.6 | -0.9 | -0.4 |
| **Moderate Left to Center** | **-3.7** | **-3.7** | **-4.2** | **-2.7** | **-4.3** | **-6.5** | **-2.9** |
| *5%* | -5.9 | -5.9 | -6.7 | -4.2 | -6.8 | -10.2 | -4.7 |
| *95%* | -1.7 | -1.7 | -1.9 | -1.2 | -1.9 | -2.8 | -1.3 |
| **Moderate Left to Moderate Right** | **-1.3** | **-1.3** | **-1.5** | **-0.9** | **-1.5** | **-2.2** | **-1.0** |
| *5%* | -3.4 | -3.4 | -3.8 | -2.4 | -4.0 | -5.8 | -2.7 |
| *95%* | 0.7 | 0.7 | 0.8 | 0.5 | 0.8 | 1.2 | 0.6 |
| **Rep Deficit Median to 3rd Quartile** | **-1.5** | **-1.5** | **-1.7** | **-1.1** | **-1.8** | **-2.6** | **-1.2** |
| *5%* | -2.0 | -2.0 | -2.2 | -1.4 | -2.3 | -3.4 | -1.5 |
| *95%* | -1.0 | -1.0 | -1.2 | -0.7 | -1.2 | -1.8 | -0.8 |

Note: The median representative deficit is 23.15, and the 3rd quartile is 26.85.

**Figure 1 – Distribution of Latent Valuations of the EU Profiler**

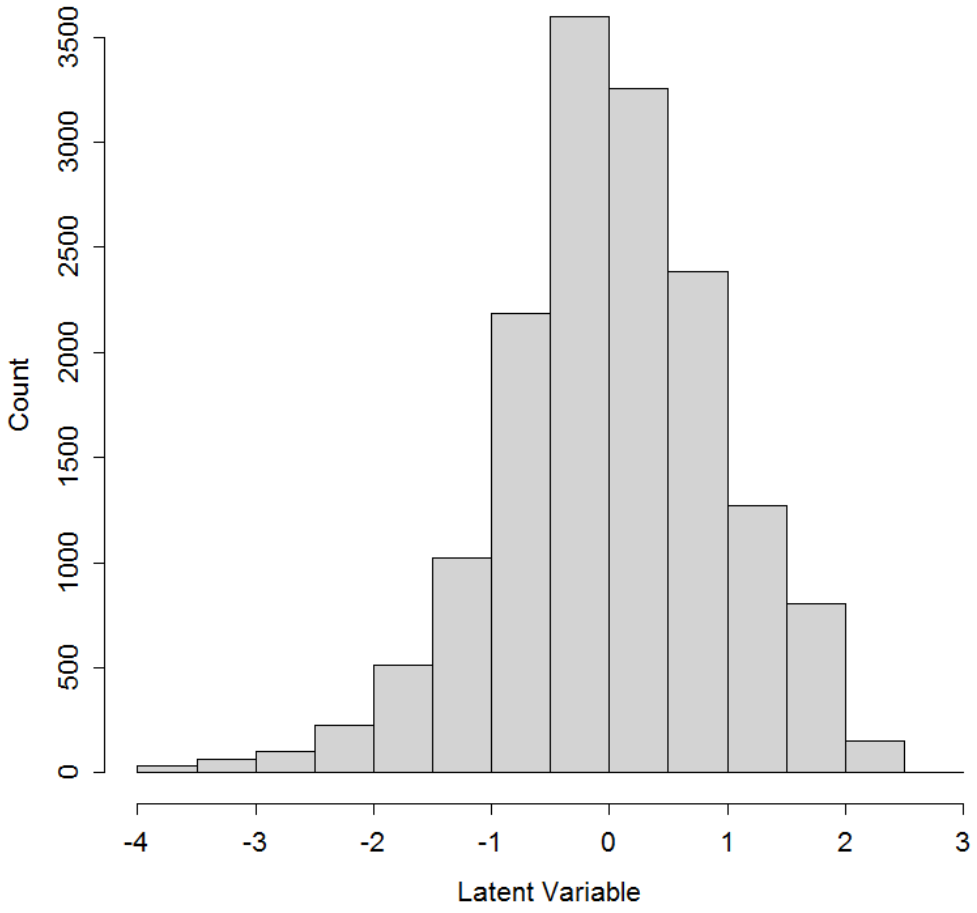

**Figure 2 – Relationship between Additive Index and Latent Valuations**

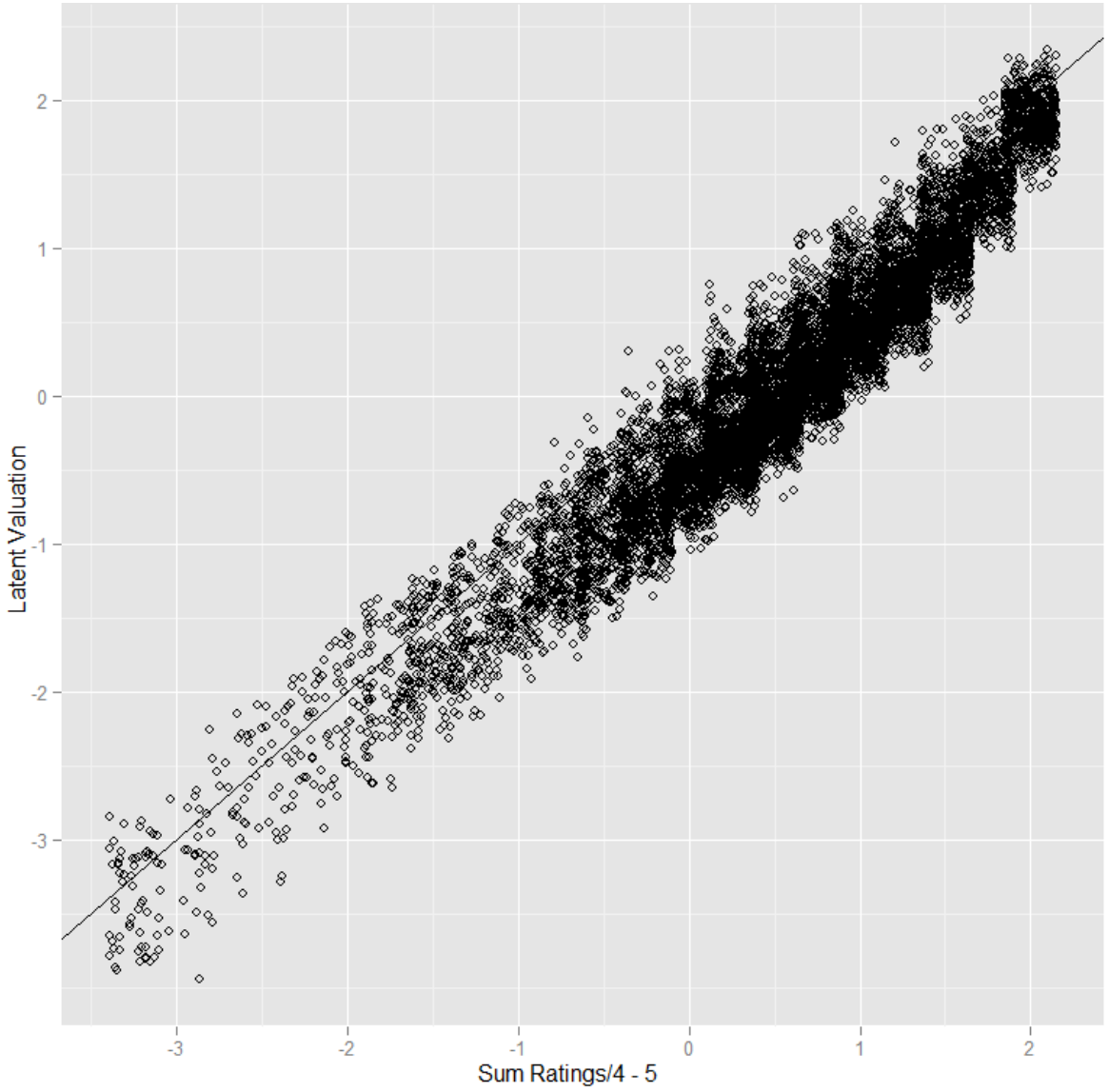

**Figure 3 – Mean and Uncertainty about Latent Valuations for Selected Users**

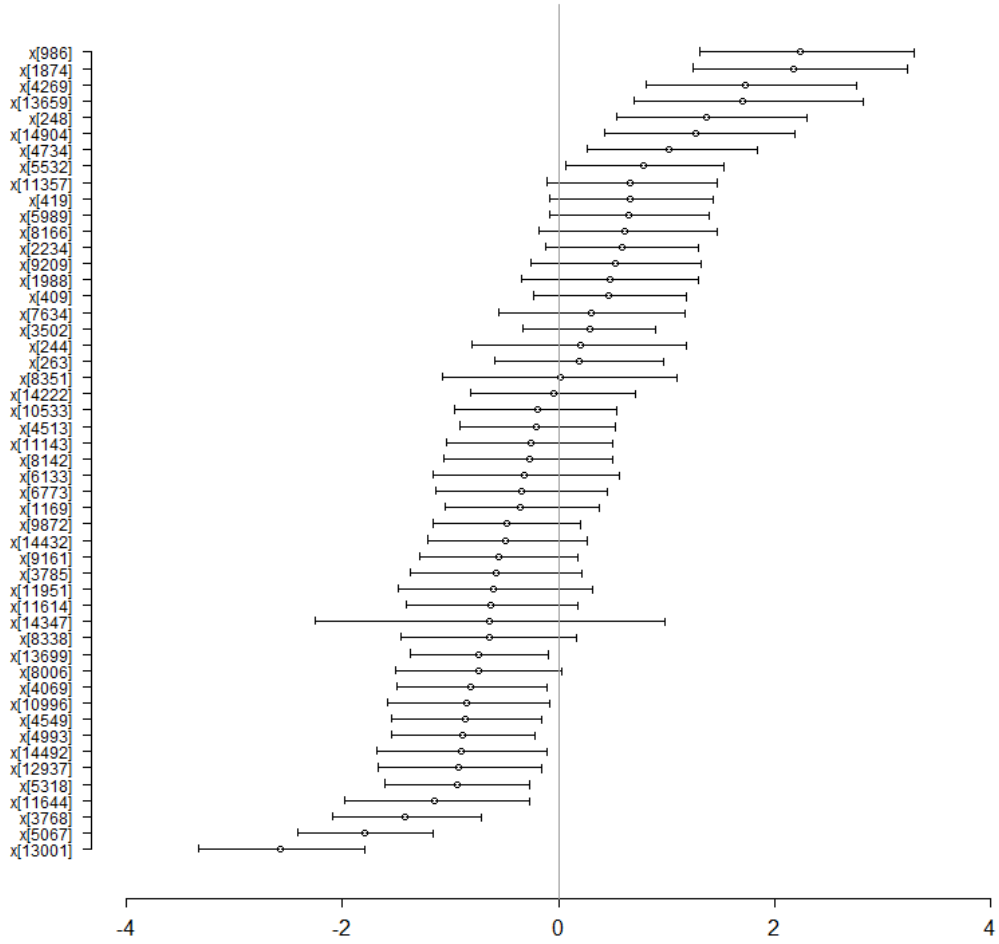

**Figure 4 – Difficulty and Discrimination Parameters for an Average Country**

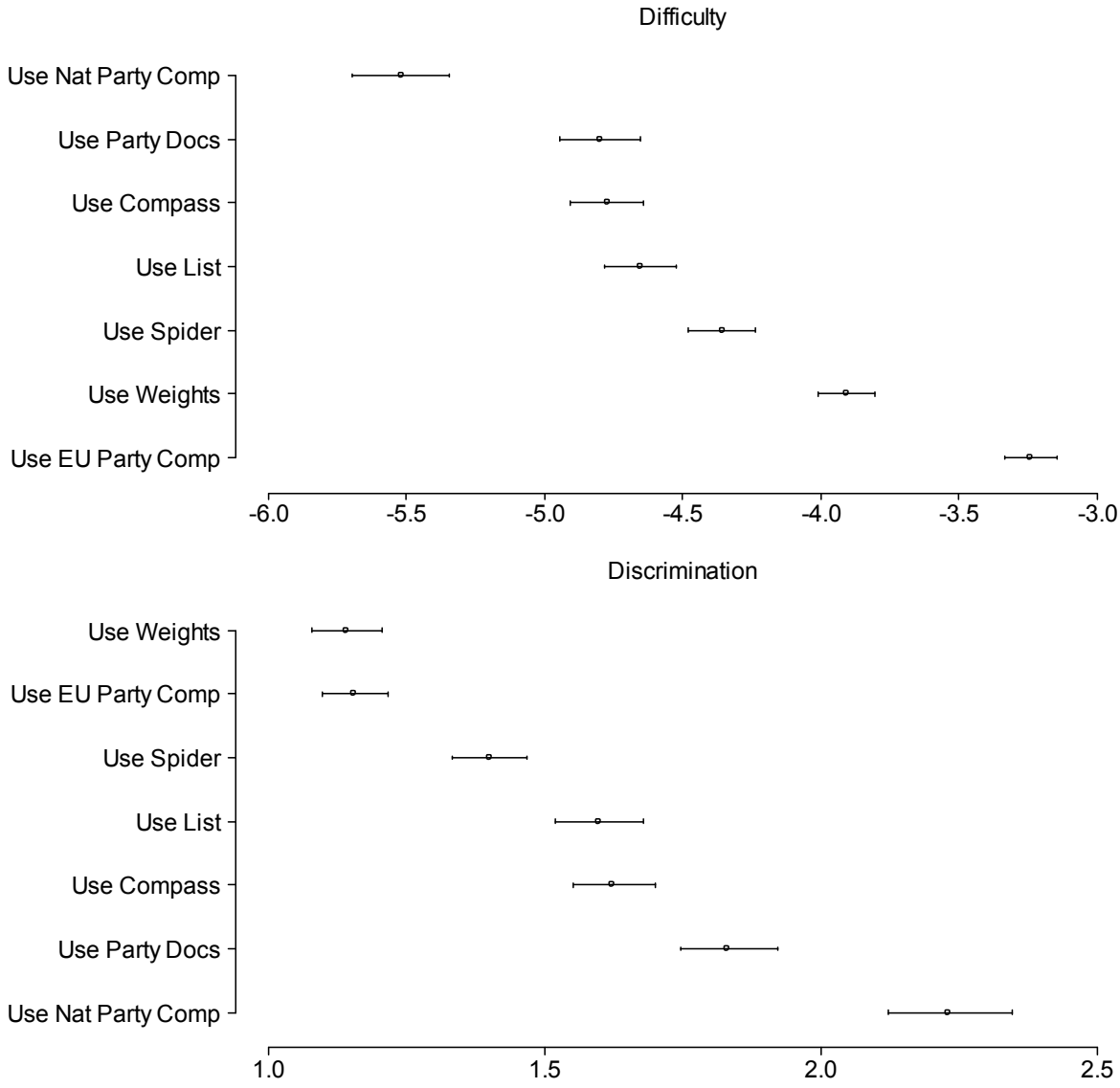

**Figure 5 – Relationship between Latent Valuation and Choice Probabilities**

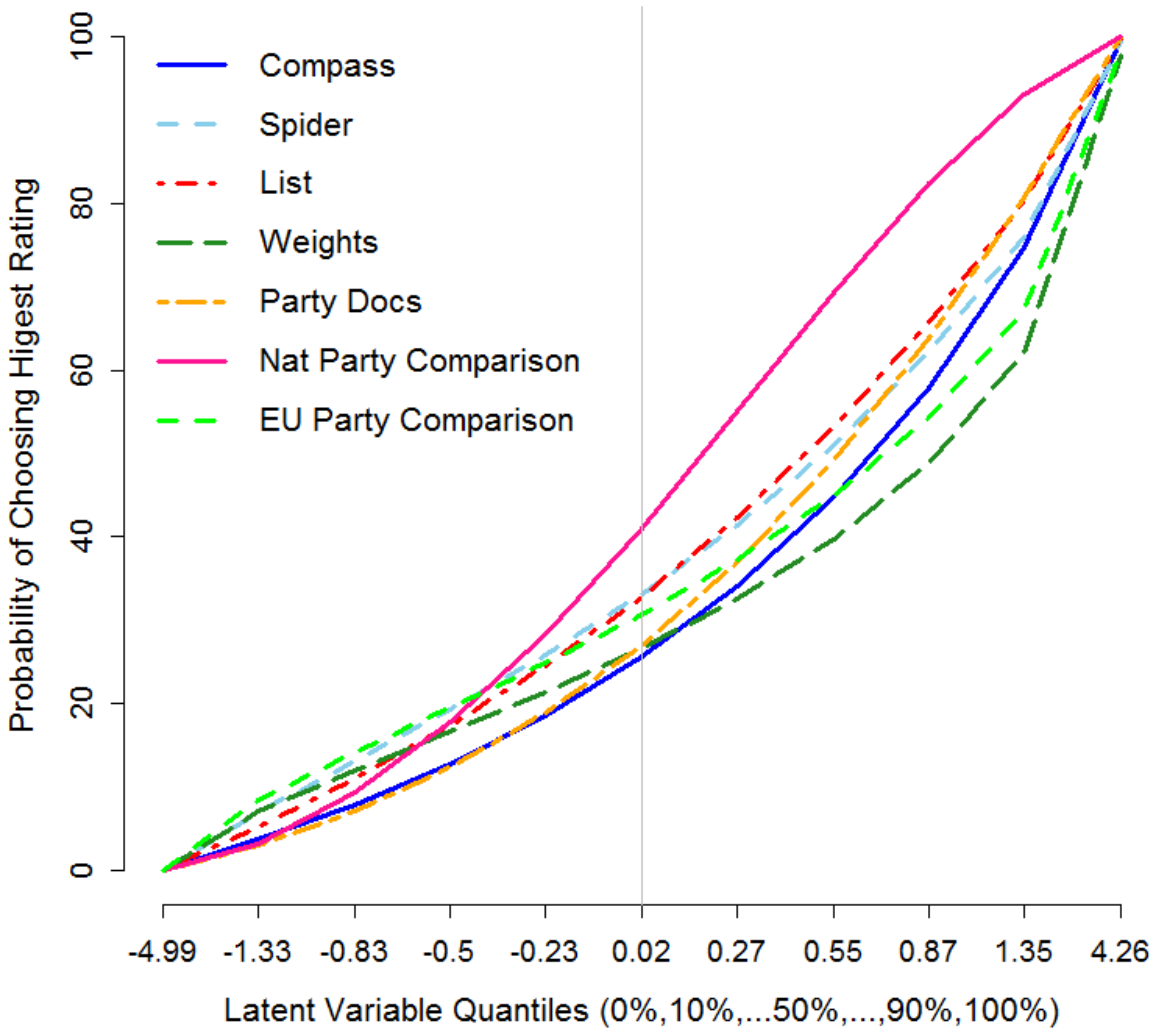

**Figure 6 – Coefficients of Explanatory Model**