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## **Internet Voting in Estonia**

### A Comparative Analysis of Four Elections since 2005

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## **Contents**

<b>Secrétariat général</b>	1
Directorate General of Democracy and	1
Political Affairs	1
Executive Summary	5
Method	5
Results	5
Introduction	9
Context of Internet Voting	11
Estonia and ICTs in general	11
E-voting in the context	12
Goals of the study	15
Methods	16
Results	18
The Internet and the campaign in the 2009 EP elections	18
Participation in elections: General and socio-demographic aspects	26
Where and when voters participated	26
Participation in elections by age and gender	31
Potential impact of e-voting on the frequency of electoral participation	35
Subjective reasons for the choice of e-voting and future prospects	41
Choosing to e-vote: explanatory models	46
Socio-demographic and -economic (SDE) model	46
Education	46
Occupational status	47
Income	48
Language	49
The SDE Model	50
The political model	53
The ICT model	57
The Global model	58

Conclusions	63
Recommendations	66
Annex	69



## EXECUTIVE SUMMARY

The recent decade has seen growing interest in Internet voting from the scholarly point of view as well as from the perspective of policy makers. Some have argued that the introduction of e-voting breaks down the barriers hindering political participation and, through easy access to the electoral process, boosts turnout. Others have a more pessimistic view, claiming that e-voting affects only those few who are highly engaged in politics already. This study aims to shed light on the topics beyond this debate. In particular, our objective is to analyse the determinants that lead some citizens to opt for e-voting and others for traditional means of participation. We ask the question of who is voting online and how can we explain the choice of the voting channel? Only then are we able to provide a more scrutinised answer to the question of whether Internet voting indeed affects the aggregate levels of turnout.

### *Method*

We draw our evidence from Estonia, the only country that has Internet voting available for its citizens across the whole country as a legally binding option to cast one's vote. In particular, our data stems from four elections: the 2005 local elections, 2007 national, 2009 European Parliament and 2009 local elections. In each of these years we have conducted a post-election survey of approximately one thousand citizens who are eligible to vote. Since our main research question is about the differences in the choice of voting channel, this sample has been proportionally split between e-voters, traditional voters and abstainers. To achieve comparability between the studies we have synchronized the research design of all four studies, i.e. gathered information about the same set of variables, subscribed to the same sampling procedures, and made use of the same data collection techniques. This enables us to shed some light on the progress of e-voting, the development and possible change in voting behavior and to draw conclusions over time beyond the descriptive and aggregate data.

### *Results*

One of the main questions is whether Internet voting exercises an effect on aggregate levels of turnout. We have addressed this question in our surveys with careful attention and the effect of e-voting does now seem to have an impact on aggregate turnout. In 2005, this extra-channel of electoral participation did not raise turnout levels. Our study, however, reveals that this has changed over the past two years. Our simulation showed that turnout in the 2009 local elections might have been up to 2.6 percent lower in the absence of Internet voting. A technologically induced change in turnout by 2.6 percent is far from negligible. Also, one needs to bear in mind that Estonia has seen a rapid growth of e-voters, affecting mostly the people who vote anyway. We have argued that from the

theoretical point of view, e-voting could only exercise an influence on politically disengaged people after it has been available for a while as the laggards, as opposed to the early adapters, are the last to adopt the new technologies. Therefore, the mobilization effects that we have found should not be dismissed that easily, since e-voting keeps attracting ever larger audiences. The chances that politically disengaged people come across Internet voting are therefore increasing.

Regarding the variables that predict the usage of e-voting as opposed to traditional means of voting, age has been considered an important property. We have found in our previous studies that e-voting in Estonia has been indeed a property of younger generations. While this is certainly true, the current study was able to show that with the growing number of e-voters at the last two elections in 2009, the new method of voting became much more dispersed across age groups than in early elections. This trend was visible particularly during the 2009 EP elections where e-voting was able to attract the broadest spectrum of age groups. We have speculated in our 2007 report that over-representation of the young disappears over time as they grow older and keep using the opportunity to vote over the Internet. This statement seems to gain validity in light of our comparative data analysis.

Estonia is a multilingual society with a considerable Russian minority. Our multivariate models have convincingly demonstrated that language is one of the most important predictors of the usage of e-voting, highly significant and stable over time, which indicates a systematic exclusion of the Russian-speaking minority from e-voting. The fact that the e-voting procedure is offered only in Estonian language caused a very large part of the Russian speaking community to refrain from using this tool. In order to convince larger parts of the already large community of Russian speakers in Estonia to use e-voting, offering this device in Russian becomes indispensable. Compared to previous elections, the two elections of 2009 improved the situation in this regard. More information on the internet voting channel was now made available in the run-up to the elections and clickable “adds” in Russian were put on official websites, leading potential voters to the internet voting website.

With respect to the ICT variables such as computing knowledge and the frequency of Internet usage, they have been important predictors of the usage of e-voting in 2005 and 2007, but lose their significance in subsequent elections. This finding can be explained in a similar fashion with the disappearing over-representation of the young voters. Namely, as more people start using e-voting and as the PC-literate cohorts age, the main predictors of early elections lose their explanatory power.

Political variables are the weakest predictors of the voting channel. To summarise, we have found that the variable measuring trust in the procedure of e-voting has remained significant for all the elections under investigation. As we have reported in our 2007 study, most of the use of e-voting boils down to the simple question: does one trust or not this mechanism to take one's vote correctly into account, producing trustworthy results? If this question can be answered by an unconditional, or almost unconditional "yes", then the probability for one's use of e-voting at the polls goes up significantly. Any successful information policy pointing in the direction of giving voters trust in the mechanism itself will therefore make this means of participation more popular.

Our multivariate models have also displayed a number of non-results, which are of great interest to us. For example, while controlling for other variables, we do not find an effect of gender, income, education and the type of settlement (urban, rural) on the choice of voting channel. This indicates that e-voting does not introduce systematic biases in a socio-demographic sense (with an exception of language) and is therefore a truly democratic procedure. This finding is even more solid since our results remain stable over time.

When e-voting was introduced in 2005, an important question was raised by politicians of whether e-voting is politically neutral. Indeed, we have found through the bi-variate relationships that e-voters do behave differently to traditional voters with respect to their party choice. In particular, we have found discrepancies between traditional voters and e-voters in how they vote for one party, and not the other. Also, our multivariate models show that left-right auto-positioning and the frequency of political discussions had significant impact on the choice of e-voting. However, these effects completely disappeared in our overall model, suggesting that these variables are correlated with more dominant determinants of e-voting: when controlling for all the independent variables, the initial political bias disappears. Moreover, the partial political models had very little explanatory power, hence we conclude that in the Estonian case the introduction of e-voting can be regarded as politically rather innocent.

Finally, we have seen that both voters and political parties are quickly adapting to Internet elections as well as the Internet as an information source. As would be expected, in general voters are more engaged in the campaign than are non-voters although sizable percentages of non-voters also were engaged in learning about the campaign. Moreover, some campaign activities affect both voters and non-voters similarly. Indiscriminate campaign tactics, such as political ads in newspapers and magazines and street tents, and direct mail similarly penetrate across both groups. However, if we consider exclusively Internet as a mode of education to learn about the campaign, then we find Internet voters

are much greater consumers of online information compared to both election day voters and advance polling station voters. When we compare the results of these questions with the ones from the 2007 Estonian parliamentary election, we see slight shifts across various categories. However, voter interest differed between the two elections, and there was a clear increase in 2009 in voter use of the Internet to gather information. There has also been an increase in the use of non-traditional media aggregators – blogs – as information sources between 2007 and 2009.

## INTRODUCTION

This report for the Council of Europe analyses the trends in the use of Internet voting since 2005, the year in which – for the first time - this means of casting a valid vote in a legally binding election became possible for the Estonian electorate. Thanks to the Council of Europe and the Estonian government we were able to academically follow up on the Internet voting experience in Estonia ever since. Amongst other things, we have conducted computer-assisted telephone surveys after the 2005 local elections, the 2007 national elections, the 2009 European Parliament elections and the 2009 local elections. In this report we present the data from the two surveys from 2009 and compare it to the earlier data. In particular, we will assess what voting channels have been used by what type of citizens and we will explore the various participation patterns and political behavior of citizens over time.

The data, exclusively gathered for this project, allows us to analyse various voting channels and their appeal to citizens. It offers us the opportunity to predict the usage of Internet voting versus traditional means of voting by taking into account numerous socio-economic, political and technology-related dimensions. Furthermore, this report offers an over time perspective covering four elections and it provides fruitful comparative insights. To achieve comparability between the studies we have synchronised the research design of all four studies, i.e. gathered information about the same dimensions, subscribed to the same sampling procedures, and made use of the same data collection techniques. This enables us to shed light on the progress of e-voting, the development and possible changes in voting behavior and to draw over time conclusions beyond purely descriptive and aggregate data.

The report is structured in a similar fashion to the previous two reports of 2005 and 2007. After the introduction, the second section of the report lays out the context in which Internet voting in Estonia has evolved. As we have devoted considerable attention to the description of the context of e-voting in our previous report, we refer the reader to also have a look at the 2007 report. The goals of the study will be introduced in the subsequent section four. Methodological foundations, as well as the overall setup of the study are highlighted in section five. Section six contains the analytical part of the study, involving both bi-variate and multivariate analyses of the electoral campaign in the age of the Internet as well as answers to the question of why Estonians chose (or refrained from) voting over the Internet. Section seven provides a brief summary of the findings and section eight builds a number of recommendations on the basis of the results of our analyses. The last section, the Annex, contains a number of tables we refer to in the section on the Internet and electoral campaigns.



## CONTEXT OF INTERNET VOTING

### *Estonia and ICTs in general*

Estonia is one of the most progressive countries in Europe when it comes to the use of the Internet and other ICTs in both the private and the public sector. Amongst other things, Estonia is the only country in Europe where access to the Internet is legislated as a social right. Already in February 2000, the Estonian Parliament approved a proposal to guarantee Internet access to each of its citizens, just like any other constitutional right. Being one of the leading investor in ICTs in the world, Estonia has reached a strong technological infrastructure: 63% of the households are connected to the Internet as of 2009. Since the introduction of Internet voting in 2005, this figure almost doubled. Also, today, more than 70% of citizens aged from 16 to 74 are using the Internet (Table 1).

**Table 1. Internet connections and Internet users in Estonia**

	2005	2007	2009
Households with Internet connection at home	38.7%	52.9%	63.0%
Internet users among 16-74 year old individuals	59.2%	63.6%	71.2%

Source: Statistics Estonia (2010) [www.stat.ee](http://www.stat.ee)

Overall, the use of the Internet is still growing and the access density is increasing, as is the spread of the public services available online. Numerous services offered online by the state to its citizens and companies are nowadays more heavily in demand than their offline counterparts. Examples include corporate or personal income tax declarations, the monitoring of children's progress at school, etc. The number of public services that are being made available via the Internet is rapidly growing and the government's cabinet meetings have been changed to paperless sessions using a web-based document system since 2000.

Estonia's governing bodies actively support the development of a society using up-to date information and communication technologies. To reach this aim, "Principles of the Estonian Information Policy 2004-2006" were adopted in May 2004 to "strengthen the central IT co-ordination and increase consistency and collaboration in developing the information society". In November 2006 the Estonian government endorsed the "Estonian Information Society Strategy 2013", which is a development plan presenting a general framework and basic objectives for the broad employment of ICTs in the development of a knowledge-based economy and society. The objectives of the Estonian

information policy for the upcoming years are the introduction of e-services in all state agencies and training and knowledge-raising activities for the whole society. In addition to strengthening the efficiency of the Estonian economy and society, the policy aims to adapt national action plans to be in line with EU priorities (particularly the objectives set out in EU i2010 and eGovernment action plans).

Additionally, an information technology action plan is annually approved by the government to set out information policy priorities and aims. The Ministry of Economic Affairs and Communications is responsible for the co-ordination of the action plan which summarizes the activities that state agencies put in place for the development and strengthening of the information society. Various projects aim at developing and integrating ICT infrastructures of state and local governments into a citizen-friendly service. Some key projects in this regard are the Participate portal ([www.osale.ee](http://www.osale.ee)), the eGovernment portal, the eSchool project and the electronic X-Road environment project.

### ***E-voting in the context***

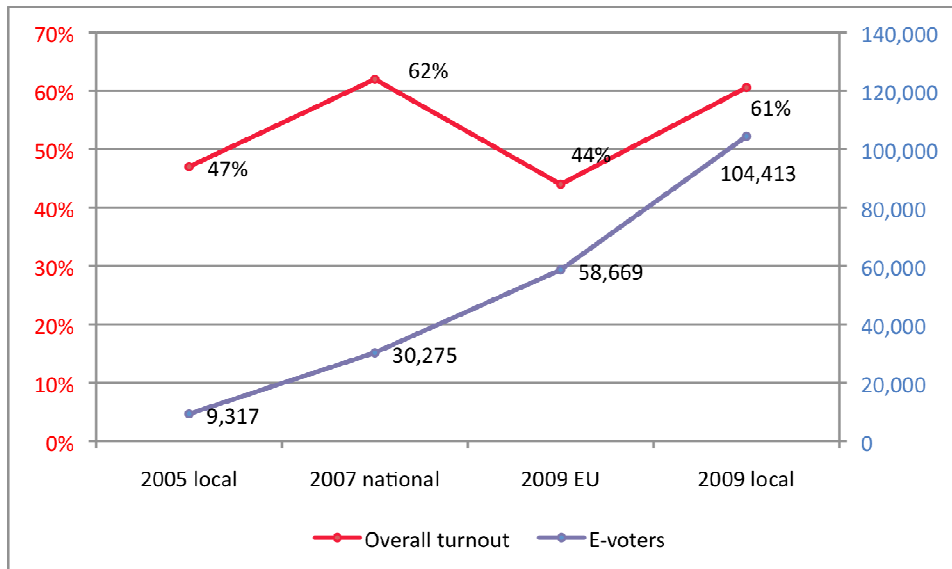
In October 2005 Estonia became the first country in the world to have nationwide local elections where people could cast their binding votes over the Internet. This world premiere was followed by the national parliamentary elections in 2007 where the number of Internet voters reached 3.4% of the total number of eligible voters<sup>1</sup>. In the following European Parliamentary elections in 2009 the number of e-voters increased to 6.5% and in local elections of 2009 to 9.5% of the eligible voters. Figure 1 presents the growth of e-voters and the overall turnout in elections graphically.

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<sup>1</sup> <http://www.vvk.ee/index.php?id=10610>



**Figure 1. Turnout and the number of Internet voters**



The success of the e-voting in Estonia is based on the widespread use of electronic identification cards. Since 2002 more than one million of these credit-card size personal identification documents have been issued. For Internet voters they allow people to cast legally binding digital votes at a high level of security. Participation in the electronic ballot requires a computer with an Internet connection and a “smart-card reader”. For less than ten Euros, these card readers are easily available at computer shops, supermarkets and bank offices. For users without a personal computer or Internet access, Internet voting is accessible through a wide number of free Internet access points in public libraries, community centers, banks etc.

For Internet voting, the user goes onto a website of the National Electoral Committee, [www.valimised.ee](http://www.valimised.ee) ([www.voting.ee](http://www.voting.ee)). The user first inserts the ID-card into a card reader and goes onto the website. Then the user is required to identify himself/herself through a PIN-code associated to his/her ID-card. If the user is eligible to vote, the system displays the list of candidates by party in the user’s electoral district. The user chooses a candidate by clicking on the name and confirms the choice by using a second PIN-code. At the end of the process, the voter receives a confirmation that the vote has been cast.

During the 2005 local and 2007 national elections Internet voting was available during three days of advance voting in the week preceding the respective elections. The period during which it is possible to vote was extended to seven days in both elections of 2009. To prevent coercion and fraud, Internet voters were allowed to electronically recast their electronic vote with their previous vote being deleted. For similar reasons, Internet voters can dismiss their electronic vote altogether by casting a paper ballot during the early voting period.

In order to learn about early development of the e-voting and concomitant legal issues, as well as the technical proceedings and e-voting principles we refer to our previous reports of 2005 and 2007.

## GOALS OF THE STUDY

The main goal of this study is to monitor the development of Internet voting in Estonia throughout the period where it has been available as an additional means to cast one's vote. In particular, our aim is to analyze the political, demographic and socio-economic factors and effects linked to the use of Internet voting in Estonia. Our analysis is based on four surveys that were carried out after each election since 2005 including: the local elections in 2005 (October), the national elections in 2007 (March), the European Parliament elections in 2009 (June) and the local elections in 2009 (October). Based on the conducted telephone surveys and the obtained data, the study aims at answering the following questions:

1. Who votes online? Who prefers the traditional channel of participation at the polling place? Do the socio-demographic and socio-economic profiles of Internet voters differ in any substantive way from those voting at the polling station and from those abstaining in the elections?
2. How can we explain the choice of the voting channel?
3. What is the impact of offering Internet voting on electoral participation?
4. What are the political effects (if there are any) of electronic voting? Is the introduction of this channel of participation politically neutral with regard to the outcome of the elections or not?
5. What role did ICTs play in the campaign preceding the 2009 European Parliament and local elections?
6. How do these results compare with the analysis presented in the earlier studies and what are the more general over time trends?

In answering these questions, this study is able to provide a thorough description and an in-depth analysis of the impact of Internet voting on the elections and the related voting behavior of the electorate. This allows us to generate some substantive conclusions and recommendations regarding both the specific application of e-voting in the Estonian case and more general aspects of the Internet as a new voting channel and its impact on elections. The fact that the findings of the study offer a powerful perspective over time (because of the related studies conducted in all elections where e-voting has been present) strengthens the relevance of the results and conclusions of this research.

## METHODS

In order to answer the above-mentioned questions, after each election we conducted classic, computer-assisted telephone surveys among the Estonian electorate. Approximately 1000 respondents were sampled for each of the studies who had the right to cast their ballot in the corresponding elections. However, since our major goal is to compare Internet voters with those voting at the polling station, and those abstaining in the elections, our sampling strategy needed to account for the choice of the voting channel. To achieve this, we instructed the survey company to sample Internet voters, voters at the polling station and abstainers in approximately three equal parts. For statistical reasons, a purely random sampling technique would have lead – in particular in 2005 and 2007 – to low numbers of Internet voters among the respondents (see explanations below). With only a few dozen e-voters in our survey, most of the analyses would have been impossible to conduct. Hence the choice of oversampling Internet voters. The following table illustrates the respondents in all four surveys according to the choice of the voting channel.

**Table 2. Sample structure by voting channel**

	2005 Local		2007 National		2009 EP		2009 Local	
Voters at the polling station	318	33.9%	365	37.3%	278	28.0%	337	33.7%
Internet voters	315	33.6%	367	37.5%	400	40.3%	328	32.8%
Abstainers	305	32.5%	246	25.2%	315	31.7%	334	33.5%
Total	938	100%	978		993	100%	999	100%
			100%					

These data allow us to undertake a thorough analysis of the voting channels and voting behavior of the Estonian electorate. The survey method used was CATI (*computer-assisted telephone interviews*) and the surveys themselves were outsourced to a survey agency in Estonia, called OÜ Faktum & Ariko.

Despite the fact that the number of e-voters has been rapidly increasing, a major difficulty was to sample a sufficient number of e-voters. Evidently, it is difficult to rely on the random sampling strategy when there are only about 9000 e-voters in the first place (like in 2005). The likelihood that these rare cases will be sampled will be very low. In order to overcome this difficulty, the Estonian National Electoral Committee, on our request, provided us with 1000 names of e-voters, randomly chosen, who participated in

the elections. The survey company researched the phone numbers of these voters and contacted them with the permission of the Electoral Committee. The voters' details were later completely anonymised by the survey institute. Considering the rather low number of e-voters, especially during the first couple of elections, it is very satisfying that we managed eventually to interview a number of e-voters that corresponds to one third of our total sample.

The Estonian National Electoral Committee has given the research team – as already mentioned – access to its aggregate data in conformity with, and within the limits of, the data protection and electoral legal framework. Taken together, these data sources combine aggregate data (official statistics) with individual level data (stemming from our survey) and allowed the research team to effectively answer the questions presented above. We would like to warmly thank the Estonian authorities for their exemplary cooperation with our research team.

The proponents of the study can build on a large experience with surveys in the field of e-voting. Central questions of already developed questionnaires, particularly those of the e-voting pilots in the Swiss cantons of Geneva and Zurich, were used in their original wording or adapted to the Estonian context. The research team replicated the first (2005) questionnaire for the survey, adding relevant questions primarily concerning the campaign preceding the actual poll.

## RESULTS

### *The Internet and the campaign in the 2009 EP elections*

In 2009, our survey of a sample of the Estonian electorate also included a series of questions related to the European Parliamentary election campaign and where Estonian voters obtained their political information. These questions replicate a series asked for the first time in the 2007 parliamentary elections. A primary research question is whether the addition of the Internet voting channel in Estonia is altering how voters access information, and how political parties are reaching out to potential voters: is the availability of Internet voting changing the nature of political discourse in Estonia? The survey questions on the flow of political information focused on (1) the general way in which voters were exposed to the campaign; (2) whether individuals used the Internet to educate themselves about the issues, parties, and candidates in the election, (3) the most common ways that voters perceived the political parties used to communicate with them. For each of these three sets of questions, we examine first the difference in perceptions and experiences between voters and non-voters in the European parliamentary elections. Second, we consider differences in perceptions and experiences among Election Day voters, polling station advance voters, and Internet voters. Our interest is in seeing if voters who cast ballots using different modes of voting also access the campaign differently. For example, do Internet voters also use the Internet more to access information about the campaign? In addition, using these data we can see the ways in which voters and non-voters differ in their search for campaign information. Finally, we can examine how voters and non-voters perceive the push of campaign information from parties and candidates and whether there are differences in perceptions across various groups.

We begin by examining the sources from which individuals obtained information regarding the campaign and elections (Table 3). As would be expected, in general voters are more engaged in the campaign than are non-voters although sizable percentages of non-voters also were engaged in learning about the campaign. When we consider various campaigning tactics, we find that there are some campaign activities that affect both voters and non-voters similarly. Indiscriminate campaign tactics, such as political ads in newspapers and magazines and street tents, and direct mail similarly penetrate across both groups. There are also very high levels of penetration across both groups for radio, television, and newspaper articles. Voters are also more likely to discuss the election with co-workers or friends compared to non-voters.

When we examine campaign information sources for only voters, based on their mode of voting, we find that there are marked differences between individuals who vote in person on Election Day, those who vote early in person, and Internet voters. Specifically, Internet voters tend to be less affected by traditional modes of political communication.

They are less likely to have obtained information from radio, flyers and leaflets, party tents and outdoor events, or direct mail. Internet voters are similar to other voters in their use of newspapers and television as sources of election information but they listen to the radio less than in-person voters. The major difference between Internet voters and polling place voters is that Internet voters are more likely to obtain election information online and to talk about the election with family members. There are also interesting differences between advance polling station voters and Election Day voters. Advance voters tend to be slightly more engaged than are Election Day voters in the process of obtaining information about the election, except that early voters use the Internet slightly less than Election Day voters for information.

**Table 3. Campaign Information Sources: Averages by Mode of Participation**

Could You Tell For Each Information Whether You Have Obtained Information On The Issues At Stake In The Elections From These Sources During The Campaign Preceding The Elections?	Did You Vote In The 2009 EP Elections in Estonia?	How Did You Vote In These Elections?	Voted On Election Day	Voted In Advance Polling Station	Voted By Internet
	Yes	No			
Editorial contributions to newspapers and magazines	<b>74.05%</b>	<b>62.22%</b>	75.45%	83.33%	72.00%
Radio broadcasts concerning the elections	<b>64.96%</b>	<b>56.51%</b>	<b>71.43%</b>	<b>79.63%</b>	<b>59.00%</b>
TV broadcasts concerning the elections	<b>86.95%</b>	<b>72.38%</b>	85.27%	96.30%	86.50%
Leaflets, flyers	<b>39.88%</b>	<b>47.94%</b>	<b>45.54%</b>	<b>53.70%</b>	<b>34.50%</b>
Political ads in newspapers and magazines	35.48%	38.10%	37.95%	44.44%	32.75%
Posters in the streets	<b>22.14%</b>	<b>33.02%</b>	24.11%	16.67%	21.50%
Opinion polls	<b>37.24%</b>	<b>20.00%</b>	<b>28.13%</b>	<b>33.33%</b>	<b>43.00%</b>
Party's election tents, stalls in the streets and parks	7.62%	10.48%	<b>12.50%</b>	<b>7.41%</b>	<b>5.00%</b>
Direct-mailing materials	34.16%	31.43%	<b>37.50%</b>	<b>48.15%</b>	<b>30.50%</b>
Discussions at your workplace/educational institution	<b>26.83%</b>	<b>15.87%</b>	21.43%	25.93%	30.25%
Discussions among your family, friends	<b>63.64%</b>	<b>52.06%</b>	<b>55.36%</b>	<b>62.96%</b>	<b>68.50%</b>
Communications on the Internet	18.77%	16.19%	<b>13.39%</b>	<b>9.26%</b>	<b>23.00%</b>
SMS/text messages	6.89%	6.03%	4.91%	9.26%	7.75%



Email	9.68%	10.48%	<i>6.70%</i>	<i>7.41%</i>	<i>11.75%</i>
<b>Somewhere else (partisan happening, public debates, etc)</b>	7.18%	6.35%	6.25%	3.70%	8.25%

Note: bold-faced entries are instances where a t-test for the observed row frequency comparisons are statistically significant,  $p < 0.05$ . Entries in italics have a  $p < 0.10$ .

Next, we consider differences in the use of the Internet as a mode of education for citizens in Estonia (Table 4). Not surprisingly, voters are more likely than non-voters to use the Internet to learn more about the campaign, although 30 percent of non-voters also read about the campaign online. In almost every case, voters used the Internet more than non-voters for campaign purposes. When we examine voters more carefully, we find that Internet voters are much greater consumers of online information compared to both Election Day voters and advance polling station voters. Internet voters were 20 percentage points more likely to have read about the elections online and to have used the Internet to inform themselves about politics compared to traditional Election Day voters. Online information about candidates and political parties was used by almost 40 percent of voters and 46 percent of Internet voters in their search for election information and almost 38 percent of voters and 44 percent of Internet voters used the Internet explicitly to find information about whom to vote. Internet voters bring their ICT skills to all aspects of the electoral process, not just the process of voting. We also see small but important differences between advance polling station voters and Election Day voters, with advance voters more likely to use the Internet to learn about politics and the elections.

When we examine new modes that political parties can use to communicate with potential voters—such as blogs, emails, videos, or online commentaries—we find that there are few differences among voters and non-voters or among voters voting online or in a polling station. Voters and non-voters alike watched campaign video clips online, which suggests that this is a medium that can penetrate to the non-voting population even if it may not have motivated them to cast a ballot. Voters were much more likely to read blogs to inform themselves about politics compared to nonvoters. Only a small number of voters signed up for emails or posted information about the election online, with Internet voters the most likely to do so. In Tables 4 and 5, it is important to note that there are several questions, such as whether individuals signed up to receive emails from the candidates or political parties, which have very low response rates. In such cases, it is difficult to make any generalisations across voting mode for these questions.

**Table 4. Internet as a Mode of Education: Averages by Mode of Participation**

<i>(In Percent for those Answering "Yes")</i>					
	Did you vote in the 2009 EP elections in Estonia?		How did you vote in these elections?		
	Yes	No	Voted on Election Day	Voted in Advance	Voted by Internet Polling Station
<b>In the months leading up to the EU parliamentary elections, did you hear or read anything online about the EU parliamentary elections?</b>	<b>65.68%</b>	<b>46.55%</b>	<b>61.19%</b>	<b>40.00%</b>	<b>68.77%</b>
<b>Do You use the Internet in order to inform yourself about politics?</b>	<b>40.15%</b>	<b>30.60%</b>	<b>38.35%</b>	<b>25.00%</b>	<b>41.93%</b>
Volunteer online to work for a campaign	1.27%	0.85%	0.75%	0.00%	1.54%
<b>Look for more information online about political party or candidates' positions on the issues or voting records</b>	<b>40.76%</b>	<b>21.79%</b>	<b>28.36%</b>	<b>34.62%</b>	<b>45.64%</b>
<b>Look online for whom to vote</b>	<b>38.48%</b>	<b>19.66%</b>	<b>30.08%</b>	<b>7.69%</b>	<b>43.59%</b>
<b>Participate in online endorsements or ratings polls</b>	<b>34.24%</b>	<b>25.21%</b>	<b>26.87%</b>	<b>19.23%</b>	<b>37.95%</b>
<b>Use the Internet to check the accuracy of claims made by or about the political party or</b>	<b>22.46%</b>	<b>14.96%</b>	<b>11.94%</b>	<b>23.08%</b>	<b>26.15%</b>

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**candidates**

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Watch video clips about the political party or candidates or the election that are available online	<b>26.09%</b>	<b>19.66%</b>	20.15%	19.23%	28.72%
Sign up to receive email from political party or candidates or campaigns	<b>3.44%</b>	<b>0.85%</b>	<i>0.75%</i>	<i>0.00%</i>	<i>4.62%</i>
Post your own political commentary or writing to an online news group, website or blog	6.16%	5.56%	6.72%	3.85%	6.15%
Forward or post someone else's political commentary or writing	1.81%	0.43%	1.49%	3.85%	1.79%
Create and post your own political audio or video recordings	<b>17.21%</b>	<b>9.40%</b>	13.43%	15.38%	18.72%
Forward or post someone else's political audio or video recordings	<b>3.44%</b>	<b>0.85%</b>	<i>0.75%</i>	<i>0.00%</i>	<i>4.62%</i>

Note: bold-faced entries are instances where a chi-square test for the observed row frequency comparisons are statistically significant,  $p < 0.05$ . Entries in italics have a  $p < 0.10$ .

We next consider how political parties and candidates used various modes of campaigning to push information to citizens, as perceived by the citizenry (Table 5). Not surprisingly, we see that parties and candidates were more likely to have their messages received by likely voters as compared to non-voters. The most indiscriminant form of campaigning—door-to-door canvassing—was little used in this campaign. E-voters and early voters reported more contacts by mail from a party or candidate compared to others. Likewise, Internet voters were three times as likely as others to receive an email contact from a candidate or party.

**Table 5. Information from political parties and candidates: Averages by mode of participation**

	<i>Did You Vote In The 2009 EP Elections In Estonia?</i>		<i>How Did You Vote In These Elections?</i>		
In the past two months have you....?	Yes	No	Voted on Election Day	Voted in Advance Polling Station	Voted by Internet
Received mail urging you to vote for a particular political party or candidate	<b>24.49%</b>	<b>15.24%</b>	<i>19.64%</i>	<i>22.22%</i>	<i>27.50%</i>
Received email urging you to vote for a particular political party or candidate	<b>12.17%</b>	<b>8.25%</b>	<b>5.80%</b>	<b>0.00%</b>	<b>17.50%</b>
Been visited at home by someone urging you to vote for a particular political party or candidate	<b>1.61%</b>	<b>0.32%</b>	<i>3.13%</i>	<i>1.85%</i>	<i>0.75%</i>
Received prerecorded telephone calls urging you to vote for a particular political party or candidate	<i>5.87%</i>	<i>3.49%</i>	<i>4.91%</i>	<i>7.41%</i>	<i>6.00%</i>

Note: bold-faced entries are instances where a chi-square test for the observed row frequency comparisons are statistically significant,  $p < .05$ . Entries in italics have a  $p < 0.10$ .

When we compare the results of these questions from the 2007 Estonian parliamentary election with the ones from the 2009 European parliamentary elections, we see slight shifts across various categories. However, voter interest differed between the two elections, and there was a clear increase in 2009 in voter use of the Internet to gather

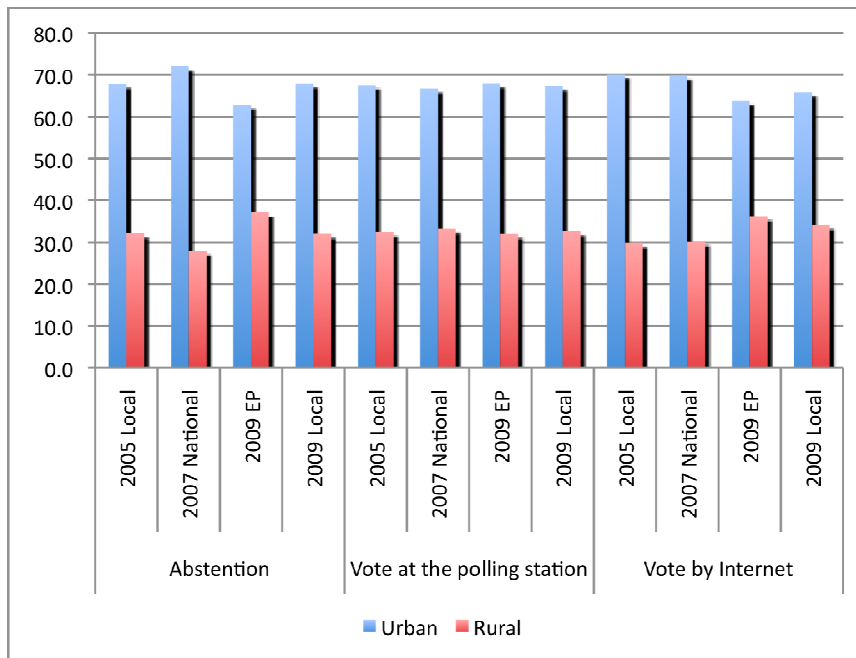
information. There has also been an increase in the use of non-traditional media aggregators – blogs – as information sources between 2007 and 2009 (see Annex).

## *Participation in elections: General and socio-demographic aspects*

### **Where and when voters participated**

For the further analysis of the survey results, and in analogy to the previous studies, we first reduced the data concerning the geographical distribution of our respondents according to the type of settlement they live in. Their place of residence has been coded as either urban or rural, allowing us to measure whether or not the introduction of e-voting indeed creates – as it is often hypothesized in the literature – a cleavage between cosmopolitan, urbanised voters using this “hype” form of participation and their less modern, rural counterparts, who prefer to rely on traditional voting methods.

**Figure 2. Mode of vote by place of residence (%)**



The results of this analysis support the findings of the previous studies: there is no significant difference in the general participation pattern and the use of e-voting based on the origin of the respondents. In other words, there is no major difference or bias between urban areas and the countryside (Figure 2).

Regarding the locus of Internet voting, Table 6 shows that a large majority of e-voters cast their e-ballot from home, and increasingly so if one considers the over time trend. Conversely, workplaces and educational institutions are losing their importance as places to access e-voting system and only a very limited number of users have logged onto the system in order to vote either from the public Internet access point or from another place, for example a café or a friend’s place.

These results indicate a significant move toward an ever more private form of voting behavior. E-voting seems to be increasingly a feature of the private environment rather than an activity carried out in a public place. Whether it is a truly individual form of voting, however, remains an interesting question. It has been long speculated that voting from home reduces vote confidentiality, and may expose either younger or elderly voters to the influence of their close relatives. The extremely low numbers of re-cast votes over the Internet, indeed a quasi-absence of the latter, go against these assumptions, though. If “private” voting was the result of coercion behind closed doors, this would arguably lead to higher numbers of re-cast ballots. Likewise, complaints would have started to appear. So far, this was not the case.

**Table 6. Where e-voters cast their ballots**

	2005 Local	2007 National	2009 EP	2009 Local
Home	54.5%	68.3%	78.8%	76.8%
Workplace/educational institution	36.6%	28.4%	18.1%	21.7%
Public Internet access point	5.1%	1.4%	0.5%	0.6%
Elsewhere (cafe, friend's place)	3.8%	1.4%	1.8%	0.9%
Abroad	n/a	0.5%	0.8%	n/a
	100%	100%	100%	100%

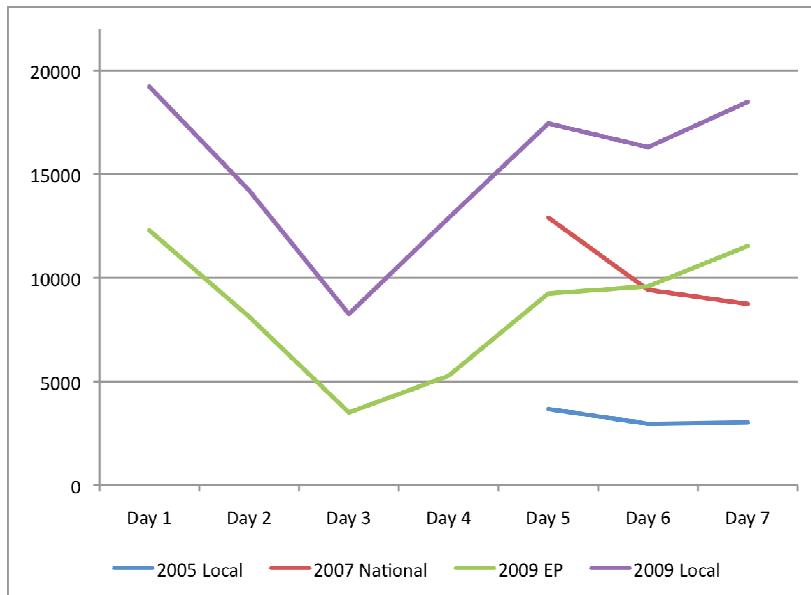
With regard to the usage of e-voting across the voting period, we have aggregate data that is based on the entire group of e-voters. It is important to note that the voting period was extended from three days in 2005 and 2007 to seven days for both elections in 2009, thereby following our previous recommendations for an extension of the Internet voting period.

The common feature of all elections is that the opening day of the e-voting period attracted most voters (Figure 3). However the results demonstrate two distinct patterns of the usage of e-voting. In 2005 and 2007 during three days of e-voting the number of e-voters gradually decreased toward the end of the voting period, whereas in both elections in 2009 the number of e-voters started to grow after the third day of early voting. The V-shaped pattern of the usage of e-voting is most likely due to the fact that the third day was a Saturday, but it also points to the importance of the length of the voting period as an important determinant of voting activity, especially if considering e-voting as a means of convenience voting. Finally, the campaign may have been more concentrated towards the

beginning of the early voting period and towards the end, a pattern that could be observed in other contexts of early voting over a week or more (e.g. in Switzerland). In the Swiss case, too, there generally is a camel-back-shaped curve of participation over the early voting period, indicating that large parts of the electorate cast a vote immediately upon receiving their voting material, with the other major part of the electorate waiting for the end of the campaign and sometimes for the very last moment. Note that similar patterns can be observed with regard to invoice payment patterns. While numerous people like to “get the thing out of the way”, others wait – for myriad reasons – until the very last moment to make their payment. Possibly, the extension of the voting period also leads to similar patterns to which campaigning has adapted, in particular in Switzerland, where voting is a very regular act of democratic decision making due to the existence of direct democracy at all levels of the federal state.

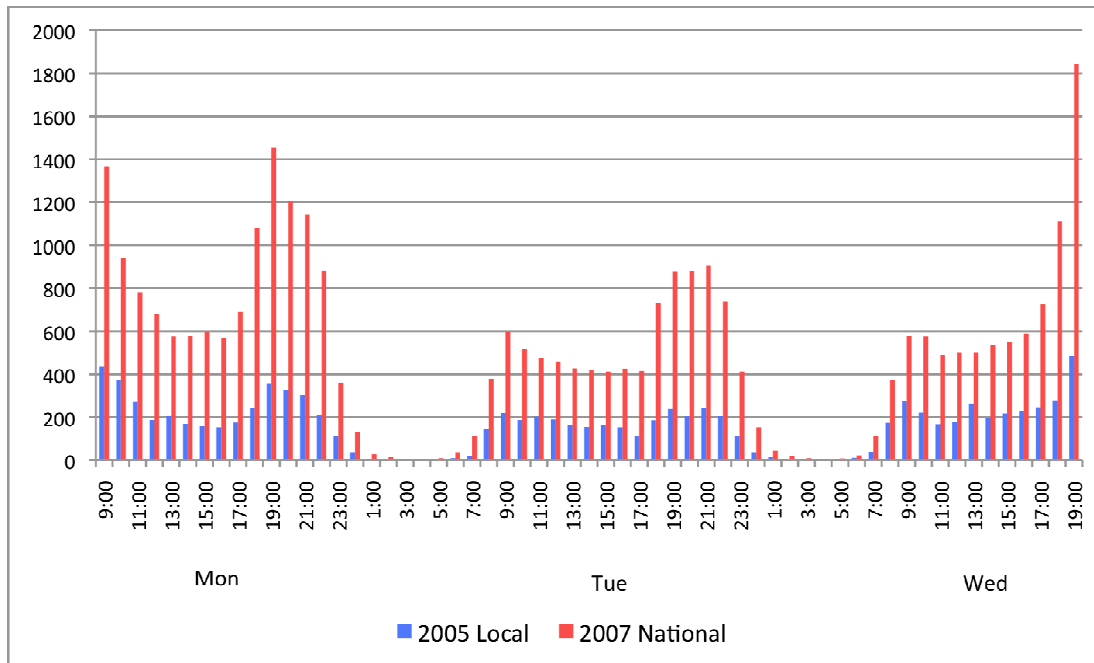


**Figure 3. E-voting across the voting period (number of voters by days)**

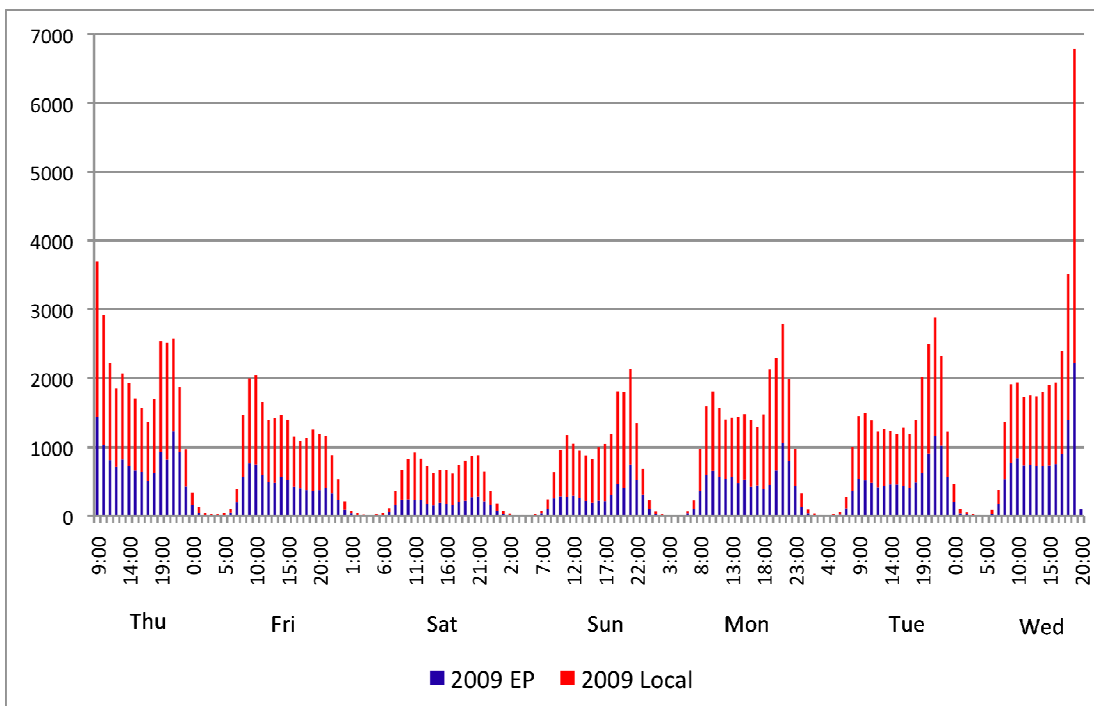


Differences in the frequency of voting over the Internet can also be measured across the hours of the day. We have collapsed four elections into two charts by the length of the voting period (Figures 4 and 5). As these Figures show, there are normally two peaks of e-voting regardless of the election type. The first one is between 9 am and 11 am, the second one between 6 pm and 10 pm. Based on these findings, one can assume that the majority of e-voters voted either at the beginning of their working day and when getting home from work. The weekend days seem to be no exception, although Saturday has a more equal distribution of voting hours than any other day. The distribution of the other hours of the day is almost identical, with a quasi-total absence of e-voting between midnight and 8 am. Finally, Figures 4 and 5 show that there are almost no differences between the individual elections with regard to the hourly voting patterns. A similar pattern holds for the two elections in 2005 and 2007 where the voting period was limited to three days.

**Figure 4. Number of e-voters by days and hours (2005 and 2007)**



**Figure 5. Number of e-voters by days and hours (2009)**

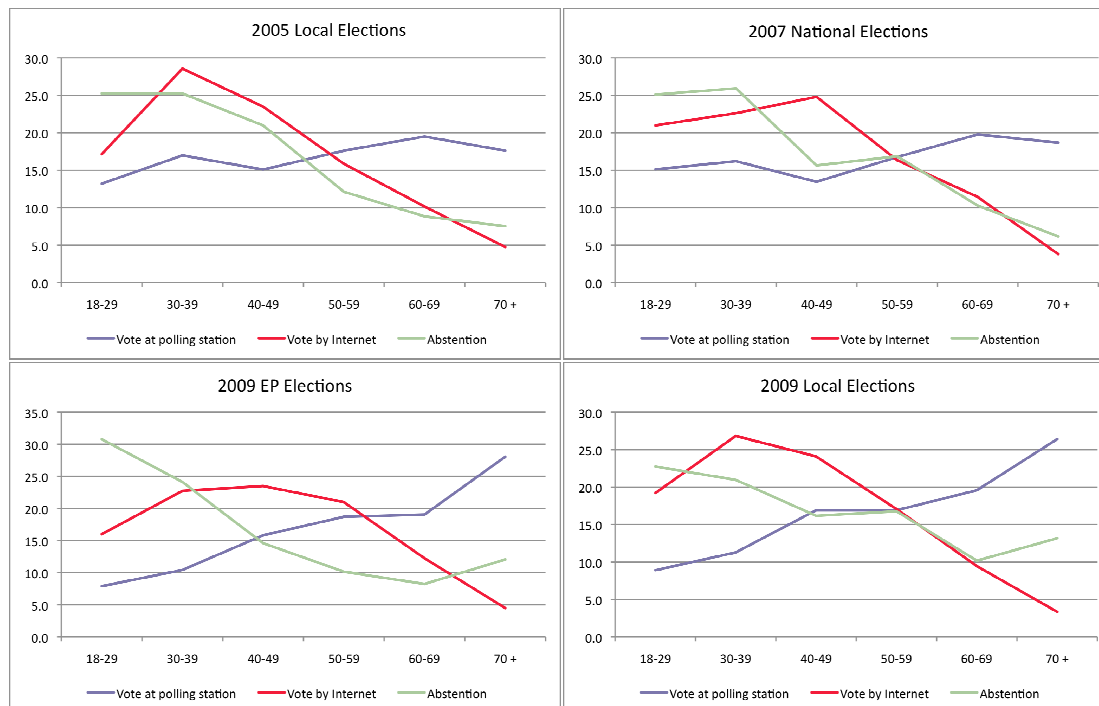


## Participation in elections by age and gender

Age and gender are the two demographic variables that are of obvious interest when researching Internet voting. A particular interest lies in their impact on the choice of voting channels, in order to answer questions such as “are younger people more likely to engage in e-voting?” and “what is its impact on political participation?” Gender is interesting with regard to potential gender gaps in Internet voting. Our results are displayed in Figure 6 and Table 7 and in both cases our surveys show very interesting results.

Considering voting behavior by age category, it becomes clear that above all younger people participated by voting over the Internet. Figure 6 indicates how far the decision to vote at the polling station, to vote by Internet or not to vote at all is related to the age of the respondents.

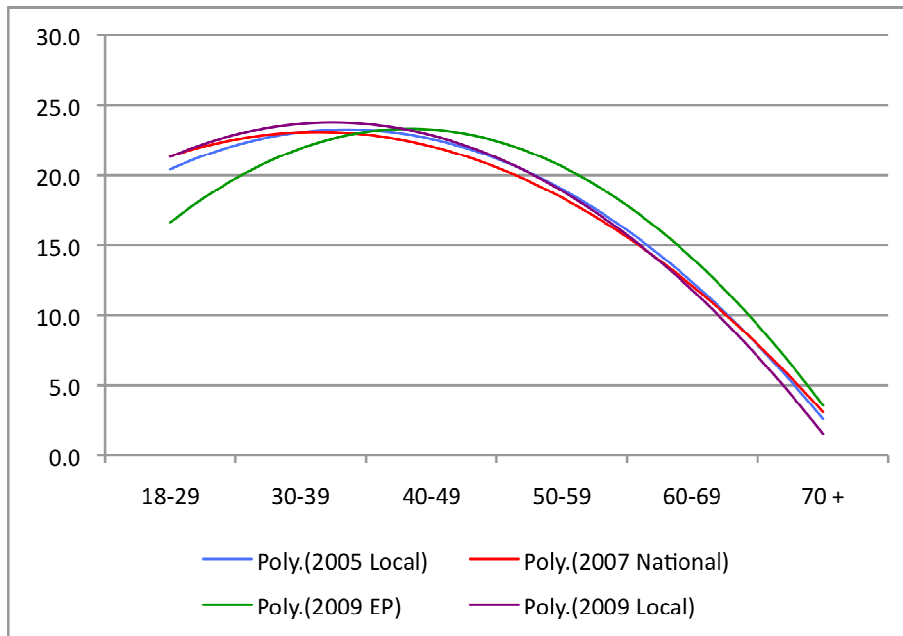
**Figure 6. Mode of vote by age (%)**



The curves in Figure 6 reveal that e-voting shows the inverse trend across age compared with the trend of voting at the polling station. The latter almost linearly increases with age while the opposite is true with regard to Internet voting. A deviation from this pattern, however, occurred during the 2009 EP elections, which stands out as an election where Internet voting was used not only by the young voters but also almost at equal rates up until the age group of 40-49. Had we not measured the usage of e-voting in the 2009 local elections, we could have concluded that as the number of e-voters increases the new method of voting becomes more dispersed across age groups and becomes less of

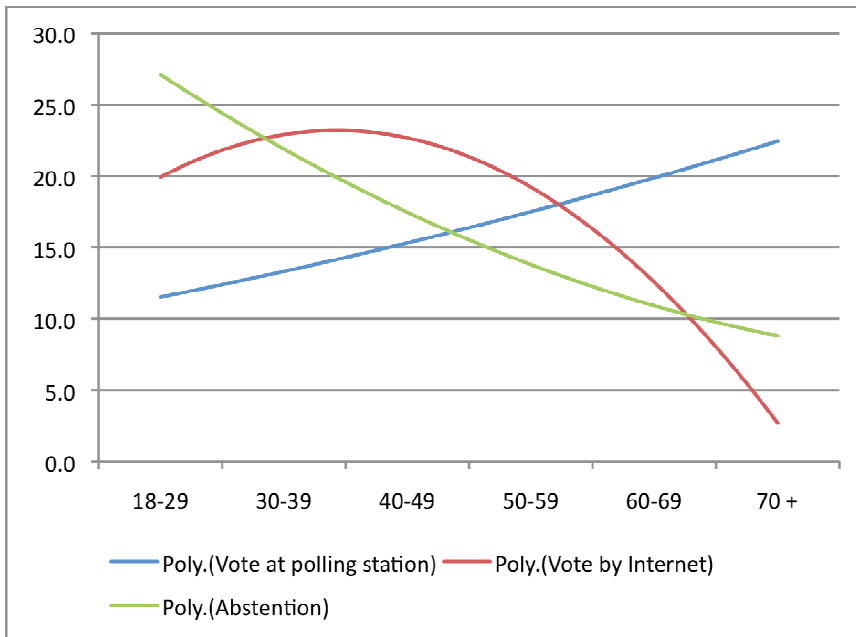
a property of the young voters. However, while not entirely false, this pattern seems to be conditioned by a particular election. In this case, the “second order” EP elections still attracted more e-voters than the local elections four years before, but also managed to attract an age group of 50-59 at the level where it has not been reached by any other election. The following figure (Figure 7) shows this particularity of the 2009 EP elections graphically. The figure shows fitted polynomial trend lines of the usage of e-voting across the age groups for all the elections.

**Figure 7. Fitted trend lines of the e-voters by age groups (%)**



Let us now return to the patterns of general voting behavior on the basis of the age groups. Regarding the youngest age group (18-29) we observe that e-voting appears to be, indeed, more popular than voting at the polling station and thus, we can conclude that the introduction of Internet voting seems to have a significant impact on the participation of younger voters in elections, but the ceiling effect conditioned most probably by the general level of political interest impedes the young to become the most prominent age group in voting online. In Figure 8 we have reduced the complexity of the actual data and calculated the means for each type of voting behavior (abstention, voting at polling station and voting online) across all four elections for each of the age groups and plotted the fitted polynomial trend lines. These show the general patterns of voting behavior on the basis of the age groups.

**Figure 8. Fitted trend lines of voters based on the means of all elections (%)**



Another interesting question arises with regard to the potential gender bias in the usage of Internet voting: does the introduction of e-voting introduce a gender gap and if so, how does it evolve over time? Before answering these questions it should be noted that females are over-represented in the total Estonian population. According to the official statistics in 2005 through 2009 53.9% of the people were females (Statistics Estonia 2009). Thus, if there is no gender bias in the usage of e-voting we would expect the female proportion of Internet voters to be slightly higher than the proportion of male Internet voters.

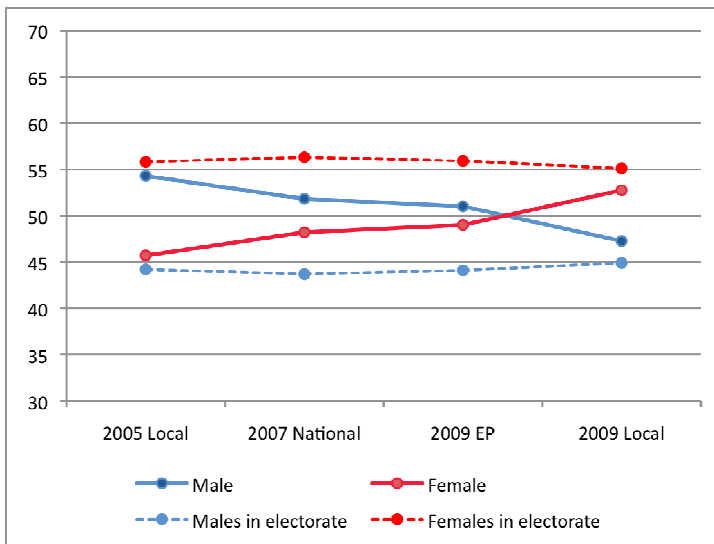
Table 7 shows the results of the choice of the voting channel by gender and indeed, it reveals that female voters are slightly over-represented in using Internet voting and this is similar to the aggregate age-structure of the Estonian population.

**Table 7. Gender and mode of participation (%)**

	Vote at polling station				Vote by Internet				Abstention			
	2005	2007	2009	Local	2005	2007	2009	Local	2005	2007	2009	Local
Males	41.2	38.5	34.5	37.4	49.8	48.8	46.8	41.5	45.3	44.9	54.3	44.9
Females	58.8	61.5	65.5	62.6	50.2	51.2	53.2	58.5	54.8	55.1	45.7	55.1

Fortunately, we have a precise measure of the potential gender bias in the form of the aggregate data of Estonian e-voting. Figure 9 shows the actual usage of Internet voting by gender. What this figure reveals is that there was a notable gender bias in the usage of e-voting toward males in the first election where e-voting was available. One could theorise that e-voting as a form of technological innovation may attract men as early adapters rather than women, but with subsequent elections, and with the overall increase of Internet voters, this bias gradually disappears. The 2009 local elections almost reached an equilibrium in this respect. As of the most recent election, there is no sizeable gender bias in Internet voting anymore (note, the dashed lines representing the distribution of males and females among the electorate).

**Figure 9. Internet voting by gender (%)**



Thus, we conclude that during the first two elections male voters were slightly disproportionately more mobilised by the possibility to vote over the Internet than was the case with their female counterparts, but this bias has almost disappeared by today. In our subsequent analysis we will come back to this point in more detail.

## Potential impact of e-voting on the frequency of electoral participation

In the following section, we focus on one of the most fundamental question of this report: the potential impact of e-voting on electoral turnout, i.e. to what extent the adoption of e-voting can increase the level of political participation. Keeping in mind that one of the main reasons for introducing e-voting was to increase voter turnout, the following analysis is of major interest to both academics and policy makers.

First, Table 8 presents the frequency of the respondent's usual frequency of political participation in elections and compares the latter to their specific mode of vote across all the elections under investigation.

**Table 8. Electoral participation by mode of vote (%)**

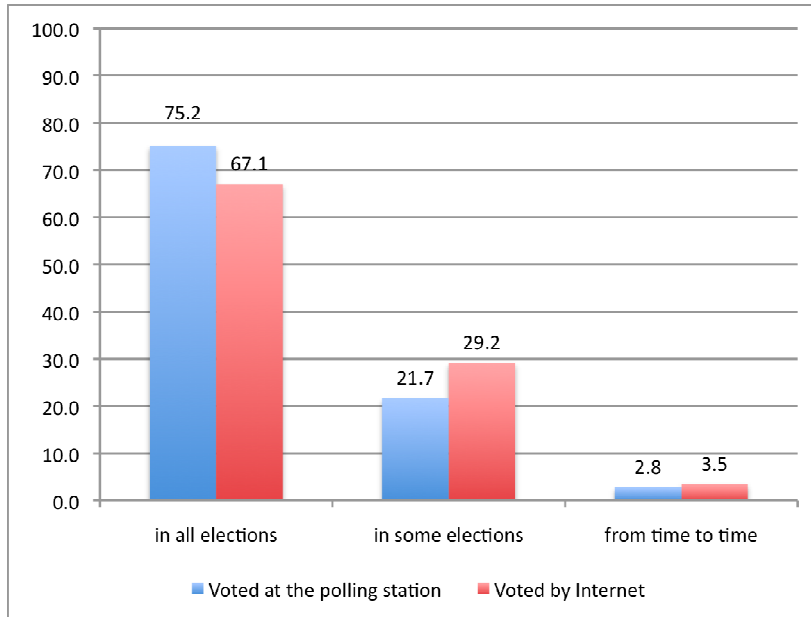
			In all elections	In some elections	From time to time
2005 Local elections	Vote at polling station		77.6	18.0	3.5
		Vote by Internet	70.2	24.4	4.8
2007 National elections	Vote at polling station		78.8	20.1	0.8
		Vote by Internet	67.9	29.4	2.5
2009 EP elections	Vote at polling station		77.7	18.0	4.3
		Vote by Internet	70.3	27.6	2.1
2009 Local elections	Vote at polling station		66.5	30.9	2.7
		Vote by Internet	59.9	35.2	4.9

Table 8 reveals that there is a slight difference between the usual patterns of political participation of voters who vote by traditional means or over the Internet. In particular, we observe that the disciplined voters who vote in all or most elections are more frequent among the traditional voters than among e-voters. Inversely, among e-voters, the categories of less frequent voters are larger than among traditional voters. Radical non-voters, however, are just as rare among traditional voters as among e-voters (less than 1% in 2005 and 0.3% in 2007 and none in 2009).

In order to provide a more comprehensible representation of the above-mentioned pattern, Figure 10 demonstrates the average participation levels of all four elections by the type of voting. One can see immediately that those voting at the polling station vote more regularly (by 8.1 percentage points) than e-voters; and conversely, e-voters are 7.4

percentage points more likely to vote in some (as opposed to all) elections than traditional voters. In other words, e-voters are less disciplined in their electoral participation, a fact which could indicate a slight mobilisation effect of e-voting.

**Figure 10. Average participation levels by the type of voting (%)**



Following the structure of the previous studies we also asked the respondents to answer the question whether they believe that the introduction of e-voting could boost the frequency with which they participate in elections. Figure 11 contains the answers to this question as a function of the respondent's usual pattern of political participation.



**Figure 11. Subjective estimation of future increase in participation if e-voting is introduced as a function of the frequency of the usual pattern of political participation (%)**



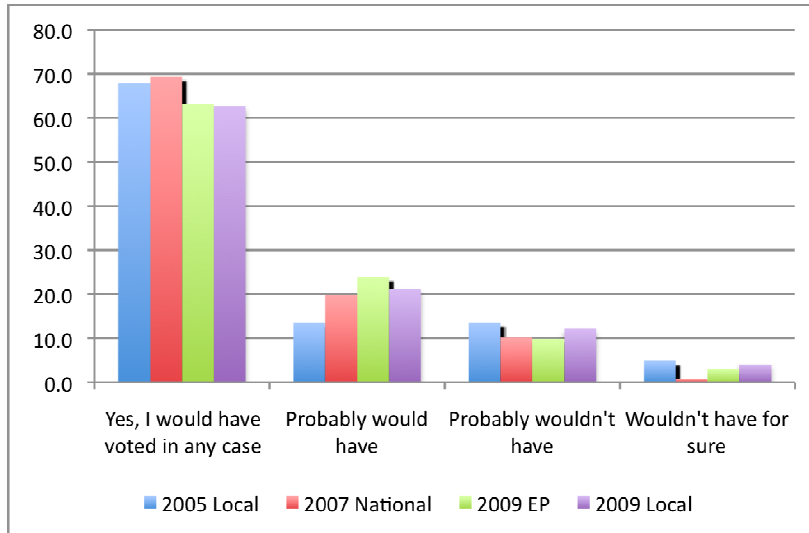
Note that respondents indicating that they voted in all elections were not asked about the potential of e-voting to increase their future voting frequency.

Analysing this figure, we see that voters who usually only vote in some elections are slightly more positive about e-voting's ability to promote their future electoral participation. The slight exception seems to be the election in 2005 when e-voting was first available. There was less variation in these subjective estimations about future behavior. Instead all respondents, regardless of their past political behavior, indicated very similar notions of how e-voting may interfere with their future participation at the polls. However, we can conclude that according to self-reflexive statements our respondents tend to show that e-voting as an alternative form of political participation may indeed increase one's willingness to turn out and this effect is higher among those who vote in some elections and weakens as the political participation becomes more rare. Thus, we can conclude that e-voting may have an effect on those citizens who have maintained some tangible level of political interest and vote occasionally. Conversely, those who are more disengaged from politics have also a lower probability of being mobilised by e-voting.

The last aspect of this section focuses on the perceived impact of Internet voting on individual turnout. In so doing, we have asked e-voters in our surveys whether they would have voted in the elections had they not had the possibility to vote by Internet.

Figure 12 displays the results of subjective estimation of participation in elections in the absence of e-voting.

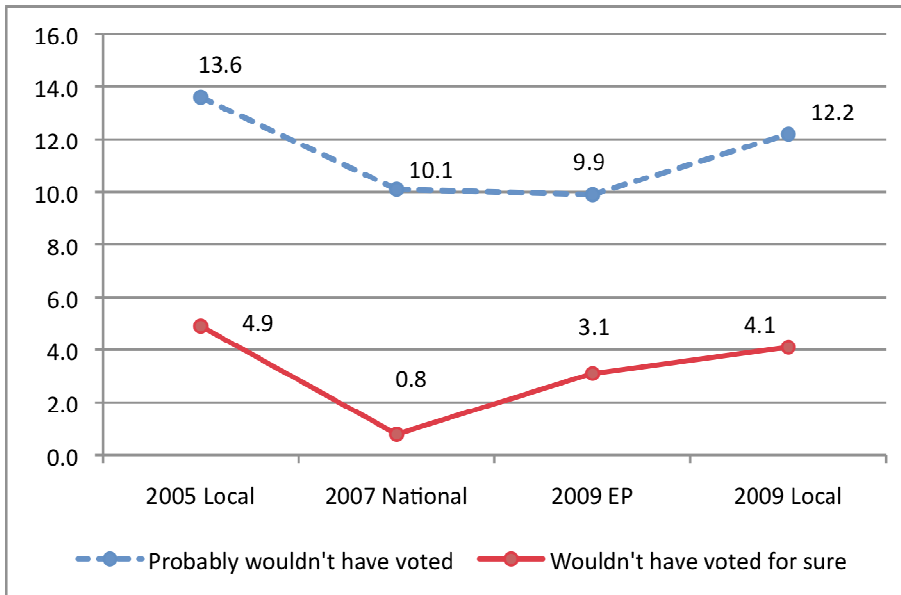
**Figure 12. Participation in elections in the absence of e-voting (%)**



The results are rather clear and of utmost importance with regard to the impact of e-voting on electoral turnout. Figure 12 reveals that the vast majority of e-voters would have voted anyway, even if it had not been possible to cast one's vote over the Internet. Furthermore, the second largest group of respondents *probably* would have voted in the absence of Internet voting. These two groups constitute the overwhelming majority of e-voters who are according to their own evaluations unaffected by the presence of Internet voting. However, it is worth to notice that over time the number of those who claimed to cast their vote anyway is slightly decreasing, whereas the opposite is true for those who claim that they *probably* would have voted.

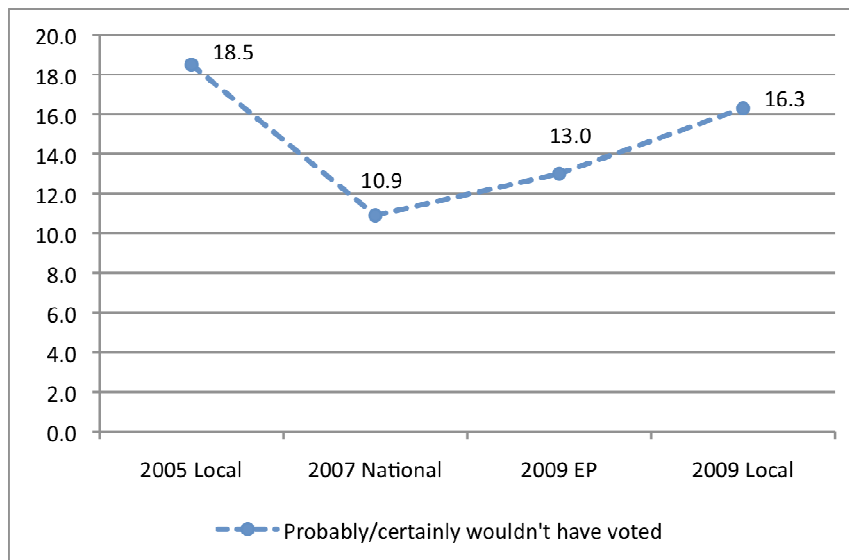
Next, we turn to the most interesting part of this particular question, the respondents claiming not to have voted had they not had the option of e-voting. Figure 13 displays the overtime dynamics of the percentages of those who *probably* and *certainly* would not have voted had there been no option to vote of the Internet, i.e. people who may have contributed to the overall levels of turnout.

**Figure 13. E-voters who probably and certainly would not have voted had there been no option to vote of the Internet (%)**



First, we see that the amount of those who would not have voted for sure is small (ranging from 0.8% to 4.9%, respectively), whereas the number of those who probably would not have voted is noticeable (from 9.9% up to 13.6%). Roughly speaking we can collapse these two categories into one and arrive at the percentages presented in Figure 14.

**Figure 14. E-voters who probably and certainly would not have voted had there been no option to vote of the Internet collapsed into one category (%)**



The results reveal that roughly speaking, at least one out of ten e-voters would (probably) not have voted, if the traditional voting channels had been offered exclusively. This proportion of voters is lowest in the 2007 national elections and highest in the 2005 elections with the option of e-voting in 2005, a fact which can most probably be explained by the initial enthusiasm of e-voters in 2005 (which may also have resulted in over reporting the potential influence). Furthermore, in 2007 the number of e-voters tripled causing a broader base for assessing its impact and therefore arriving at more conservative (and more realistic) estimates. The surprising thing, however, is the fact that the number of these voters has grown quite a bit in the two consecutive years.

These findings are obviously of utmost importance with regard to the question of whether the introduction of e-voting contains the potential to increase the overall voter turnout in elections. As we have shown above there is a noticeable amount of e-voters who certainly or probably would not have voted without the option of e-voting, however, the question remains: what would be its impact on the actual level of electoral turnout? For answering this question, we engage in a small exercise to demonstrate the impact of e-voting on the levels of turnout<sup>2</sup>. Table 9 displays the aggregate data and data calculated in combination with our survey data in order to find the number of e-votes that would not have been cast in the absence of the availability of Internet voting (the “lost votes”). Also, it shows us the (counterfactually deduced) level of turnout Estonian elections would have reached without Internet voting.

**Table 9. Potential impact of e-voting on electoral turnout**

	2005	2007	2009	2009
	Local	National	EP	Local
Would not/probably not have voted (%)	18.5	10.9	13	16.3
Potentially lost votes out of total e-votes	1724	3300	7627	17019
Potentially lost votes out of total votes (%)	0.3	0.6	1.9	2.6
Actual turnout (%)	47.4	61.9	43.9	60.6
Potential turnout without e-voting (%)	47.1	61.3	42.0	58.0

<sup>2</sup> The proposed extrapolation of these empirical findings should be taken for what they are: an extrapolation. A potential uncertainty remains, as we do not observe counterfactual scenarios. However, the extrapolation demonstrates one of the potential, empirically plausible, outcomes.

The results of this exercise are hard to misinterpret: the effect of Internet voting seems to be rather irrelevant for the aggregate turnout in the 2005 elections. There are two important observations we need to add. First, we witness a steady growth in the theoretical percentage of potentially lost votes over time, reaching 2.6 percent in the local elections of 2009. An increase of 2.6 percent in the overall turnout, simply due to the availability of Internet voting, is a substantial figure. Second, one needs to bear in mind that Estonia has seen a rapid growth of overall e-voters, affecting mostly the people who vote anyway (as we have shown in preceding sections). Theoretically, e-voting could only exercise an influence on politically disengaged people after it became available for a while, because according to the theory of technological innovation the laggards (as opposed to the early adapters) are the last ones to adopt the new technologies. Therefore, the differences in actual and potential turnout without e-voting must be seen as rather substantial.

### **Subjective reasons for the choice of e-voting and future prospects**

In accordance with the structure of our previous studies, before going into more details about structural relationships explaining the choice of e-voting in Estonian polls, we briefly present our data on the subjective reasons e-voters and traditional voters indicated for their respective choice of voting mechanisms.

First, we asked all e-voters in all surveys to spontaneously name the main reasons why they chose to vote over the Internet. These responses were coded by the interviewers into six categories, displayed in Figure 15.

**Figure 15. Subjective reasons for choosing to vote over the Internet (%)**

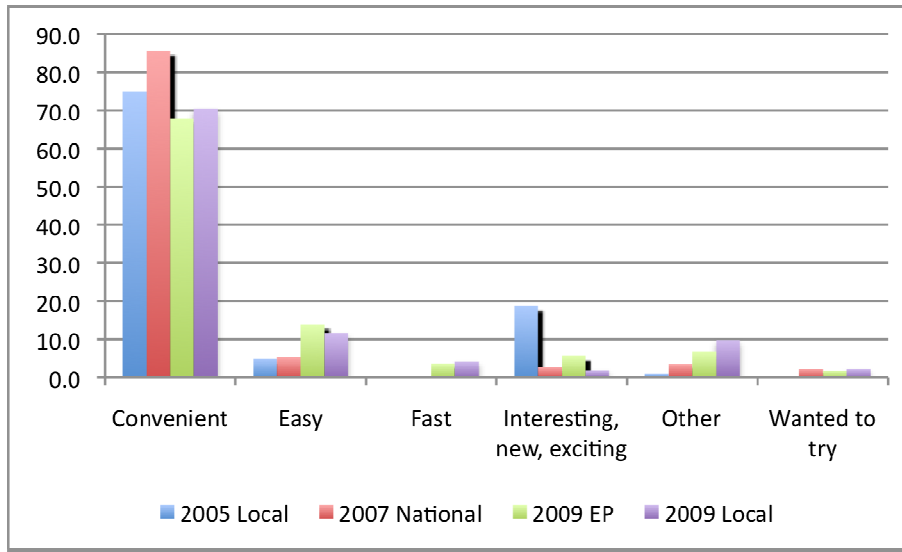


Figure 15 clearly shows that e-voting was above all perceived as a device of convenience, making voting more speedy, practical and, overall, simplifying participation. On average, 75% of e-voters across four elections mentioned this reason as having guided their choice for voting over the Internet. Compared to the 2005 *première* of e-voting, in which almost one fifth of the e-voters indicated that the “kick of the first time” (“wanted to try” and “interesting, new, exciting”) was the primary motivation to vote over the Internet, this proportion came down to less than 5% in 2007 and the following years. In other words, this “first time curiosity” which we could show in 2005 was significantly reduced, as the “curious voters” may have become more faithful to e-voting because the first experience in October 2005 was convincing to them.

The question of whether e-voting sticks to its user can be tested with our survey. We specifically asked all our respondents if they voted in each of the preceding elections and if they did so, by which channel. The results are rather astonishing. In 2007 we asked all our respondents if they voted in 2005 and if they did so, by which channel. In our 2007 sample we have 58 valid cases of reported e-voters in 2005. Of these 58 individuals, 58 voted over the Internet in 2007. In other words: the “faithfulness ratio” is 100 percent: none of the e-voters of 2005 still participating in 2007 did so otherwise than over the Internet. This is quite a strong finding. For participation-willing electors, having tested the Internet voting mechanism the first time, no movement back to traditional forms of participation could be measured. In our 2009 EP election survey, we find 116 e-voters from 2007 all of which have voted online in the 2009 EP elections. Again, the faithfulness-ratio is 100 percent. Finally, we have 173 e-voters from the EP elections in our 2009 local elections survey, out of which 168 reported that they voted online in the

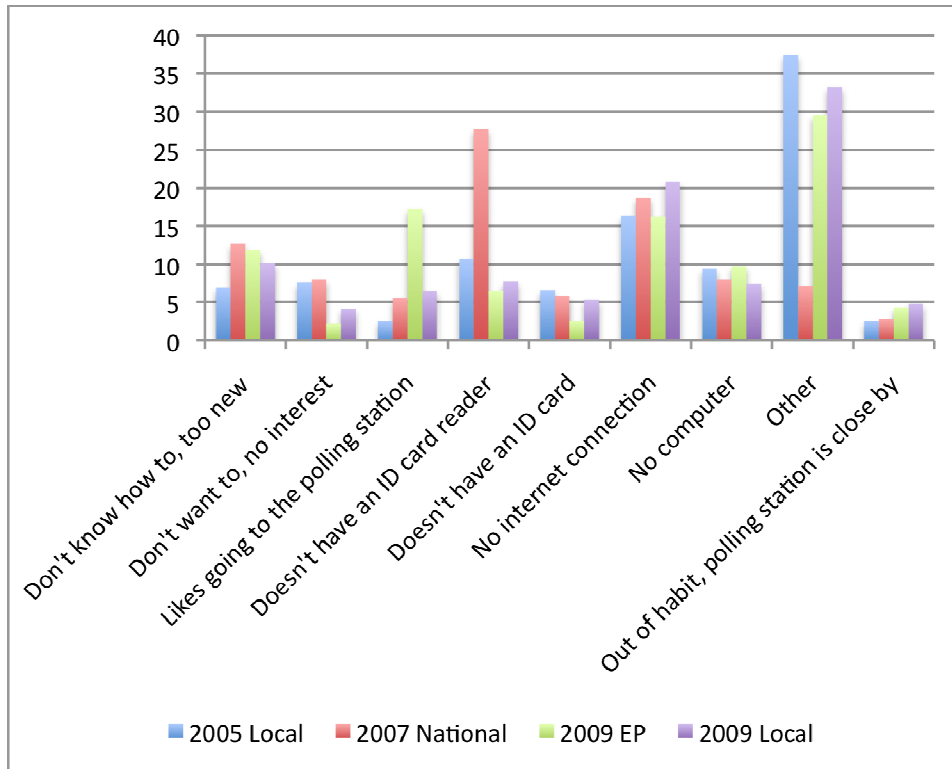
2009 local elections<sup>3</sup>. Again, the faithfulness-ratio is almost 100 percent. This has now become a very strong and structural finding, validated over time. E-voting is a sticky voting method: for those having tested the Internet voting mechanism the first time, almost no movement back to traditional forms of participation could be measured in any of the following elections. While we cannot show whether an e-voter in t1 will necessarily have cast an e-vote in t2 – or, as a matter of fact, have cast a vote at all – we can say that any voter in t2 who has voted over the Internet in t1 was, indeed, an e-voter in t2.

In the next step we wanted to look at those respondents who did not use Internet voting in order to get a better understanding of why they chose not to. Figure 16 reveals a fairly clear pattern as well. The most commonly cited hurdle over time seems to be the lack of access to the Internet, followed by the limited technical skills, and the lack of required equipment (either in the form of a computer, identification card or smart card reader). Although with some fluctuations a limited number of traditional voters express some sort of polling-place conservatism, either because they like going to the polling station, because of a habit or because the polling station is close by. It is important to notice that over time the number of these voters has gradually increased.

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<sup>3</sup> For the record: of the five voters who, in the local elections of 2009 did not reiterate their EP elections Internet voting experience, four voted on Election day and one voted in advanced polls at the polling station.

**Figure 16. Subjective reasons for not choosing to vote over the Internet (%)**



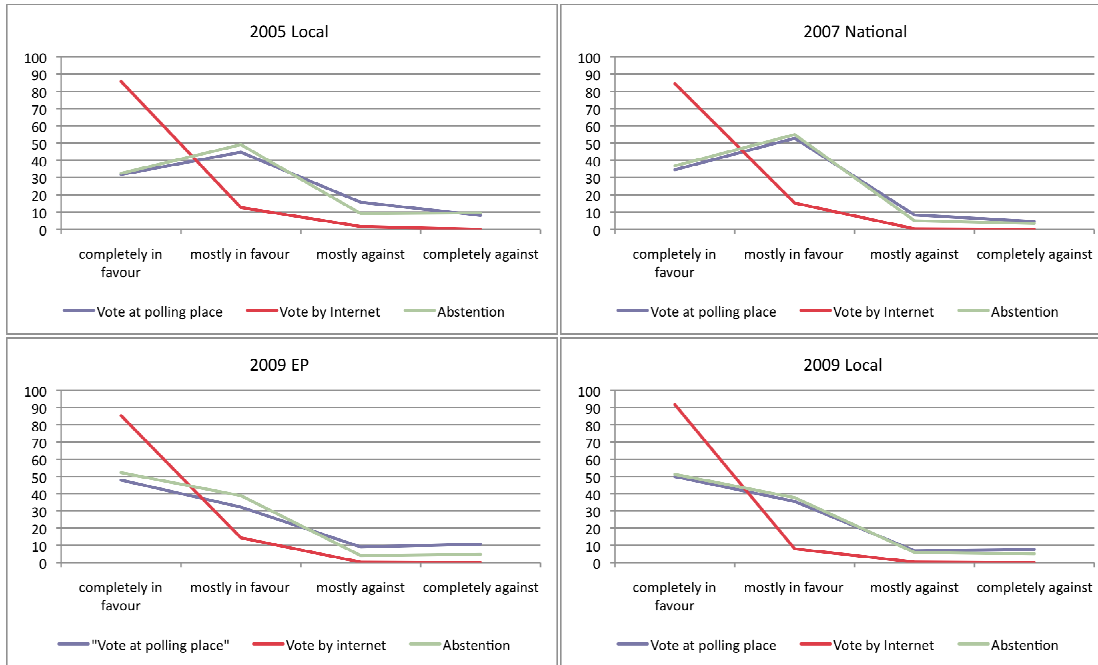
Next, we asked our respondents whether they favored or rejected voting over the Internet as an additional feature to pre-existing voting channels. Figure 17 contains the opinions of those voting at the polling station, over the Internet and those abstaining from elections. The patterns are very clear: the vast majority of e-voters (on average 86%) are completely in favor of Internet voting and none of them is entirely against the e-voting. The pattern of e-voters remains almost the same across all four elections. More interesting results, however, are observable among traditional voters and abstainers. The first thing to notice is that during each election both curves are extremely coherent. Second, one can see that they express much more conservative attitudes toward e-voting than those of the e-voters. Furthermore, there has been a positive transformation of the attitudes of traditional voters and abstainers over time. In particular, during the first two elections (in 2005 and 2007) the majority of these two groups were *mostly in favor* of e-voting. In both elections of 2009, however, the majority is – very clearly *completely in favor* of e-voting, showing that over time e-voting has gained even stronger support, even among non-users.

We conclude that for e-voters, even if the predispositions to e-voting were strong already from the outset, the actual exposure to the system did not harm these positive predispositions over time. Quite the contrary, we can assume that the exposure to the



system may well have intensified these attitudes, resulting in this impressively high level of strong support for e-voting.

**Figure 17. Attitudes towards e-voting as a supplementary means of participation (%)**



### *Choosing to e-vote: explanatory models*

The final part of the study presents - along the lines of our previous reports - three partial models explaining the decision to vote via the Internet instead of voting at the polling station: a socio-demographic and -economic model, a political model and an ICT model. After investigating each partial model separately, we will combine the three models into an overall, global model explaining the choice of the channel of participation.

#### **Socio-demographic and -economic (SDE) model**

In the first section of this paper we have argued that some socio-demographic variables, namely age, gender and the type of settlement (urban, rural) are of utmost interest to social scientists and policy makers in predicting the usage of e-voting. We have shown by descriptive bivariate statistics that age had quite a substantial impact on the choice of voting channel, whereas the impact of gender and the type of settlement was almost non-existent. Before presenting our first multivariate model including all socio-demographic and -economic variables, we will present briefly the remaining variables belonging to this category, i.e. education, occupational status, income and language.

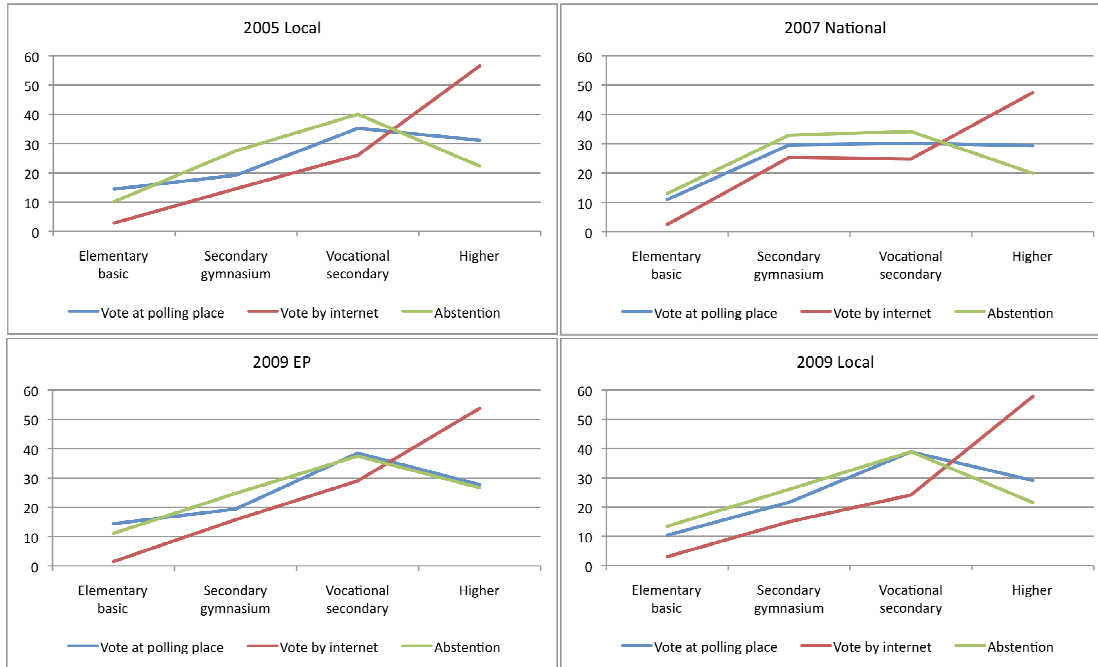
#### **Education**

The respondents in our survey were asked about their highest educational attainment. We classified all respondents according to three categories: elementary/basic education, secondary education/high school, vocational secondary education and higher education. According to the comparative literature on voting behavior, high educational levels are typically correlated with participation at the polls: the higher the educational resources of the voter, the higher his or her probability of participating in elections. We have noted in our 2007 report that this trend is only weakly apparent in Estonia, and the following elections are no exception to this. Figure 18 presents the composition of the group of non-voters, e-voters and traditional voters with respect to their level of education. It shows that traditional voters have a slightly more important proportion of higher educated individuals compared to non-voters (except 2007 EP elections). Inversely, the proportion of non-voters having only a basic level of education is only marginally more important than its respective counterpart within the group of traditional voters. In overall terms, the educational attainment of traditional voters and those abstaining from voting are remarkably similar, only occasionally deviating from each other.

E-voters, however, differ from the rest significantly. On average about 45% of e-voters have a higher education level compared to 29% in the case of traditional voters and 22% in the case of non-voters. In other words, e-voting in Estonia was by no means “education neutral” as the share of highly educated voters was by more than 20 percentage points

higher among e-voters than among traditional voters. Needless to say, education may play an important role in predicting the usage of e-voting in our multivariate model.

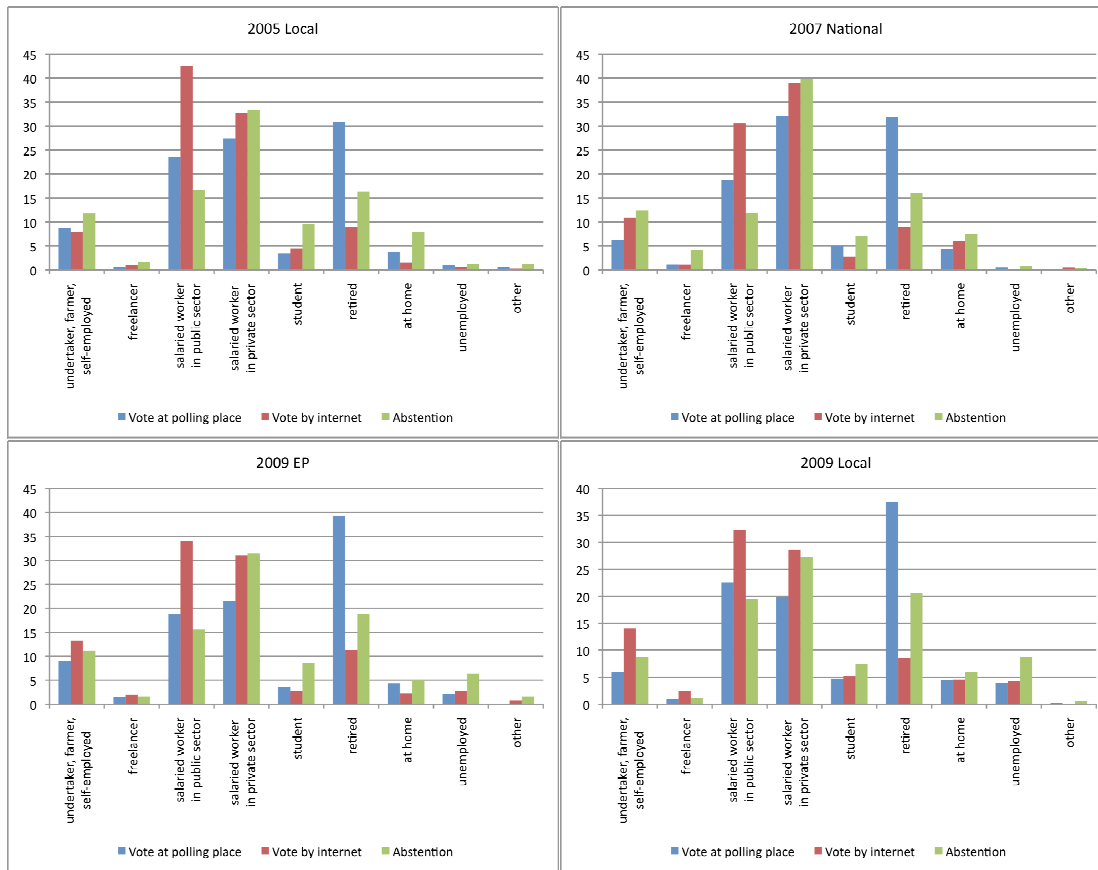
**Figure 18. Levels of education by type of voting (%)**



### Occupational status

Another important socio-demographic and -economic factor is the occupational status of the respondents. Figure 19 shows that across all four elections e-voters are above all employees in both the private and public sector. On the other hand, retired people are clearly underrepresented, which, of course is directly linked to the age distribution discussed earlier.

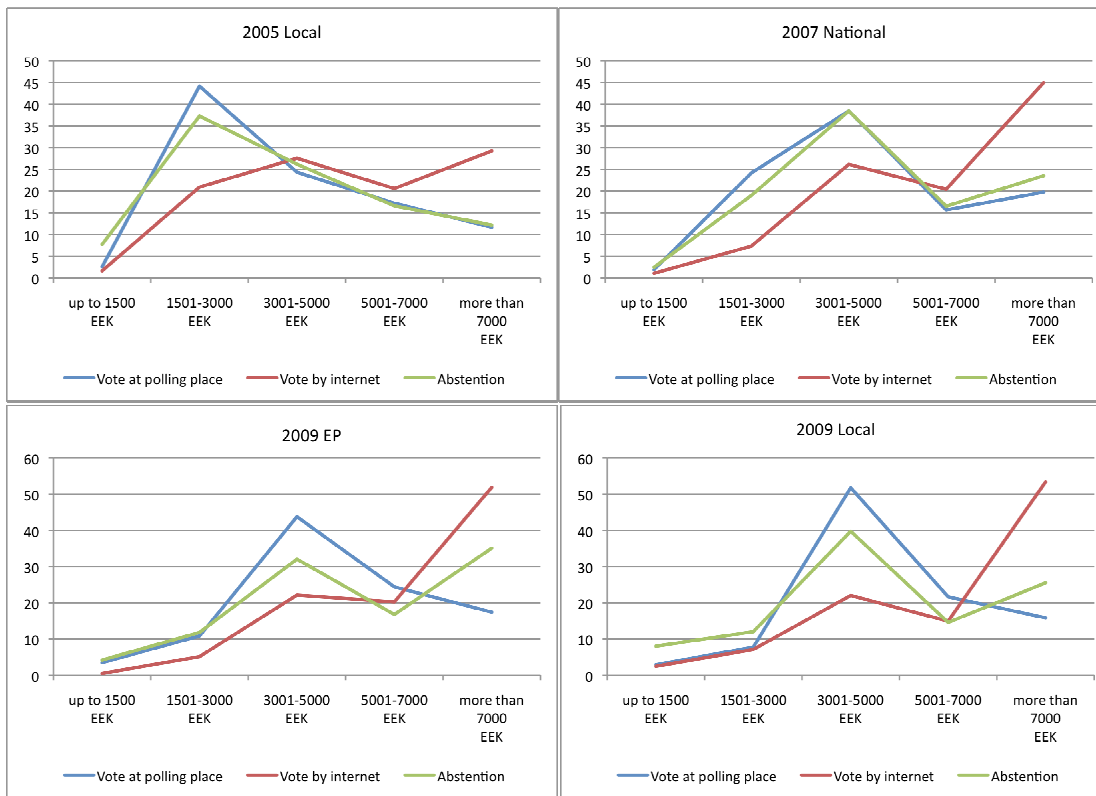
**Figure 19. Occupation by type of voting (%)**



## Income

The patterns of income across voting types resemble each other, as one would expect given the overall large socio-demographic and -economic similarities between traditional voters and non-voters (Figure 20). As reported in 2007, these patterns show an inverse u-shaped curve, skewed towards the lower side the income categories. E-voters are structurally very similar to others, except for the strongly over-represented highest income category. On average 44% of the e-voters and 16% of the traditional voters belong to the highest income category. It is self evident that the traditional voters are more widely dispersed over the socio-demographic spectrum, but it clearly shows that e-voting is a property of those with above-average income.

**Figure 20. Income by type of voting (%)**

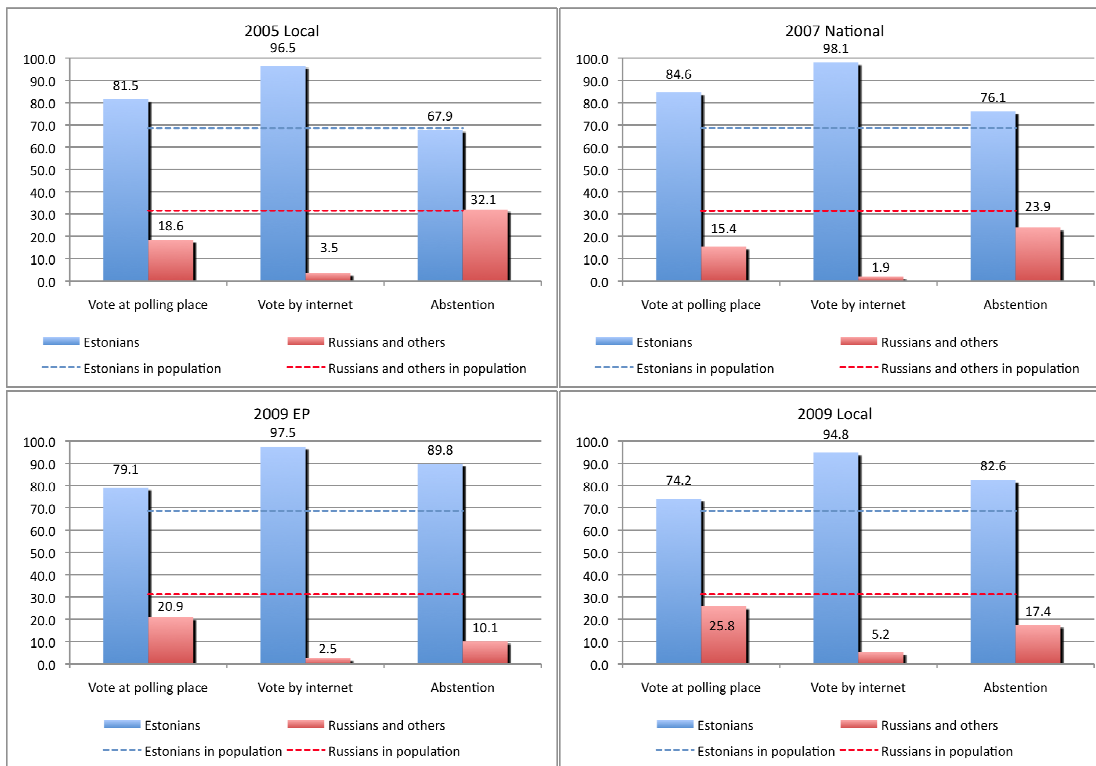


## Language

Two major language groups dominate the ethno-linguistic structure of Estonia: Estonians and Russians. The latter group represents about 26% of the population throughout 2005-2009. Other nationalities, e.g. Ukrainians, Belarusians, Finns, Tatars, Latvians, Poles, etc. constitute about 6% of the total population. Figure 21 represents voting behaviour by language groups, the dashed lines indicate the proportion of the respective ethno-linguistic group in the population<sup>4</sup>. We have collapsed the Russian-speaking population with the *others*, since the non-Russian speaking group is hardly visible with regard to voting if treated separately. Our results reveal that on average the group of non-voters contains 20.9 percent and the group of traditional voters 20.2 percent Russian and other speaking people, indicating a large linguistic cleavage when it comes to the participation in Estonian elections. Among e-voters this cleavage is even more drastic: on average only 3.3 percent of the e-voters are Russian (or other)-speaking.

<sup>4</sup> According to official statistics from the Statistical Office of Estonia ([www.stat.ee](http://www.stat.ee))

**Figure 21. Language groups by voting types (%)**



In general the ethno-linguistic cleavage in Estonia stems from the fact that the Russian minority without citizenship but with the permanent residence permit are allowed to vote only in the local elections and not in the national and European elections, hence the cleavage is conditioned to some extent by the legislation. When looking at e-voting in particular, the low number of Russian and other language speaking users may have been due to the fact that the system was offered only in Estonian. Although there was a significant change of attitude by the Estonian authorities towards election information in Russian (almost completely absent in 2005, the 2009 local elections were advertised in Russian, too) the voting system remained “Estonian-only”, which might have induced most Russian native speakers not to use this channel of electoral participation.

### **The SDE Model**

To determine the relative impact of socio-demographic and -economic factors on the choice of e-voting over traditional means of participation we continue with the multivariate analysis. Following the overall structure of the previous study, and in order to provide comparable results, we will estimate several multivariate models. First, we will estimate three partial models for each of the elections: the socio-demographic and -economic, political and ICT model. The goal is to explore the effect of the respective

variables on the choice of e-voting. Second, we estimate one global model for each of the elections containing all variables that have been present in each individual, partial model. In doing so, we are able to explain the dependent variable (type of voting) by taking fully into account all variables of our interest and the necessary controls. Since our dependent variable is dichotomous (0=traditional voting, 1=e-voting) we apply a logistic regression approach. Our independent variables are either treated in ordinal format or coded as dummy variables<sup>5</sup>.

Regarding the coefficients we estimate, it must be underlined that it is not possible to identify the spread of the effect of each variable by looking at the logistic regression coefficients as the latter depend on the spread of the independent variable itself. However, the sign of the coefficient (either positive or negative) indicates the structure of the relationship between the independent variables and the dependent variable. For example, if we find a positive coefficient for the variable “income” we can infer that the higher the income of a respondent, the higher his or her probability to vote by Internet as opposed to voting at the polling place. Also, an important factor for the interpretation of our coefficients will be their levels of statistical significance.

While our bivariate analyses have shown several interesting relationships, it is only through the use of multivariate models that we will be able to make statements about their respective importance, taking into account all other independent variables.

For the socio-demographic and -economic model (SDE model) we are interested in the relative impact of the following variables: age, gender, type of settlement (urban or rural), level of education, income and language. We excluded the variable measuring occupation status of respondents, as the latter cannot be recoded as an ordinal variable<sup>6</sup>

Table 10 shows four SDE Models that we have estimated for each of the elections. The regression coefficients are non-standardised and standard errors are displayed under each coefficient in parentheses.

The results of the SDE Model are straightforward and consistent over time. Age, level of education, income and language are the four highly significant predictors of e-voting, confirming the bivariate relationships and their directions. However, gender and the type of the settlement have no significant effect on the choice of e-voting over voting at the polling station, with one exception in the 2009 European Parliamentary elections where female voters were slightly more likely to vote over the Internet than male voters. It is

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<sup>5</sup> Variables that can take exactly two values are coded as dummy variables, while variables that can take more than two values are coded in a meaningful ordinal manner.

<sup>6</sup> The estimation results of socio-demographic and -economic model remain robust when we include dummies for occupational status in our model.

worth noticing that the SDE model has a fairly good overall fit with the explained variance ranging from 14% in 2005 to 27% in 2009.

The bivariate analyses already showed the absence of any urban-rural cleavage and so does the multivariate model. However, our bivariate analyses showed that men were to some extent more likely to vote over the Internet than women, especially during the first two e-enabled elections. In the multivariate analysis, however, this cleavage almost disappears. It appears only once in the 2009 EP elections, but even then the coefficient is rather weak and barely significant.



**Table 10. SDE Model. Multivariate model explaining the decision to e-vote rather than vote at the polling station (logistic regression coefficients)**

Coefficient	2005 Local	2007 National	2009 EP	2009 Local
Age	-0.27*** (0.06)	-0.21*** (0.05)	-0.42*** (0.07)	-0.49*** (0.07)
Gender	-0.01 (0.18)	-0.23 (0.17)	-0.38* (0.20)	0.00 (0.20)
Settlement	-0.02 (0.20)	-0.18 (0.18)	0.31 (0.20)	0.26 (0.22)
Education	0.46*** (0.10)	0.30*** (0.09)	0.53*** (0.12)	0.46*** (0.12)
Income	0.21** (0.09)	0.38*** (0.07)	0.28*** (0.08)	0.28*** (0.08)
Language	-1.76*** (0.36)	-2.28*** (0.42)	-2.24*** (0.45)	-1.69*** (0.35)
Constant	0.71 (0.77)	1.40* (0.73)	1.69*** (0.85)	0.63 (0.88)
Observations	609	731	628	589
Pseudo R <sup>2</sup>	0.14	0.15	0.27	0.23

Standard errors in parentheses, significant at .1 \*\* significant at .05 \*\*\* significant at .01

Clearly, other factors contribute to the explanation of why voters chose to vote over the Internet rather than voting at the polling station. We therefore continue in our investigations and subsequently estimate two alternative models to our socio-demographic and -economic mode, namely a political and an ICT model.

### **The political model**

In the political model we use several relevant independent variables, which we do not comment on in detail before turning to the estimation of the entire model. However, we make one exception, namely the variable measuring party choice among traditional voters and e-voters. This variable cannot be coded in an ordinal manner and we therefore refrain from including it in our multivariate model, but provide some descriptive evidence on its relation with the choice of the voting channel across all elections.

Figure 22 shows that e-voters and traditional voters do not politically behave in complete correspondence. As our data show, e-voters do not only differ with regard to their socio-demographic and -economic profiles, but they also do so (quite unsurprisingly) with regard to their political preferences. Over time, this particularly affects two large parties:

the Centre Party (under-represented among e-voters) and the Pro Patria Union<sup>7</sup> (over-represented among e-voters). To a smaller degree, but increasingly over time, the Social Democratic Party seems to be more attractive to e-voters.

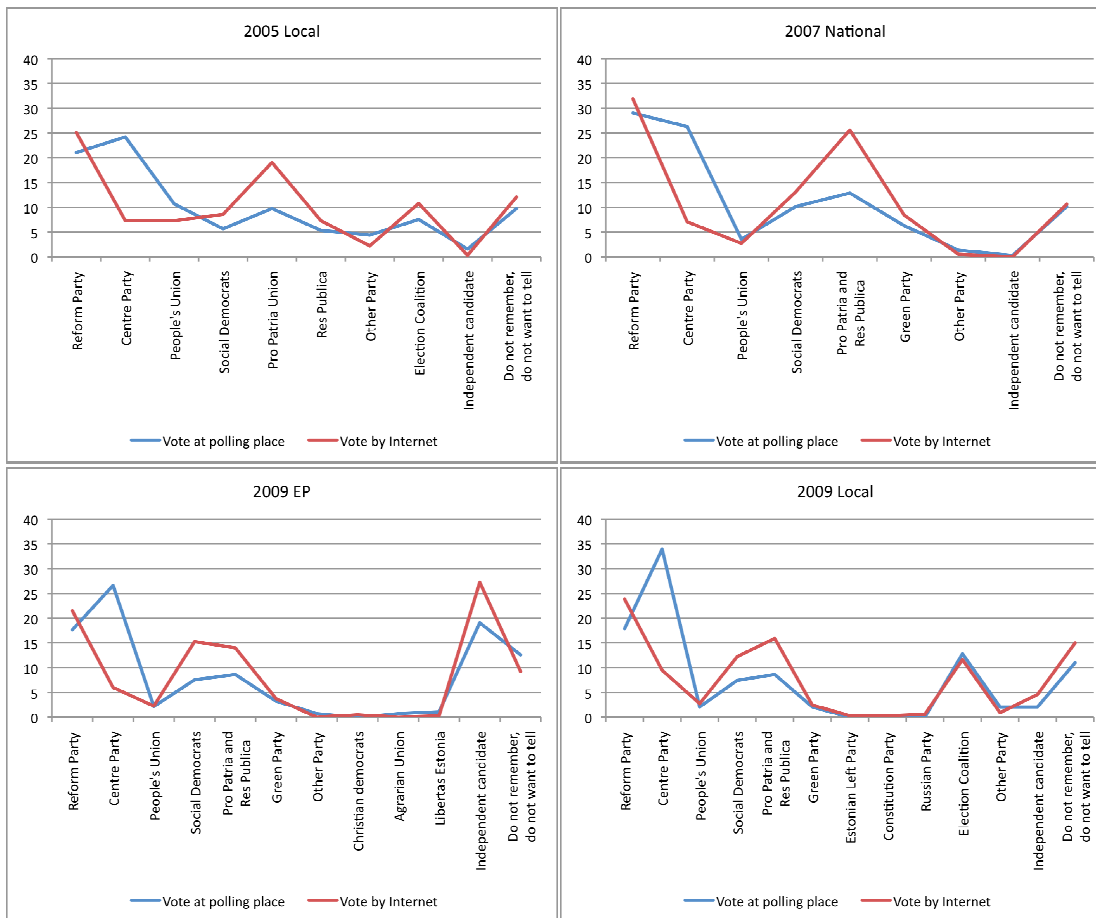
An interesting result is the over-representation of an independent candidate during the 2009 EP election among e-voters, which might be due to his popularity: Indrek Tarand - an independent candidate - won 25.8% of the votes in the 2009 EP elections (note that the winner, the Estonian Centre Party, won with 26.1% of the votes). Many commentators have suspected that it was Tarand who managed to get the protest votes.

However, the question of whether e-voting reshapes the political landscape of Estonia by mobilising the supporters of some parties and not the others, remains a valid question. We argue that as long as Internet voting does not have an exceptionally strong impact on mobilizing new voters these differences do not produce any significant changes in the Estonian political landscape in partisan terms.

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<sup>7</sup> After merging with Res Publica was renamed to Pro Patria and Res Publica Union.

**Figure 22. Party choice among e-voters and traditional voters (%)**



For the estimation of our political model we use the same set of variables that have been used in the previous studies. First, we have asked voters to position themselves on the traditional left-right scale. Secondly, we measured their level of politicisation by finding out how frequently they engage in political discussions with friends and family. Thirdly, we dispose of three variables measuring the Estonian voters' trust in Estonians political institutions and actors (trust in Parliament/government, trust in Estonian politicians, and trust in the State).

The results of the Table 10 show a mixed picture, much less consistent over time than, for example, the results of the SDE Model. First, we can observe that the respondent's positioning on the left-right scale had a large impact in the two early elections in 2005 and 2007, but much less so in the both elections in 2009. In particular, the more to the right a voter places him or herself on the scale from 0 to 10 (0=left, 10=right) the more probably he or she will use e-voting as opposed to vote at the polling station. Since the significance of the left-right scale drops after the 2007 National election and the coefficients become much reduced, we infer from this finding that the left-right

positioning was more prominent when the number of e-voters was limited, and lost much of its explanatory power after more citizens started to use e-voting.

The frequency of political discussions shows a negative and significant coefficient present only in 2007 and is completely absent in all other elections. In a way, this non-finding bears an important aspect of the usage of e-voting. Namely, if one would expect e-voters to be particularly politically interested and active – more so than their traditional counterparts - then this is not what we find. Quite the contrary, political activity does not seem to condition the usage of e-voting which may well indicate its power to appeal to a wider range of citizens and therefore mobilise them to participate in elections.

With regard to the three trust variables we see that the higher respondent's trust in the parliament/government and politicians and the lower his or her trust in the state the more likely he or she is to use e-voting. We'll come back to this more in detail in the section describing the full model.

Overall, these findings have to be considered carefully, because despite their statistical significance the explanatory power of the model is poor. The Pseudo  $R^2$  ranges from 0.02 to 0.05. Political variables, taken together, do not therefore make a major contribution to the explanation of e-voting in Estonia.

**Table 11. Political Model. Multivariate model explaining the decision to e-vote rather than vote at the polling station (logistic regression coefficients)**

Coefficient	2005 Local	2007 National	2009 EP	2009 Local
Left-right scale	0.14*** (0.05)	0.17*** (0.05)	0.06 (0.05)	0.08* (0.04)
Political discussions	0.03 (0.11)	-0.31*** (0.12)	0.11 (0.11)	-0.03 (0.10)
Trust in Parliament/ government	0.48** (0.21)	0.35 (0.26)	0.02* (0.20)	0.56*** (0.18)
Trust in politicians	0.05 (0.21)	0.26 (0.26)	0.49*** (0.19)	-0.10 (0.18)
Trust in the State	-0.43** (0.18)	0.07 (0.19)	-0.56*** (0.18)	-0.27* (0.15)
Constant	-0.35 (0.60)	1.03 (0.64)	0.16 (0.61)	0.21 (0.55)
Observations	475	489	505	516
Pseudo R <sup>2</sup>	0.03	0.05	0.02	0.03

Standard errors in parentheses, significant at .1 \*\* significant at .05 \*\*\* significant at .01

### The ICT model

The last partial model that we estimated contains a set of explanatory variables measuring the self-assessed computing knowledge of the respondents, their frequency of Internet use, the place they access the Internet from, their trust in interactions on the Internet (such as e-banking or buying goods over the Internet) and finally their trust in the procedure of Internet voting itself (Table 12).

Before discussing the effect of the variables, note that contrary to the prior political model, the ICT model appears to have a good overall fit with its explained variance ranging from 23% to 32%. This indicates a strong relationship between the explanatory variables and the dependent variable.

First, we gather from the model that computing knowledge, except during the 2009 EP elections, is a powerful predictor of the usage of e-voting. Similarly, we observe that the higher the frequency of Internet usage the higher the probability to vote by Internet. With respect to the location of Internet usage, the results seem to be very interesting: while this variable had virtually no explanatory power during the first two elections it becomes significant in the two elections of 2009. In other words, the higher the possibility to use Internet at home, at work or at both sites, the higher the probability to use e-voting. This

purely mechanistic access-related finding is extremely interesting and probably linked to the availability of the high-speed Internet connections both at homes and working places. It goes hand in hand with the overall trend, witnessed and described above, of a “privatisation” of Internet voting.

The single most powerful predictor of e-voting, however, is the trust in the procedure of e-voting. This is an important finding and it corresponds to our bivariate analysis where we demonstrated how much our respondents favor e-voting over voting at the polling station.

**Table 12. ICT Model. Multivariate model explaining the decision to e-vote rather than vote at the polling station (logistic regression coefficients)**

Coefficient	2005 Local	2007 National	2009 EP	2009 Local
Computing knowledge	0.31** (0.14)	0.52*** (0.12)	0.18 (0.13)	0.39** (0.13)
Frequency of Internet usage	0.12* (0.07)	0.15*** (0.05)	0.13** (0.06)	0.09 (0.06)
Location of Internet access	0.15 (0.14)	-0.08 (0.08)	0.29** (0.14)	0.28** (0.13)
Trust in transactions on the Internet	0.38** (0.19)	0.14 (0.17)	0.09 (0.19)	-0.15 (0.17)
Trust in the procedure of e-voting	1.54*** (0.19)	1.27*** (0.19)	1.25*** (0.19)	1.39*** (0.20)
Constant	3.28*** (0.79)	3.17*** (0.59)	1.56** (0.77)	1.76** (0.70)
Observations	508	602	571	530
Pseudo R <sup>2</sup>	0.32	0.24	0.26	0.23

Standard errors in parentheses, significant at .1 \*\* significant at .05 \*\*\* significant at .01

### The Global model

Finally, we have combined all partial models presented above into an overall model for the explanation of e-voting. All independent variables have been included simultaneously in one model explaining the choice of the voting channel. Table 13 contains a number of exceptionally interesting results from which several cutting-edge conclusions can be drawn with regard to the Estonian elections over the Internet.

First of all, the overall fit of the global model is satisfactorily indicated by a Pseudo R<sup>2</sup> ranging from 0.28 to 0.36. Keeping in mind the caveats of interpreting this number as a

measure for the explanatory power of a certain specification, it is interesting to see that the Pseudo  $R^2$ 's of the global model are only slightly higher than those of the each ICT models (especially those of 2005 and 2007). This can be regarded as an indication that compared to the ICT model, which is nested in the overall specification, the global model adds little explanatory power.

The second striking observation is the effect of controlling for political and ICT variables on the coefficients associated with socio-demographic and -economic factors. When simultaneously estimating the effects of all our independent variables, we first find that two of our initially significant socio-demographic and -economic effects totally disappear. Levels of education as well as levels of income lose their entire significance. Age remains strongly significant in the first two elections and language persists to be significant over time. Note that, in contrast to the partial SDE Model, the age-coefficient is positive in the global model for 2005 and 2007 election. The analysis presented in our 2007 report revealed that the reversed impact of age on the probability to e-vote is due to the inclusion of the ICT-variables into the model, and in particular to the inclusion of the variable "computing knowledge". This is due to the strong negative correlation between the age and ICT variables. While this is true for the first two elections in the global model, the age coefficient has become weak and completely insignificant in the both 2009 elections. Unexpected though it is, this finding seems to point to a clear trend that, when controlling for other variables, age is losing its explanatory power as a predictor of e-voting.

The significant political variables in the political model lose importance in the global model as well. Left-right auto-positioning and the frequency of political discussions became insignificant in the global model, which indicates that, while controlling for other variables, neither of the two contributes significantly to explaining the internet voting. With respect to the three trust variables the pattern that was observed in the political model (the higher the trust in the parliament, government and politicians and the lower the trust in the state the more likely he or she is to use e-voting) becomes rather blurred in the global model. First, we observe the overall loss of statistical significance across these three trust variables. Second, over time the coefficients of trust variables switch signs (from a positive relationship to a negative one or the other way around) more frequently in the global model than in the political model. This clearly indicates that, while controlling for other variables, the trust variables are structurally weaker in explaining internet voting and that the pattern found in the political model almost disappears in the global one.

Regarding the ICT variables, the global model confirms their importance. Computing knowledge, the frequency of Internet use, and, above all, trust in the procedure of Internet voting, maintain their structural impact on the dependent variable and remain strongly significant. The variable "trust in the procedure of e-voting" stands out here. When one

trusts the very procedures, then participation in the latter is much more likely than for somebody distrusting that same procedure. This sounds self-evident but let us illustrate the scope of this finding through an anecdote: in an interview with a leader of the opposition on Election day in the small, ethnographically Russian-dominated town of Paldiski, the politician told us that he had much more trust in Internet voting than in the polling place voting that could be – potentially – manipulated by the party in power. For him, the organization of the elections by the local authorities was very visible, in the polling place. However, the validity of the electoral process was strongly questioned by the opposition leader. When asked what he thought about internet voting instead of polling place voting, he answered: “well internet voting is much better than what is going on here [at the polling place] as they [the local government, dominated by one party in Paldiski] cannot mess with the system of Internet voting!” The opposition leader clearly favored internet voting, a mechanism in which he trusted, This rather surprising finding is of utmost importance for the potential introduction of Internet voting elsewhere: it could well be that Internet voting, over time, becomes and is *perceived* as being *more* secure than traditional forms of casting a vote. We will engage, in the near future, in a more refined analysis of this phenomenon.



**Table 13. Global Model. Multivariate model explaining the decision to e-vote rather than vote at the polling station (logistic regression coefficients)**

Coefficient	2005 Local	2007 National	2009 EP	2009 Local
Age	0.27** (0.12)	0.36*** (0.11)	-0.05 (0.12)	-0.10 (0.11)
Gender	0.41 (0.29)	-0.06 (0.26)	-0.43 (0.30)	0.08 (0.28)
Settlement	0.36 (0.32)	-0.01 (0.27)	0.30 (0.31)	0.56* (0.31)
Education	0.29 (0.18)	0.03 (0.15)	0.31* (0.19)	0.23 (0.17)
Income	-0.17 (0.14)	0.12 (0.12)	0.10 (0.11)	0.16 (0.10)
Language	-1.38*** (0.55)	-2.35*** (0.65)	-2.30*** (0.72)	-1.25*** (0.48)
Left-right scale	-0.01 (0.07)	-0.06 (0.07)	0.04 (0.08)	-0.08 (0.07)
Political discussions	0.27* (0.16)	-0.08 (0.16)	0.19 (0.17)	-0.15 (0.17)
Trust in Parliament/ government	0.27 (0.34)	-0.21 (0.34)	-0.92*** (0.33)	0.24 (0.29)
Trust in politicians	-0.19 (0.32)	0.85** (0.34)	0.63** (0.29)	-0.16 (0.28)
Trust in the State	-0.52* (0.28)	0.10 (0.26)	-0.70*** (0.28)	-0.16 (0.23)
Computing knowledge	0.41** (0.18)	0.65*** (0.17)	0.04 (0.19)	0.34** (0.17)
Frequency of Internet usage	0.15* (0.08)	0.19*** (0.06)	0.18*** (0.07)	0.07 (0.08)
Location of Internet access	0.25 (0.17)	-0.10 (0.10)	0.23 (0.19)	0.16 (0.19)
Trust in transactions on the Internet	0.32 (0.23)	0.16 (0.21)	0.29 (0.24)	-0.22 (0.22)
Trust in the	1.68***	1.22***	1.48***	1.49***

procedure of e-voting		(0.24)	(0.25)	(0.28)	(0.25)
Constant		1.00 (1.72)	6.34*** (1.75)	0.72 (1.78)	2.21 (1.85)
Observations	399		425	419	374
Pseudo R <sup>2</sup>		0.36	0.28	0.35	0.29
Standard errors in parentheses, significant at .1 ** significant at .05 *** significant at .01					

## CONCLUSIONS

The current study is a first comparative study about Estonian elections over the period from 2005 to 2009 including four elections from local and national elections to the European Parliament elections. The study is based on four surveys, introducing a new dataset about the usage of e-voting in Estonia, which allow us to investigate these particular elections beyond the usually commented aggregate results. Our survey allowed us to accurately measure the impact of socio-demographic, -economic, political and technology-related variables on the choice of e-voting on the individual level. The major findings of the study can be summarised as follows.

First, the question of whether e-voting boosts electoral participation is of utmost importance. We have addressed this question in our surveys with careful attention and the effect of e-voting does not seem to be irrelevant to the aggregate turnout anymore. In 2005, this extra-channel of electoral participation did not increase turnout levels. Our study, however, reveals that this has changed over the past two years. Our simulation showed that turnout in the 2009 local elections might have been up to 2.6 percent lower in the absence of Internet voting. A technologically induced change in turnout by 2.6 percent is far from negligible. Also, one needs to bear in mind that Estonia has seen a rapid growth of e-voters, affecting mostly the people who vote anyway. We have argued that from the theoretical point of view, e-voting could only exercise an influence on politically disengaged people after it has been available for a while since the laggards, as opposed to the early adapters, are the last to adopt the new technologies. Therefore, the mobilization effects that we have found should not be dismissed that easily, since e-voting keeps attracting ever larger audiences. The chances of politically disengaged people coming across upon Internet voting are therefore increasing.

Second, e-voting in Estonia has been claimed to be a property of younger generations within the electorate. While this is certainly true, the current study was able to show that with the growing number of e-voters during the last two elections in 2009 the new method of voting became much more dispersed across age groups than in early elections. This trend has been visible in particular during the 2009 EP elections where e-voting was able to attract the broadest spectrum of age groups. We have speculated in our 2007 report that over-representation of the young disappears over time as they grow older and keep using the opportunity to vote over the Internet. After all, most of the e-voters that we have interviewed during each election have been using e-voting also in the preceding elections.

Third, as we have pointed out in our previous study, language remains a problem in a multilingual society like Estonia. Our multivariate models have demonstrated that language is one of the most important predictors of the usage of e-voting, highly significant and stable over time, which indicates a structural exclusion of the Russian-

speaking minority from e-voting. The fact that the e-voting procedure is offered only in Estonian language caused a very large part of the Russian speaking community to refrain from using this tool. In order to convince larger parts of the already large community of Russian speakers in Estonia to use e-voting, offering this device in Russian becomes indispensable. The authors of this report acknowledge, however, the large efforts that have been undertaken in the two 2009 elections in order to inform and attract the Russian-speaking minority to the polls (in particular in the local elections).

Fourth, ICT variables such as computing knowledge and the frequency of Internet usage have been important predictors of the usage of e-voting in 2005 and 2007. In other words, the higher the respondent's computer literacy and the use of the Internet the more likely he or she was going to use e-voting instead of traditional voting. However, with the growing number of Internet connections in homes and more people using Internet on a daily basis, our model shows mixed results for the two 2009 elections. In particular, computing knowledge as a predictor for e-voting is insignificant in the 2009 EP elections, and the frequency of Internet usage is insignificant for the 2009 local elections. This finding can be explained in a similar fashion with the disappearing over-representation of the young voters. Namely, as more people start using e-voting and as the PC literate cohorts age, the main predictors of early elections lose their explanatory power.

Fifth, independently from all other considerations, the variable measuring trust in the procedure of e-voting has remained significant for all the elections under investigation. As we have reported in our 2007 study: Most of the use of e-voting in fact boils down to the simple question: does one trust or not this mechanism to take one's vote correctly into account, producing trustworthy results? If this question can be answered by an unconditional, or almost unconditional "yes", then the probability for one's use of e-voting at the polls goes significantly up. Any successful information policy pointing in the direction of giving voters trust in the mechanism itself will therefore make this means of participation more popular.

Sixth, some non-results are of the utmost importance. While controlling for other variables, we do not find an effect of gender, income, education and the type of settlement on the choice of voting channel. This indicates that e-voting does not introduce systematic biases in a socio-demographic sense (with an exception of language) and is therefore a truly democratic procedure. This finding is even more solid since our results remain stable over time.

Seventh, the political neutrality of e-voting can be regarded as an important question. We have found through the bivariate relationships that e-voters do – in the case of two parties - behave differently to traditional voters with respect to their party choice. In particular, we have found discrepancies between traditional voters and e-voters in how they vote for the Centre Party (under-represented) and Pro Patria and Res Publica Union (over-represented). Also, our multivariate models show that left-right auto-positioning and the

frequency of political discussions had significant impacts. However, these effects completely disappeared in our overall model, suggesting that these variables are correlated with more dominant determinants of e-voting: When controlling for all our independent variables, the initial political bias disappears. Moreover, the partial political models had very little explanatory power, hence we conclude that in the Estonian case the introduction of e-voting can be regarded as politically rather innocent.

Eighth, we see that both voters and political parties are quickly adapting to Internet elections as well as the Internet as an information source. As would be expected, in general voters are more engaged in the campaign than are non-voters although sizable percentages of non-voters also were engaged in learning about the campaign. Moreover, some campaign activities affect both voters and non-voters similarly. Indiscriminate campaign tactics, such as political ads in newspapers and magazines and stalls, and direct mail similarly penetrate across both groups. However, if we consider exclusively Internet as a mode of education to learn about the campaign, then we find Internet voters are much greater consumer of online information compared to both election day voters and advance polling station voters. When we compare the results of these questions with the ones from the 2007 Estonian parliamentary election, we see slight shifts across various categories. However, voter interest differed between the two elections, and there was a clear increase in 2009 in voter use of the Internet to gather information. There has also been an increase in the use of non-traditional media aggregators – blogs – as information sources between 2007 and 2009.

## RECOMMENDATIONS

On the basis of the current study and previous reports of 2007 and 2005, we would like to propose a number of recommendations in the field of Internet voting. As the usage of e-voting has evolved considerably during this period, we comment and evaluate the relevance of our recommendations made in the 2007 report, and simultaneously propose revised recommendations in light of the recent developments.

The “wider recommendations”, such as the need for diffusion, the usefulness of reversible voting, the usefulness of academic follow-up analyses, the respect of the Council of Europe Recommendation on e-voting, will not be repeated in this report – for the latter we refer the reader to the 2005 report on e-voting in the Estonian local elections.

1. In the previous reports the authors have stressed that the success of Internet voting is linked to the overall ICT awareness among the electorate as well as the overall diffusion of ICT related practices. Estonia has proved its position as one of the leading countries in Europe in terms of the ICT infrastructure and the availability of online public services, certainly facilitating the rapid growth of the usage of e-voting throughout the four most recent elections.

While we recommend to continue to support the efforts toward strengthening the information society in general and Internet voting in particular, we hope that Estonia – the government, municipalities, civil society organisations, etc. – could have a more pronounced focus on the substantial side of online services rather than relaxing at the achievement on the technical side. In particular, we would recommend focusing on those services facilitating political participation beyond elections.

2. The importance of the internet in electoral campaigns in Estonia is increasing. This importance cannot be illustrated more directly than by the example of the independent candidate Indrek Tarand, who in the EP elections of 2009 spent about EUR 2000 on the election campaign and gathered 25.8% of the votes, which is 0.3% less than the winner of the elections, the Estonian Center Party. It is fair to say that no substantial political power neglected the Internet as a means for electioneering in the 2009 European and the 2009 local elections in Estonia. A number of new political communication and campaign instruments emerged, e.g. hijacking the campaign of a competitor; addressing young voters with more appealing and relaxed political messages, etc.

However, the political campaign in general, has increasingly become so competitive that not only it has deviated from the debate about substantial political issues, but also often reached the gray areas of what is legally allowed in campaign activities. This contains a potential threat to the young political culture of Estonia and the

overall democratic practice in general. We recommend keeping a close watch of these developments in the future and prioritise an open and civically responsible landscape for political communication and electioneering.

3. The Estonian e-voting system has been openly presented to many experts from different nations who wished to study the system. However, up until 2010 no other country in Europe was able to have voting by Internet as an alternative means to participation in elections on the scale that Estonia has. This indicates that a high degree of transparency is required should any other country have an interest to study the Estonian success. We recommend maintaining this degree of openness and transparency in future uses of the e-voting system. In particular, close technological monitoring should become a standard feature of e-enabled elections and referendums.
4. In the 2007 report we indicated that the Estonian e-voting system has so far not been subject to a comprehensive certification procedure. We recommend that the debate be initiated about possible future certification options. The Council of Europe could serve as a platform for an exchange of expertise and good practice in the framework of the 2004 Committee of Ministers Recommendation of legal, operational and technical standards for e-voting. We would like to highlight that standard-setting and certification of the e-voting system will not benefit Estonia alone, but help other countries to gain confidence in the new voting mechanism allowing them to adopt it more easily. While considerable efforts were undertaken by the Estonian government in order to audit the entire Internet voting process (carried out by Price Waterhouse Coopers), a move towards standard-setting and certification remains yet to be undertaken.
5. In the previous reports the authors stressed the language problem, which is specific to Estonia, but potentially relevant in any multilingual polity. Language remains to be one of the main predictors of choice of Internet voting: in all elections the Russian-speaking voters disproportionately avoided e-voting. In order not to become a means of exclusion and to give all potential voters the same opportunities to participate, we continue recommending that the Internet voting application and related information would also be proposed in Russian (especially for the local elections). At the same time, the authors recognise the significant efforts that have been undertaken in this regard since the first e-enabled election of 2005.
6. Internet voting is an important innovation, but since it provides an alternative to the traditional voting channels it can be handled as a rather mechanistic innovation promoting electoral turnout. Other e-tools have been tried and tested throughout Europe and beyond, aiming at increasing citizens' interest in politics and their

participation in the electoral realm beyond elections. We continue recommending the establishment of a wider “electoral platform” in which e-voting is an important but not an exclusive element.

7. Our previous reports in 2005 and 2007 evaluated the three-day voting period for Internet voting as insufficient. The authors postulated that an extension of this period would most certainly attract new voters. The added value of voting over the Internet is, amongst others, the freedom of choice with regard to the moment of voting. Note, that in all our reports *convenience* has been the single most important reason for the choice of e-voting. We were glad to learn that in both elections in 2009 the voting period was extended to seven days. As we report in our current analysis, the length of the voting period is potentially an important determinant of voting activity. In light of this event, we suggest to keep the e-voting period at seven days or even extend it (note that, for example in Switzerland, remote voting is open up to three weeks prior to Election Day).



## ANNEX

## Tables for the section The Internet and the Campaign in the 2009 EP elections

**Table 14. Campaign Information Sources: Averages by Mode of Participation % (2007)**

<i>Could you tell for each information source whether you have obtained information on the issues at stake in the elections from these sources during the campaign preceding the elections?</i>	<i>Did You Vote In The 2007 National Elections In Estonia?</i>		<i>How Did You Vote In These Elections?</i>		
	Yes	No	Voted On Election Day	Voted In Advance Polling Station	Voted By Internet
Editorial contributions to newspapers and magazines	<b>79.56</b>	<b>70.37</b>	80.38	83.84	77.66
Radio broadcasts concerning the elections	<b>75.20</b>	<b>63.37</b>	<b>79.25</b>	<b>83.84</b>	<b>70.03</b>
TV broadcasts concerning the elections	<b>93.46</b>	<b>82.72</b>	93.96	93.94	93.19
Leaflets, flyers	57.63	54.73	<b>70.94</b>	<b>70.71</b>	<b>44.41</b>
Political ads in newspapers and magazines	44.28	39.92	<b>54.72</b>	<b>57.58</b>	<b>33.51</b>
Posters in the streets	36.78	36.21	<b>42.26</b>	<b>47.47</b>	<b>30.25</b>
Opinion polls	<b>43.60</b>	<b>32.92</b>	38.87	49.49	45.78
Party's election tents, stalls in the streets and parks	8.04	6.17	<b>12.83</b>	<b>14.14</b>	<b>3.00</b>
Direct-mailing materials	<b>45.10</b>	<b>37.86</b>	<b>52.83</b>	<b>58.59</b>	<b>36.24</b>
Discussions at your workplace/educational	<b>33.51</b>	<b>23.87</b>	<b>24.15</b>	<b>23.23</b>	<b>42.78</b>

institution						
Discussions among your family, friends	<b>62.94</b>	<b>44.03</b>	<b>51.70</b>	<b>64.65</b>	<b>70.84</b>	
Communications on the Internet	<b>13.76</b>	<b>6.58</b>	<b>8.30</b>	<b>5.05</b>	<b>20.16</b>	
SMS/text messages	<b>4.77</b>	<b>1.65</b>	4.15	3.03	5.45	
Email	<b>5.18</b>	<b>1.65</b>	4.53	5.05	5.45	
<b>Somewhere else (partisan happening, public debates, etc)</b>	<b>7.22</b>	<b>2.06</b>	9.43	8.08	5.18	

Note: bold-faced entries are instances where a chi-square test for the observed row frequency comparisons are statistically significant,  $p < .05$ .

**Table 15. Internet as a Mode of Education: Averages by Mode of Participation % (2007)**

	<i>(In Percent for those Answering "Yes")</i>				
	Did you vote in the 2007 national elections in Estonia?		How did you vote in these elections?		
	Yes	No	Voted On Election Day	Voted In Advance Polling Station	Voted By Internet
<b>In the months leading up to the Parliamentary elections, did you hear or read anything online about the parliamentary elections?</b>	<b>55.41</b>	<b>30.43</b>	<b>40.52</b>	<b>50.94</b>	<b>62.91</b>
<b>Do you use the Internet in order to inform yourself about politics?</b>	<b>41.65</b>	<b>21.12</b>	<b>27.45</b>	<b>32.08</b>	<b>49.55</b>
Volunteer online to work for a campaign	2.57	0.62	2.61	3.77	2.37
<b>Look for more information online about political party or candidates' positions on the issues or voting records</b>	<b>28.10</b>	<b>13.04</b>	<b>13.73</b>	<b>12.00</b>	<b>37.20</b>
<b>Look online for whom to vote</b>	<b>23.60</b>	<b>11.80</b>	<b>11.56</b>	<b>18.37</b>	<b>29.76</b>
<b>Participate in online endorsements or ratings polls</b>	<b>20.79</b>	<b>6.83</b>	<b>9.52</b>	<b>18.37</b>	<b>26.19</b>
<b>Use the Internet to check the accuracy of claims made by or about the political party</b>	<b>14.04</b>	<b>5.59</b>	<b>7.48</b>	<b>12.24</b>	<b>16.96</b>

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**or candidates**

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Watch video clips about the political party or candidates or the election that are available online	11.24	9.32	9.52	10.20	11.90
Sign up to receive email from political party or candidates or campaigns	1.50	1.86	1.36	2.04	1.49
Post your own political commentary or writing to an online news group, website or blog	3.93	2.48	4.08	6.12	3.57
Forward or post someone else's political commentary or writing	0.94	0.00	0.68	2.04	0.89
Create and post your own political audio or video recordings	0.56	1.86	1.36	2.04	0.00
Forward or post someone else's political audio or video recordings	0.94	0.00	2.04	4.08	0.00

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Note: bold-faced entries are instances where a chi-square test for the observed row frequency comparisons are statistically significant,  $p < .05$ .

**Table 16. Information from political parties and candidates: Averages by mode of participation % (2007)**

In the past two months have you....?	<i>Did You Vote In The 2007 Elections In Estonia?</i>		<i>How Did You Vote In These National Elections?</i>		
	Yes	No	Voted On Election Day	Voted In Advance Polling Station	Voted By Internet
Received mail urging you to vote for a particular political party or candidate	<b>59.26</b>	<b>43.62</b>	56.98	66.67	59.13
Received email urging you to vote for a particular political party or candidate	<b>11.04</b>	<b>4.12</b>	<b>7.55</b>	<b>6.06</b>	<b>14.71</b>
Been visited at home by someone urging you to vote for a particular political party or candidate	3.95	3.70	5.28	3.03	3.27
Received prerecorded telephone calls urging you to vote for a particular political party or candidate	<b>6.40</b>	<b>2.88</b>	5.66	4.04	7.63

Note: bold-faced entries are instances where a chi-square test for the observed row frequency comparisons are statistically significant,  $p < .05$ .

**Table 17. Vote choice by mode of voting % (2007)**

TOTAL	Voted The Day	On Election	Voted In Advance Polls Polling Station	Voted In An Advance Polls By Internet

Center Party	32.05	13.46	3.21	15.38
Irl	20.19	7.37	3.53	9.29
Reform Party	20.19	8.33	3.85	8.01
Many Different Parties	11.22	5.13	1.28	4.81
People's Union	6.41	2.56	0.96	2.88
Social Democrats	5.13	2.24	0.64	2.24
Other	2.88	1.28	0.32	1.28
Green Party	1.92	0.96	0.00	0.96