

### How fast do people ivote

Internet voting is only one convenience voting method being offered to the Estonian voters, but it is clearly the easiest and fastest when compared with other methods. Voting over the Internet takes the voter five separate steps:

1. Going to [www.valimised.ee](http://www.valimised.ee) and downloading the voting app;
2. Opening the app and authenticating oneself digitally;
3. Controlling the displayed personal information and proceeding to vote;
4. Selecting the candidate from the candidate list;
5. Confirming the selection and signing the vote digitally.

The median speed of voting is 80 to 90 seconds depending on the election [2], not counting in the time it takes the voter to download the application and authenticate herself. It is likely that taking all the preparative steps into account will not add more than a couple of minutes to the 90 seconds, so voting online is possible within 3 minutes which is a quite efficient use of time from the individual voters perspective.

This extreme time-efficiency of Internet voting should in theory be the central reason why voters switch from paper to ivoting. The following short analysis explores this further by using the Estonian Internet voter study 2005-2019 data.

### Voting costs and participation

How much it takes the paper voter to get to her polling station of choice, vote and get back, is displayed in Figure 1. We see that the typical time is around 30 minutes, but for a significant share it is also in excess of that, for some even up to an hour and more.

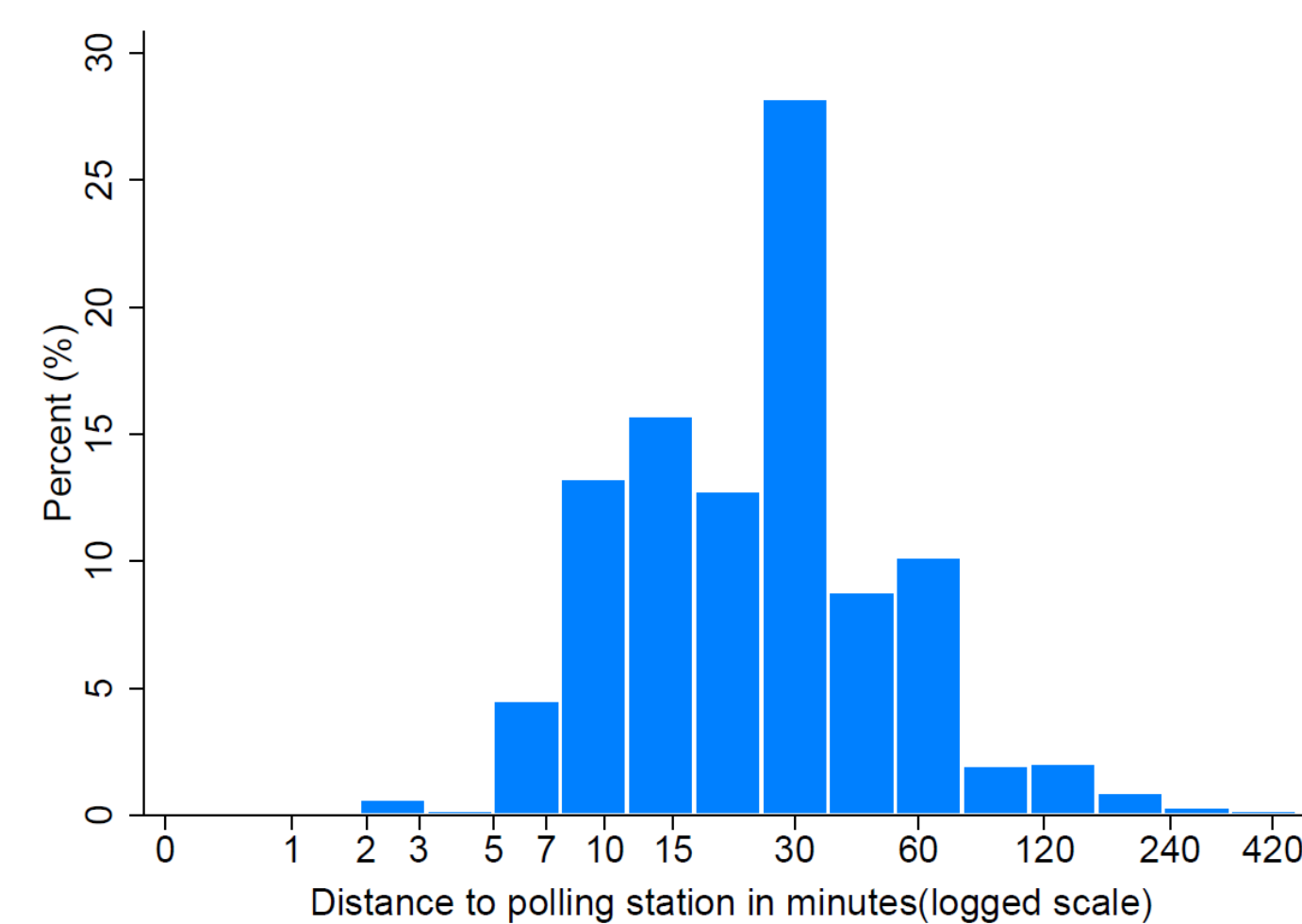


Fig. 1: Distribution of the time to get to the polling station and back in 2019

Based on this we can already assume that the association between the cost of voting for the individual and actual participation should be negative, the higher the costs, the lower the likelihood of participating. Given that internet voting should on average be 10 times faster than paper voting the primary motivator for switching to online voting should be the achieved time saving and cost reduction. This suggest that for internet voting usage the association should be positive, the costlier it is to vote on paper, the more likely using Internet voting should become.

### Time saving drives ivoting usage

A way to test the expected association between paper voting cost and participation, as well ivoting, is to see what is the probability of voting as such, and ivoting, depending how long it takes or would have taken the voter to get to a physical polling station. The result of such an analysis on the 2019 data is depicted in Figure 2. It which shows the association between distance from the polling station and voting in general, as well as ivoting specifically. Three aspects stand out. First, voting is indeed negatively associated with the time it takes to get to the polling station. The longer the trip, the less likely participation probability becomes.

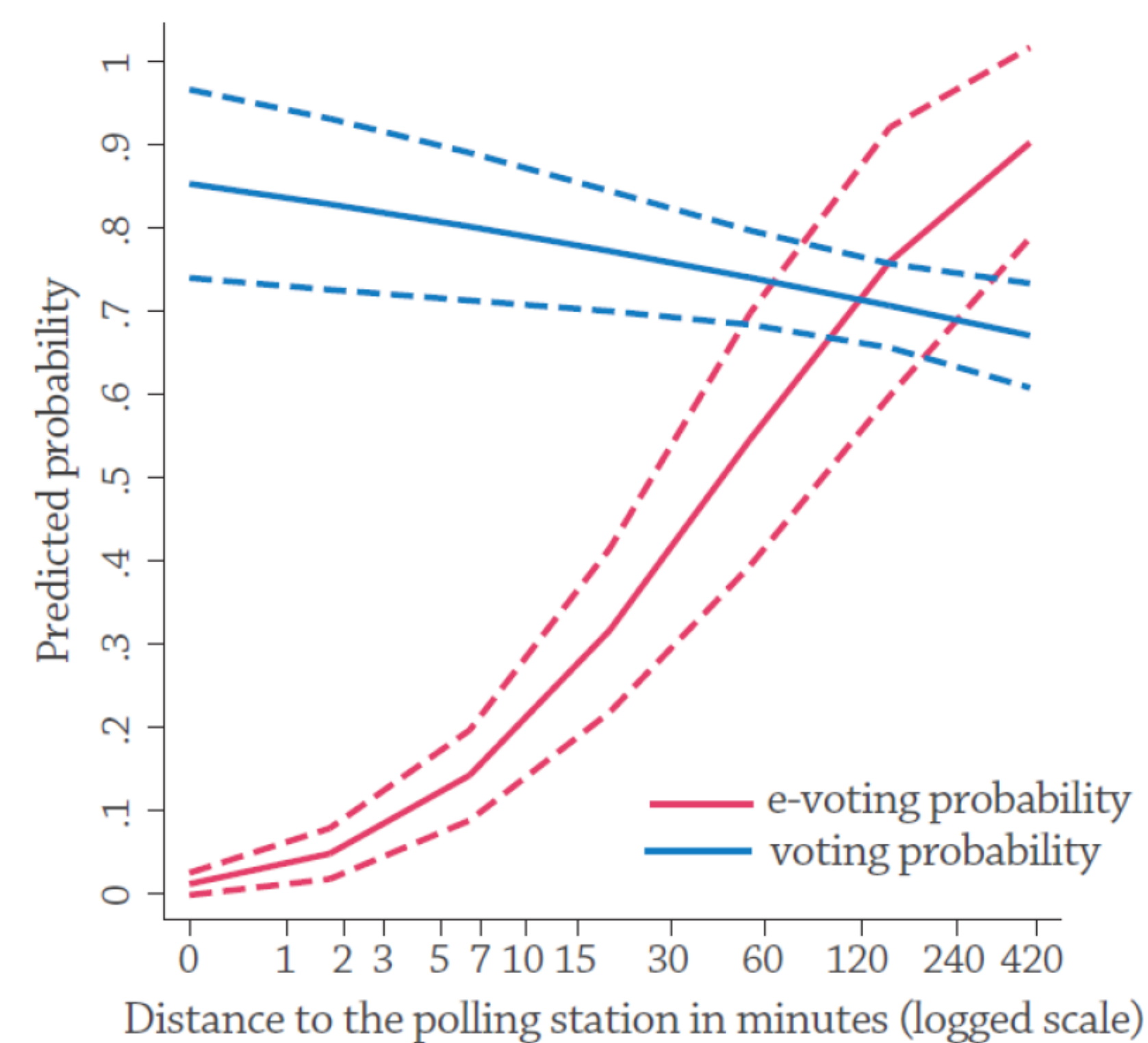


Fig. 2: Association between time to polling station and voting and ivoting in 2019 (with dashed 95% confidence intervals)

Second, the positive association with Internet voting is extremely strong. The further away the physical polling station is, the more likely ivoting becomes. The 0.5 probability threshold is crossed almost exactly at 30 minutes. For voters with a potential trip in excess of that, ivoting is already more likely than paper voting. The observed association is very robust and statistically significant.

Third, the positive association between paper voting cost and preferring ivoting kicks in immediately, as ivoting probability is already higher for someone who needs to take a 10 minute trip compared to someone for whom the polling station is a mere 15 minutes away and so forth.

These results exemplify how the extreme time-efficiency of Internet voting drives further growth in usage rates as time saving effects are immediate even for people living very close proximity to polling stations. It has also clear international implications as it shows how voter convenience could be increased especially in countries with large territories and low population density.

### Can time savings override usage barriers

A significant reduction in the time that it takes to vote online compared to paper voting might however not be sufficient to convince voters who have other ivoting usage barriers to take up this voting mode. The data at hand allows to test such situations as well. Figure 3 shows the same association extracted from a model using computer literacy as a added condition. We see that even there a strong positive association exists for all literacy levels, it simply takes for the polling station to be somewhat further away for someone with an average computer literacy rate compared to someone with a good rate to become a more likely ivoter.

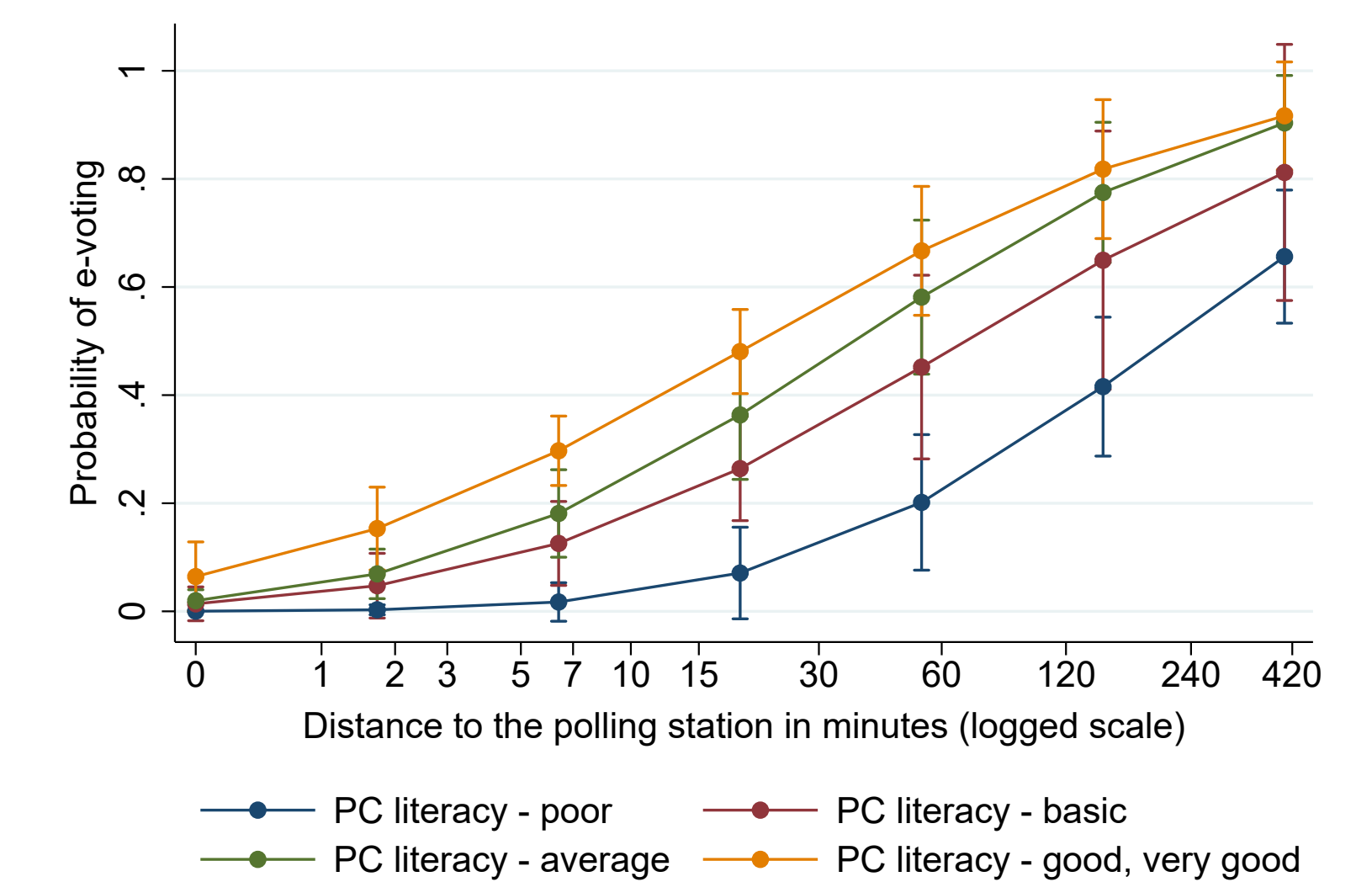


Fig. 3: Association between time to polling station and voting depending on computer literacy in 2019

This provides further evidence that the time saving effect is strong enough to override even potential barriers to Internet voting usage, such as not feeling overly computer literate. Similar overriding effects of time saving have been observed for different age groups, as well as income and education categories that somewhat structure ivote uptake [1].

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### References

- [1] M. Solvak and K. Vassil. *E-voting in Estonia: Technological Diffusion and Other Developments Over Ten Years (2005-2015)*. University of Tartu, 2016, p. 128.
- [2] T. Unt, M. Solvak, and K. Vassil. "Does Internet voting make elections less social? Group voting patterns in Estonian e-voting log files (2013-2015)". In: *PLoS ONE* 12.4 (2017).