

### Usage rates of Internet voting

Estonian Internet voting has experienced an average five percentage points growth rate for each election after the inception in 2005. As Figure 1 shows this share is now almost reaching the 50% usage rate. This warrants a question on how has this diffusion process unfolded and which groups benefited initially from the introduction of this voting channel.

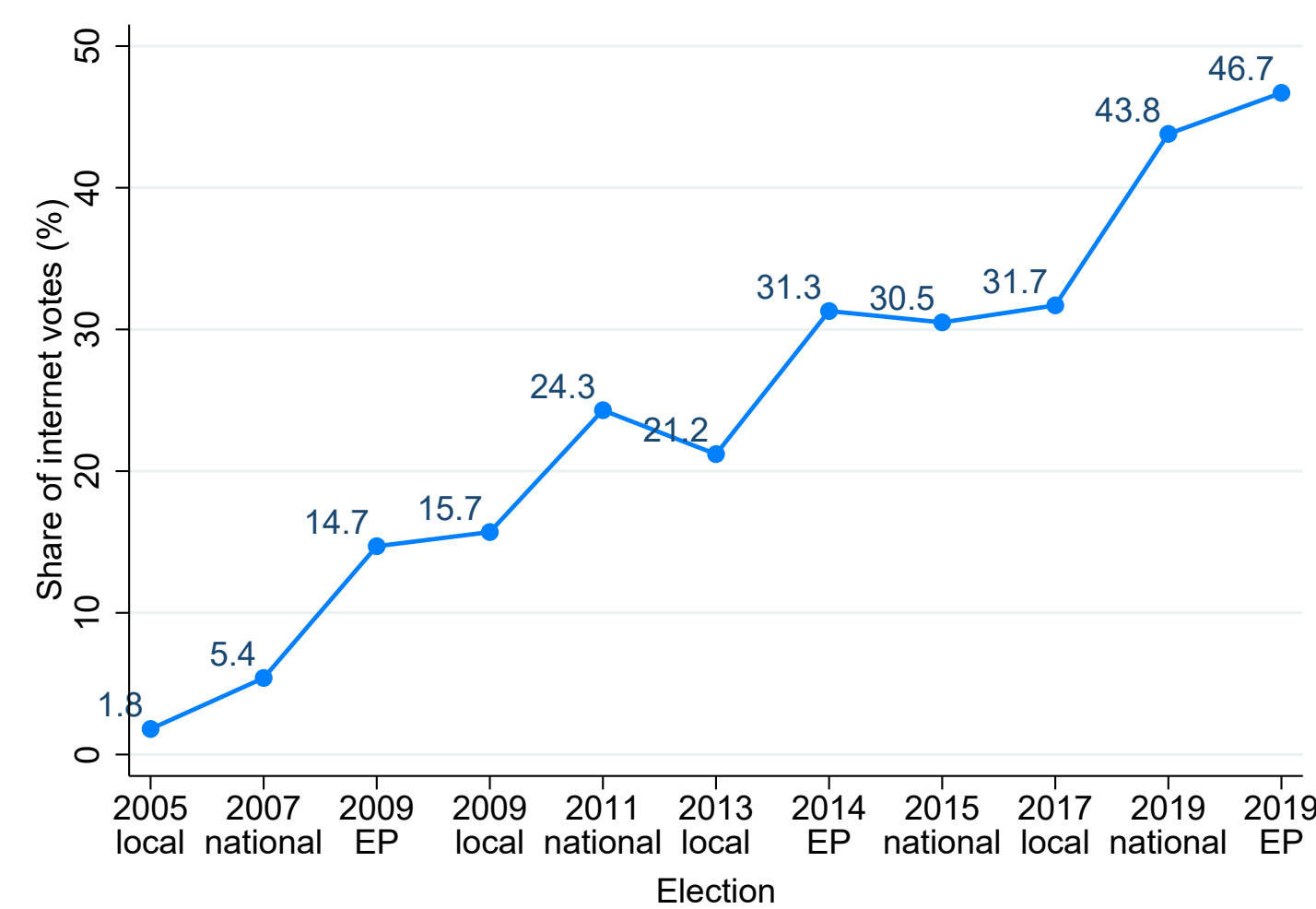


Fig. 1: Share of Internet votes out of all votes given 2005-2019 (Source: www.valimised.ee)

### How innovations diffuse

Everett Rogers' classic diffusion of innovation theory sees technology uptake happening sequentially, with different user groups picking the technology up in a specific order according to their willingness to take risks and readiness to experiment [1]. Diffusion can also not happen or stop with certain user groups if the technology does not fulfill its promise. Figure 2 depicts these two possible scenarios - A showing true diffusion exemplified by a gradual spread of the technology among a user group that is very diverse, and B showing a limited uptake by a narrow user group without actual widespread diffusion in the population.

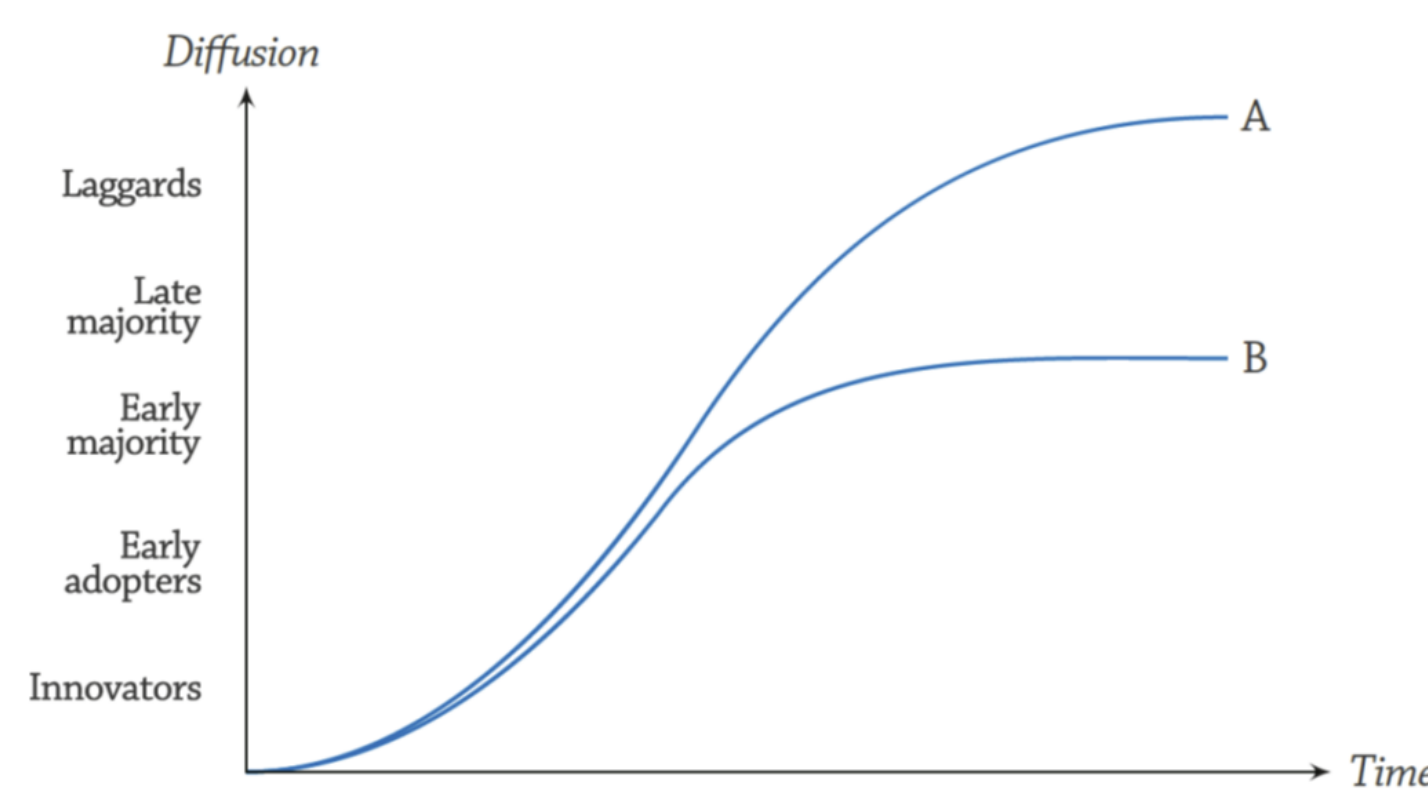


Fig. 2: Two ivote uptake scenarios, A - diffusion into a heterogeneous user population; B - uptake by a specific user group with no widespread diffusion

To what degree either of these scenarios held or hold in Estonia is examined using the Estonian Internet voter study 2005-2019 in the sections below.

### Evidence of widespread ivoting diffusion

One test for diffusion scenarios is to see if ivoters have become more diverse over time, or if the same set of parameters keeps on differentiating them from regular paper voters. This is depicted in Figure 3, which shows voter age effects on the probability of using ivoting for the first time from 2005 to 2019. A number of interesting patterns emerge.

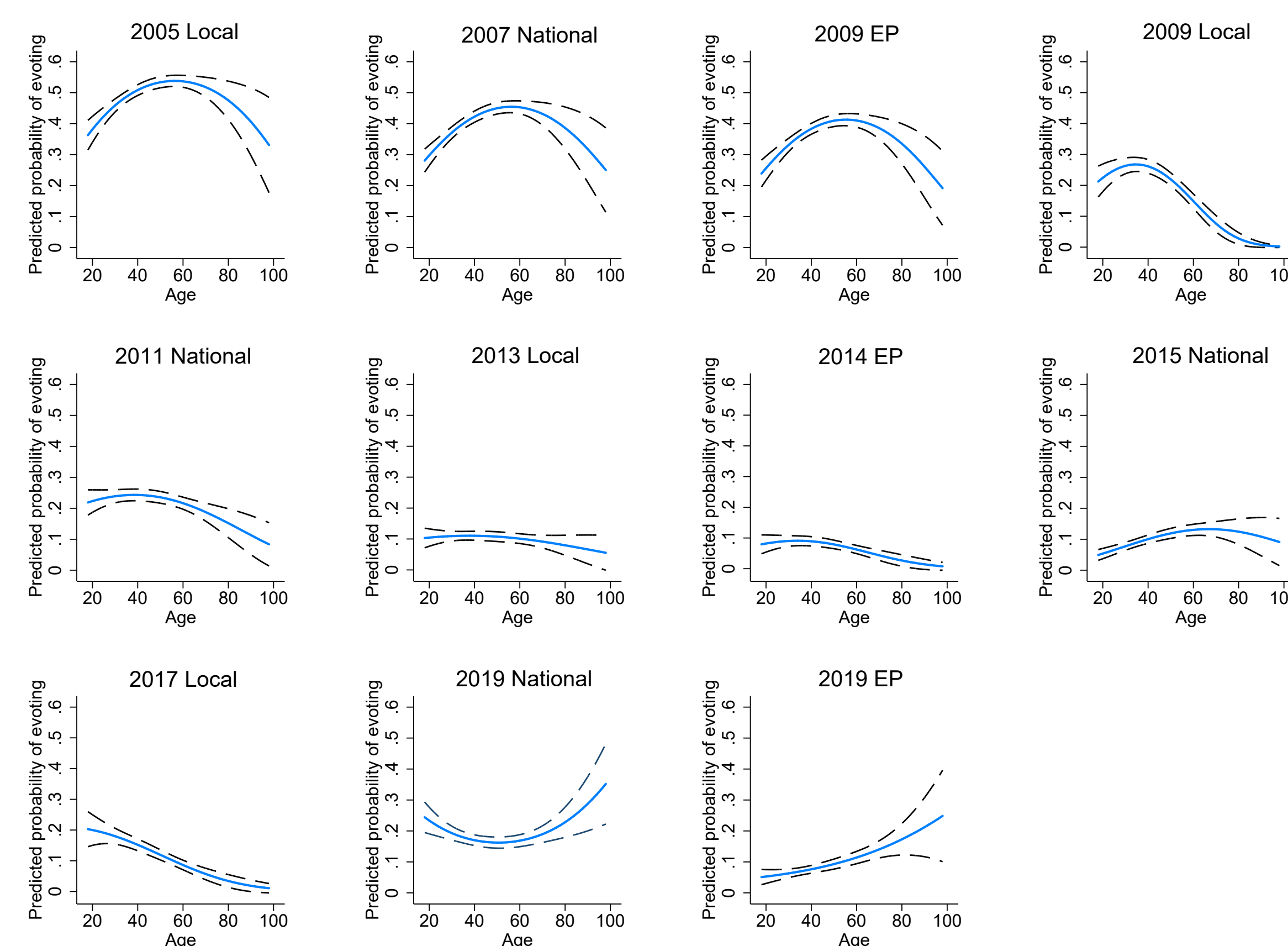


Fig. 3: Age effects on first time ivoting probability (2005-2019)

First, we see how a strong inverted U-shape age effect is apparent in the first free elections. This means that the highest probability to pick up Internet voting was heavily affected by age, with mid-aged people being the most likely ivoters in early elections.

Second, the age effect gradually flattens. This means that age loses its ability to separate first time ivoters from paper ballot voters over time and can only happen if the age structure of both groups becomes gradually more similar.

Third, one election, the 2019 national elections, shows hints of a U-shaped effect. Comparing this to the usage rates in Figure 1 shows it coincides with a sudden increase in Internet voting and indicates that the first-time users on that occasion came primarily from the very youngest and oldest voter groups. In the 2019 European Parliament election the age effect is however again much flatter meaning the statistical significance of age in predicting uptake of Internet voting has gone.

Previous research has shown that the age effect depicted here is mirrored by other socio-demographics, initially they predict uptake very well indicating no diffusion has taken place, but as usage increases over time the effects also disappear indicating that Internet voters have become very similar to regular paper voters [3]. One can conclude that this evidence backs up scenario A in Figure 2 and provides evidence that Internet voting has over time diffused into very heterogeneous voter groups.

### Missing young user groups

One peculiarity of the Estonian Internet voting has been a quite low usage rate by the very youngest voters. Some evidence from anonymized log data suggests that ivoting among the very youngest group - 18-20 year old - is at the same level as among the 70 year old [2]. This is also supported by survey data, the youngest people are among the least likely ivoters. Why this does not contradict information provided in the previous sections is explainable by a typically low youth turnout in Estonia. Young people simply do not vote, hence also don't ivote.

An exception to this rule has been the 2017 local election where voting age was lowered to 16. This produced an above average turnout among the 16-17 old, but had no effect on the continued low turnout of other younger voter groups. The low participation rates among youth is a long known global phenomenon and explainable by the low salience of politics in their daily lives due to the life-cycle effect. Being mostly still in education, not yet on the labor market nor having children means issues like child care provision, schooling, taxes, social benefits, infrastructure and business environment are not as important and will start to take centre stage only later, spurring voter participation in later life.

The Estonia case demonstrates once more that the voting channel does not really matter for youth turnout, it is the low salience of politics and lack of attention from political parties that feeds their non-participation.

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### References

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