Sorting of Candidates: Evidence from over 20,000 Electoral Ballots
Appendix

October 20, 2019

Including spaces: 7089 characters.

Appendix A

Data Description

Political Party	2002	2006	2010	2014	2018
KDUCSL	17,717	17,930	14,940	14,603	12,238
CSSD	16,095	16,111	16,884	16,336	11,752
KSCM	20,717	19,074	17,375	16,083	12,704
ODS	16,168	19,042	18,757	11,667	10,615
TOP 09	0	0	9,703	6,363	1,338
ANO	0	0	0	7,906	7,927

Table 1: Number of Candidates

Political Party	2002	2006	2010	2014	2018
KDUCSL	37 %	34 %	31 %	27 %	27 %
CSSD	43 %	41 %	48 %	50 %	50 %
KSCM	60 %	55 %	52 %	48 %	48 %
ODS	48 %	51 %	51 %	50 %	43 %
TOP 09	.	.	27 %	29 %	35 %
ANO	.	.	.	18 %	27 %

Table 2: Share of Affiliated

Definition of Rank

For all years t and ballots i, being placed on a k-th position on a ballot with n candidates yields normalized rank

$$NormalizedRank = \frac{k-1}{n-1}. \tag{1}$$

To provide a better measure of the effect of political affiliation and quality on ballot order and to provide more neat figures, we employ a conditional rank defined as followed.

$$\begin{aligned} \frac{k_{it}-1}{n_{it}-1} &= f(X_{it}, \gamma_{it}) + \eta_{it} \\ rank_{it} &= \frac{\eta_{it} - min(\eta_{it})}{max(\eta_{it}) - min(\eta_{it})}, \end{aligned} \tag{2}$$

where f is a flexible function of year fixed effects, party fixed effects, party-year interactions, age, gender and previous political experience of candidates. The rank is normalized so it falls between (0,1). The rank converges to 0 as we approach the top position and to 1 as we approach the bottom of the ballot.

Bottom Positions

There is a disproportionately high share of high valued candidates at the last position on the ballots. Candidates at the bottom are more likely to be of high valence, of higher *intra* party value, and with more political experience. We also document that the bottom positions attract more votes (Figure 1).

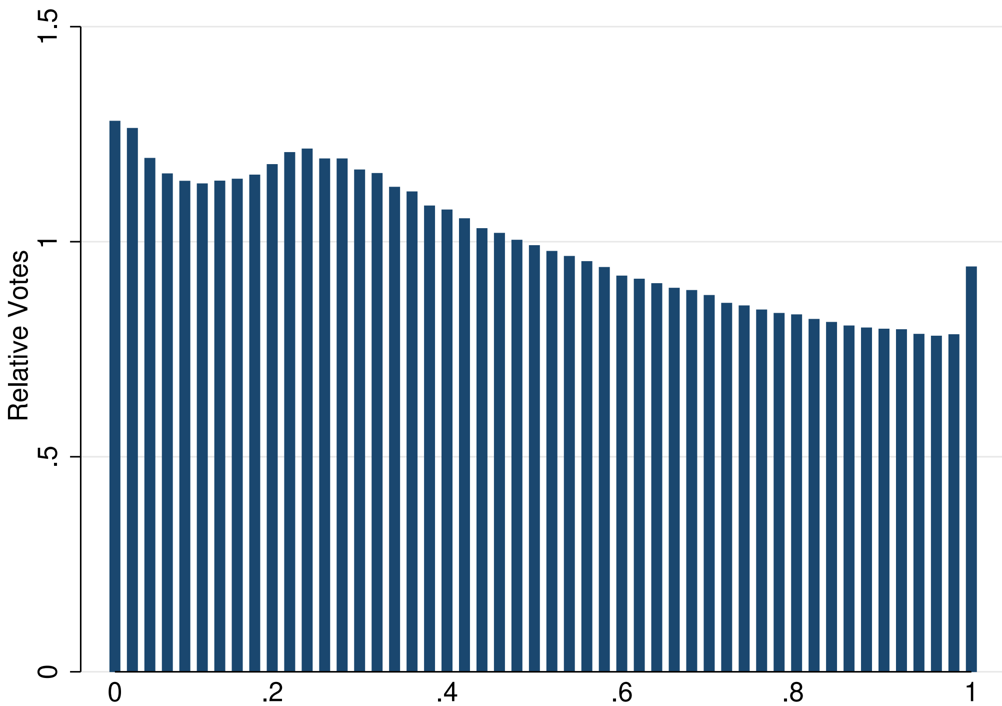
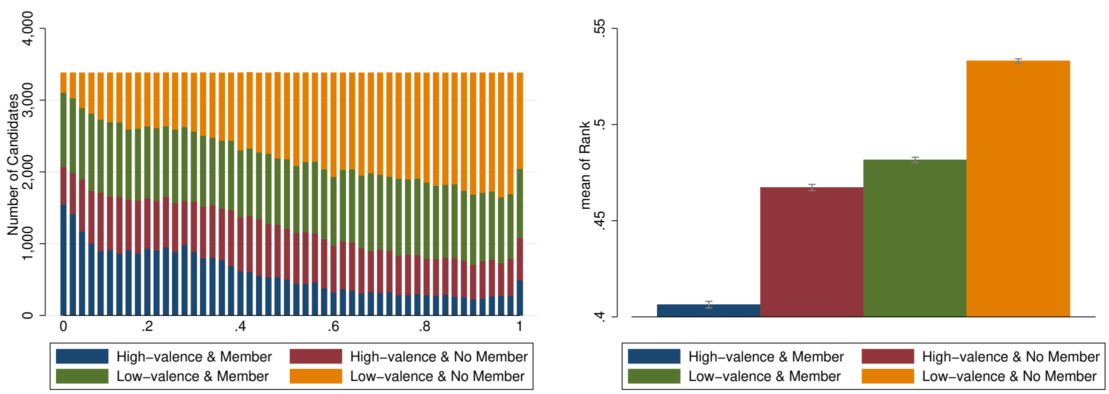


Figure 1: Average Relative Share of Votes by Ballot Position

Robustness Exercises

Ballot Structure

As a robustness check, we provide additional exercise. First, Figure 2a and 2b shows sorting and means by type of candidates for a sample of candidates who run on a ballot with all four types of candidates. Comparing to the baseline figures, it shows less than half of candidates. It also hints that a significant share of low valence non-members place on well-ranked positions are candidates running on a ballot with not high valence candidates. Overall, the figure supports sorting as summarized in Observation ??.

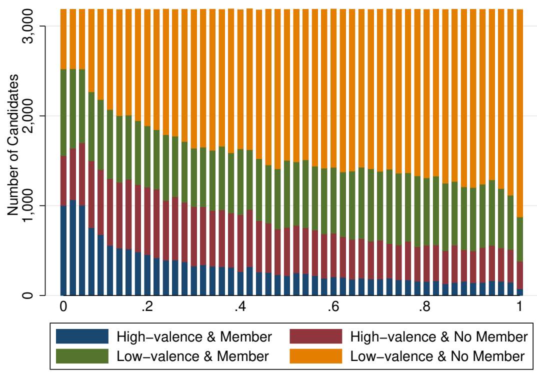


(a) Structure Ballots (Members) (b) Average Rank by Groups (Members)

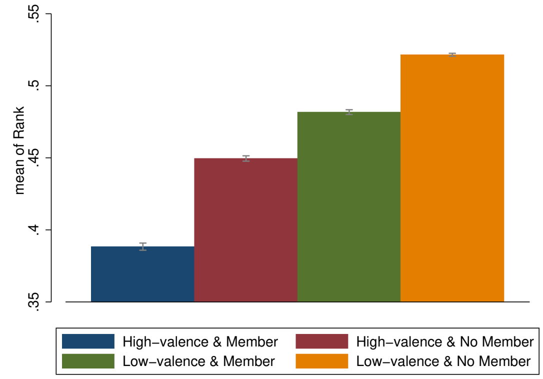
Figure 2: Ballots with all Four Types of Candidates

Second, Figure 3a and 3b take into account only candidates that prior their candidacy have had no previous experience with municipal elections. It shows that the sorting patterns hold among political novices. Interestingly, there is no peak at the bottom of the ballot, suggesting that the peak is indeed driven by politically experience candidates.

Third, using data from parliamentary elections, we reclassify the group of donors to those who donate at least 50,000 CZK (approx. 2,000 EUR). Figures 4a and 4b show the ballot structure for more generous donors. In line with the presented model, the share of donors shrinks, while the their ballot rank improved. In fact, as the threshold for donors increases, the different in rank between high and low valence candidates disappear.

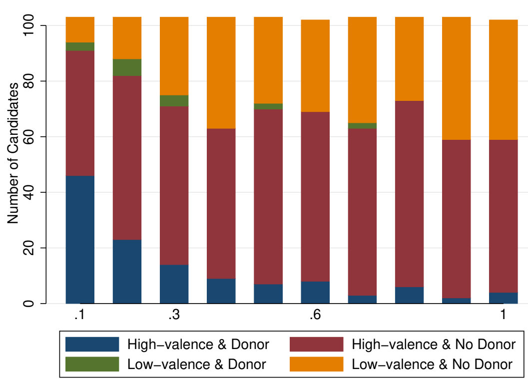


(a) Structure Ballots (Members)

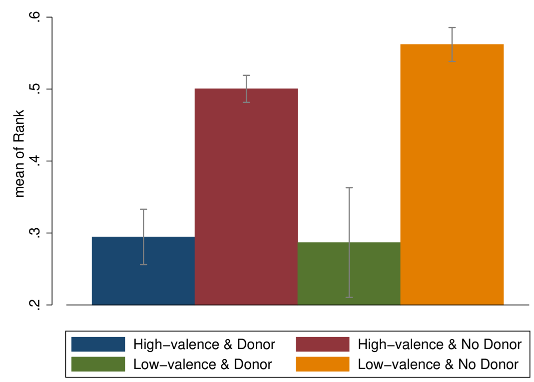


(b) Average Rank by Groups (Members)

Figure 3: Only Candidates Without Political Experience



(a) Structure Ballots (Donors)



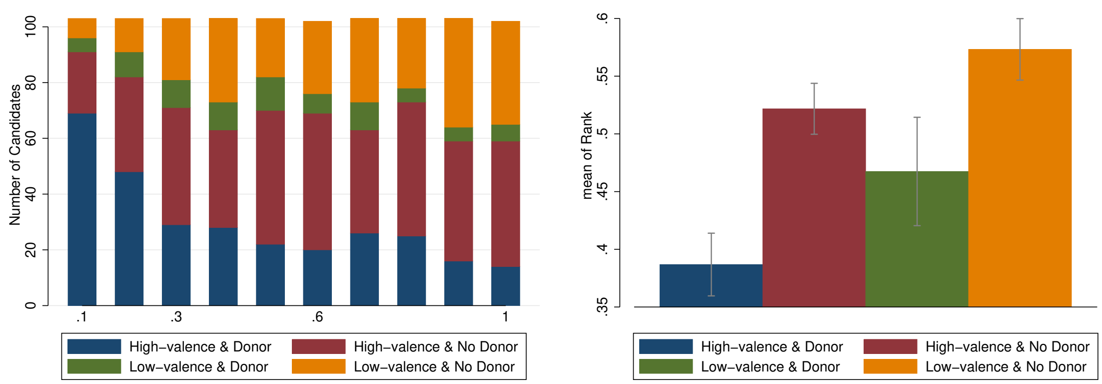
(b) Average Rank by Groups (Donors)

Figure 4

Donors - Parliamentary Election

The share of donors among candidates in municipal elections is small. To provide additional evidence of sorting on the ballot among donors, we study ballots in parliamentary elections. While the number of candidates from one of the six main parties in the last 5 parliamentary elections is *only* around 8,500, roughly a third of them are classified as donors. We create *rank* as before, normalizing the ballot position into the [0,1] interval.

Figure 5a collapses candidates according to their rank by 10%. The share of high valence donors is decreasing rapidly as one goes to worse ranked positions on ballot. While there are almost two thirds of high valence donors among the 10% best ranked positions, there are only around 15% among the worst ranked candidates. Similarly to municipal election, in parliamentary elections, low valence donors are ranked better than high valence non-donors.



(a) Ballot Structure (Donors) (b) Average Rank by Groups (Donors)

Figure 5

Party Strength

Figure 6 shows changes in ballot structure after a popularity shows decomposed for all six parties. Note that both TOP09 and ANO, i.e. parties with relatively large confidence intervals are parties that participate only in three and two elections, respectively. Therefore, the estimates are based on fewer observations.

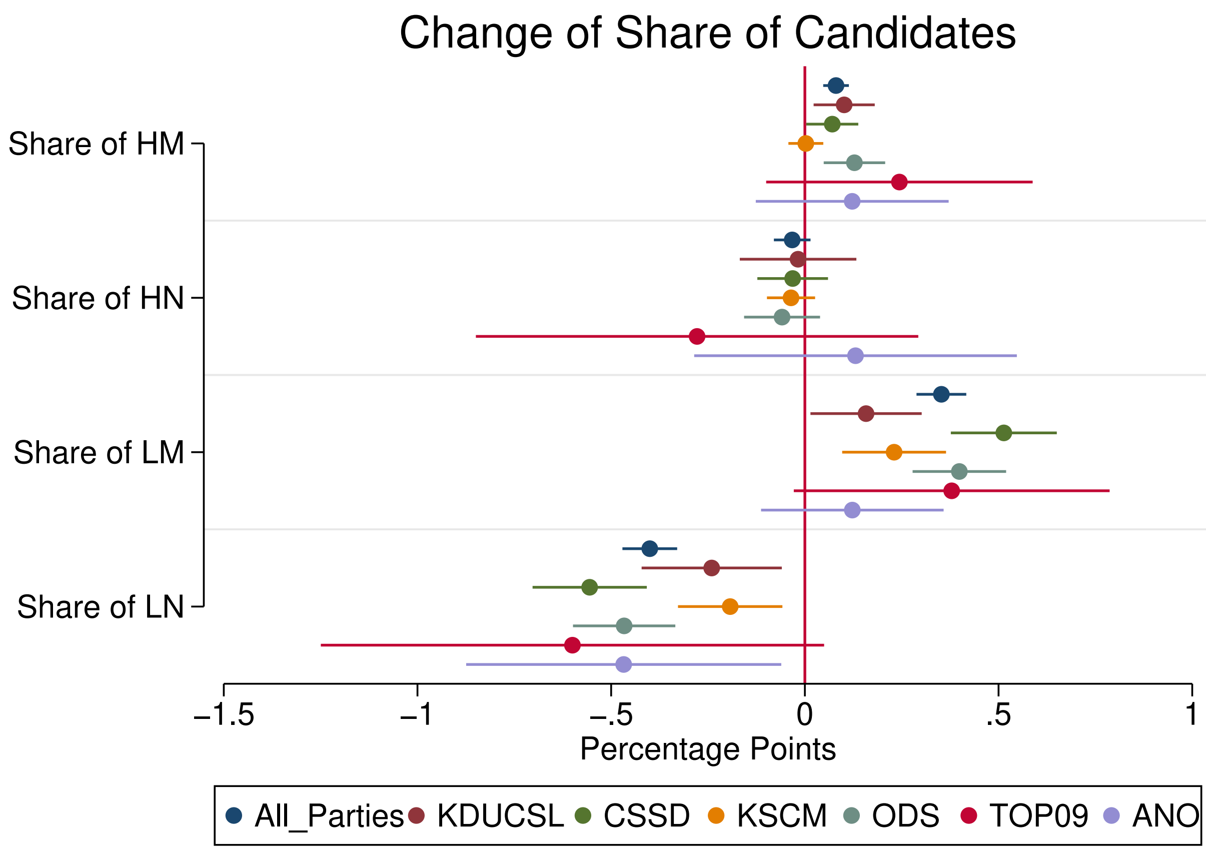


Figure 6: Changes in Groups Share (Members) by Party

Different Source of Variation

To provide additional evidence supporting our narrative, we explore different source of variation. Specifically, comparing to the Regression **??**, we employ two different fixed effects: (i) party-municipality (γ_{pj}) as before; and (ii) political cycle (γ_τ) as captured in regression 3. Therefore, we do not control for variation caused by a change a party popularity at the national level. Suppose a party A becomes more popular, then this popularity shocks increases both the share of votes in national election in the municipality and the electoral potential in the next municipal election.

$$Share^g_{pj\tau} = \alpha^g + \beta^g PE\ ShareVotes_{pj\tau} + \sum_{k\in\{HM,HN,LM\}} \delta^k PE\ Share^k_{p\tilde{j}\tau} + \gamma^g_{pj} + \gamma^g_\tau + \epsilon^g_{pj\tau} \tag{3}$$

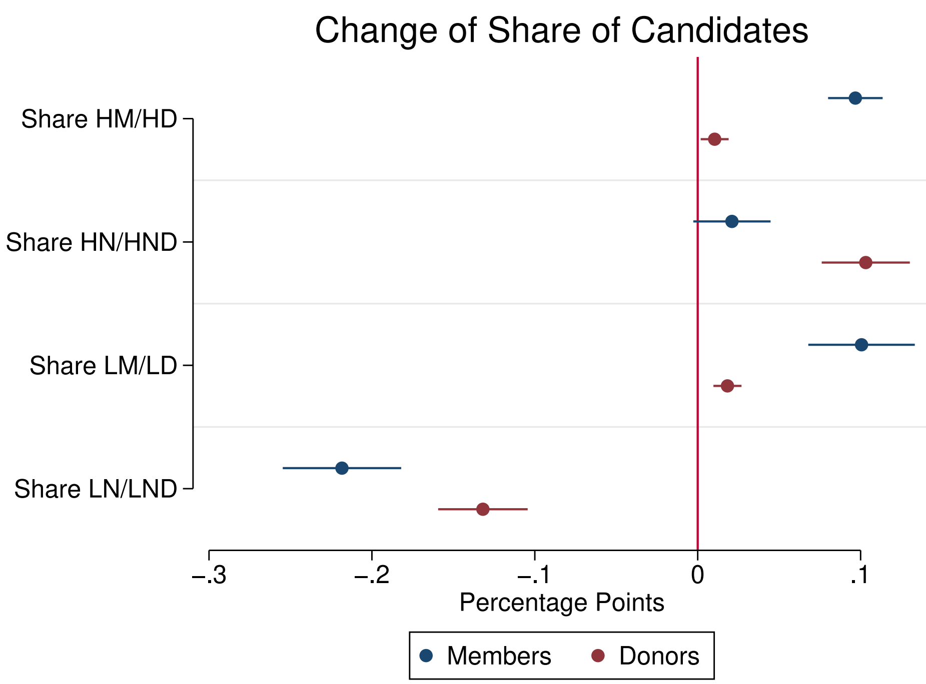


Figure 7: Changes in Group Shares (Robustness exercise)

Figure 7 graphically shows coefficients β^g for both measures of *intra* party values. Despite some of the coefficient being insignificant, the main narratives hold. As party is more popular and thus its bargain power is higher, there are more high valence candidates and more candidates with *intra* party value on the ballot. Consequently, the least valuable group low valence candidates with low *intra* party value are forced out.

Appendix B

t_4 is not sensitive to α

To see this, we show that optimal t_4 is not a function of a vector (t_1, t_2, t_3). Start with the definition of t_4 as a threshold that solve party leader's problem, i.e. a threshold that maximizes $V(\bar{q}, \bar{m})$ and note that $q(t)$ and $m(t)$ are indicator functions, so the problem can be split in four non-zero integrals.

$$V(\bar{q}, \bar{m}) = \int_{HM} g(t)dt + \int_{HM} \gamma dt + \int_{HN} g(t)dt + \int_{LM} \gamma dt \tag{4}$$

First, note that first two terms, are independent of t_4, as HM will be always placed on the interval from (0,t_1). That simplifies the problem into a sum of two integrals.

$$\tilde{V} = \int_{HN} g(t)dt + \int_{LM} \gamma dt \tag{5}$$

Second, note that t_4 is binding only if $t_4 < \min(t_2,\ t_3)$. That follows from the fact that for $t > \min(t_2,\ t_3)$, there is no trade off between LM and HN, as (at least) one of the groups does not satisfies the participation constraints.

Consider the following reduced objective function and denote x as a position of a switch between HN and LM.

$$\tilde{V} = \int_{t_1}^{x} g(t)dt + \int_{x}^{\min(t_2,t_3)} \gamma dt, \tag{6}$$

Deriving the FOC of $\tilde{V}$ with respect to x yields

$$g(x) = \gamma. \tag{7}$$

Since $g(t)$ is a decreasing function, there is no more than one value satisfies this optimal condition. If $x < min(t_2, t_3)$, there is an interior solution and $t_4 = x$; otherwise, $x = min(t_2, t_3)$ and t_4 is irrelevant. Irrelevance of t_4 implies that any value of t_4, such that $t_4 \in (min(t_2, t_3), 1)$ is consistent with equilibrium behaviour. We show that while the switch between HN and LM is a function of α, as the vector of thresholds derived from candidates' participation constraints is a function of α, the t_4 it is not.

Proofs of Propositions

We prove both Proposition **??** and **??** simultaneously by discussing all possible combinations of thresholds and associated order of groups of candidates.

As there are four different thresholds t_1, t_2, t_3, and t_4 ordered on continuous interval $[0, 1]$, there are 24 different combinations in which they may be combined. First, note that it must be the case that $t_1 < t_3$, otherwise *intra* party value would imposed negative cost, i.e. $c_a < 0$. That leaves us with 12 cases.

Second, note that if all four groups are represented on the ballot, it must be the case that $t_2 > \min\{t_3, t_4\}$. Suppose the opposite is true and $t_2 < t_4$ & $t_2 < t_3$, then low valence candidates with *intra* party value LM candidates are willing to run only from positions for which high valence candidates with no *intra* party value are preferable and willing to run. Therefore, LM would not be represented on the ballot. That excludes additional five combinations.

We are left with seven combinations of thresholds and related groups. Note that four thresholds divide the ballot into five intervals. We next describe which types of candidates (using a notation for membership status rather than donation) will be in which intervals.

(a) $t_1 < t_3 < t_2 < t_4$ implies the following intervals {HM, HN, LM, LN, LN}

(b) $t_1 < t_3 < t_4 < t_2$ implies the following intervals {HM, HN, LM, LN, LN}

(c) $t_1 < t_4 < t_2 < t_3$ implies the following intervals {HM, HN, LM, HN, LM}

(d) $t_1 < t_4 < t_3 < t_2$ implies the following intervals {HM, HN, LM, LM, LN}

(e) $t_4 < t_1 < t_2 < t_3$ implies the following intervals {HM, HM, LM, HN, LN}

(f) $t_4 < t_1 < t_3 < t_2$ implies the following intervals {HM, HM, LM, LM, LN}

(g) $t_4 < t_2 < t_1 < t_3$ implies the following intervals {HM, HM, HM, HN, LN}

Note, that in cases (f) and (g), there are not all groups represented. Case (c) is special, as HN are distributed in two disconnected intervals. If this was true, we should observe high variance in HN candidates' positions, which is not the case. Therefore, we rule the case (c) as not representing the data.

Finally, the case (e) is the only possible case that implies that the average position of low valence candidates with *intra* party value is *better* than position of high valence candidates with no *intra* party values. That proves Proposition **??**. Cases (a), (b), and (d) are the only three cases that: (i) satisfy the conditions from Proposition **??** ($t_1 < t_3 < t_2$ & $t_1 < t_4$); and at the same time: (ii) implies the sorting of candidates observed in data. This proves Proposition **??**.