Behavioral Social Choice: What is it?

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Thanks:

- American Psychological Association (APA)
- ✓ Air Force Office of Scientific Research (AFOSR)
- ✓ National Science Foundation (NSF)



Outline

- Behavioral Social Choice
- "Impossibility" in Social Choice
- Condorcet Paradox
- Partial Ranking Ballots (STV elections of APA)
- Model Dependence and Bootstrap
- Empirical Consensus among Consensus Methods

































| | ale of | ine Ar | t: Sne | epsie e | t al. 19 | 97 |
|---------------------------------|----------|---------------------------------|--|-------------------------------------|------------|-------|
| | | | | | | |
| | Based on | Probabi Sampling from ("I | lity of a Cycle: a Uniform Dist mpartial Culture | Pr(m, n) ribution on Line ")* | ear Orders | |
| | | n | umber of voter | s (n) | | |
| number of dternatives (m) | 3 | 5 | 7 | 9 | 11 | limit |
| 3 | .056 | .069 | .075 | .078 | .080 | .088 |
| 4 | .111 | .139 | .150 | .156 | .160 | .176 |
| 5 | .160 | .200 | .215 | | | .251 |
| 6 | .202 | | | | | .315 |
| limit | ≈1.00 | ≈1.00 | ≈1.00 | ≈1.00 | ≈1.00 | ≈1.00 |

State of the Art: Shepsle et al. 1997

| | Based on | Probabi Sampling from ("I | lity of a Cycle: a Uniform Dis mpartial Cultur | Pr(m, n) tribution on Line e")* | ear Orders | |
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*Source: Riker (1982: 122) as reproduced in Shepsle and Bonchek (1997: Table 4.1, 54)



| | | | | r | | |
|----------------------------------|----------|---------------------------------|--|--------------------------------------|------------|-------|
| | Based on | Probabi Sampling from ("I | ility of a Cycle: a Uniform Dist mpartial Cultur | Pr(m, n) ribution on Line e")* | ear Orders | GIGO? |
| | | n | umber of voter | rs (n) | 1 | |
| number of alternatives (m) | 3 | 5 | 7 | 9 | 11 | limit |
| 3 | .056 | .069 | .075 | .078 | .080 | .088 |
| 4 | .111 | .139 | .150 | .156 | .160 | .176 |
| 5 | .160 | .200 | .215 | | | .251 |
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\$1,000,000 Question:

Where is the empirical evidence for voting paradoxes in practice?

Oops....

For instance, hardly any evidence that majority cycles have ever occurred among serious contenders of major elections.

Actually, evidence circumstantial at best.



Majority Winner

Candidate who is ranked ahead of any other candidate by more than 50%Candidate who beats any other candidate in pairwise competition

Plurality: Choose one

- **SNTV & Limited Vote**: *Choose k many*
- Approval Voting: Choose any subset
- **STV (Hare), AV (RIV)**: *Rank top k many*
- **Cumulative Voting**: *Give m pts to k many*
- Survey Data: Thermometer, Likert Scales

Data are incomplete!!

A General Concept of Majority Rule













A General Definition of Majority Rule

Given a probability distribution $P: B \rightarrow [0,1]$ $B \mapsto P(B)$ on any set *B* of binary relations, *a is strictly majority preferred to b* if and only if $\sum_{(a,b)\in B} P(B) > \sum_{(b,a)\in B'} P(B')$













| ANES S | Strict Majority Social Welfar | e Orders |
|--------|----------------------------------|---------------------|
| Year | Threshold | SWO Nixon |
| 1968 | 0,, 96 | Humphrey Wallace |

| ANES S | trict Majority Social Welfar | e Orders |
|---------------------|---------------------------------|---------------------------------|
| Year 1992 | Threshold 0,, 99 | SWO Clinton Bush Perot |



| ANES S | trict Majority Social Welfar | e Orders |
|--------|---------------------------------|--|
| Year | Threshold 0,, 29 | SWO Carter Reagan Anderson |
| 1980 | 30,, 99 | Reagan Carter Anderson |

| ANES S | trict Majority Social Welfar | e Orders |
|--------|---------------------------------|-----------------------------------|
| Year | Threshold 0,, 49 | SWO Clinton Dole |
| 1996 | 85,, 99 50,,84 | Perot Dole Clinton Perot |

Preliminary Conclusions:

Majority Preference Relation is hypothetical is model dependent should be treated in an inference framework may or may not be robust Where are the cycles?

| Sta | ate of | the Ar | t: She | psle e | t al. 19 | 97 |
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| | | | | | | |
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| *Source: Rike | er (1982: 122) | as reproduced | in Shepsle an | d Bonchek (19 | 997: Table 4.1, 5 | 54) |

Drawing Random Samples from Realistic Distributions

What happens if we interview 20 randomly drawn voters from the 1996 ANES?

Do they display cyclical majorities?

Do they display the correct majority preference order?



































- Good approximation of political elections
- 8 Data sets (1998-2005)
- Size +/- 20,000 voters
- Ballots: Partial/Full Rankings of 5 Candidates

| et Borda | |
|----------|-------|
| CBADE | |
| | CBADE |

| esults 1 | Bootst bold > | Bootstrapped Confidence bold > 95% | | |
|----------|------------------|---------------------------------------|------------------------|--|
| 1998 | Condorcet | Borda | Plurality | |
| WO | CBADE | CBADE | C <u>E</u> A <u>BD</u> | |
| ZW | CBDAE | CBDAE | C <u>AEBD</u> | |

| Re | Results 1998 | | | | | |
|----|--------------|-----------|-------|------------------------|--|--|
| | 1998 | Condorcet | Borda | Plurality | | |
| | WO | CBADE | CBADE | C <u>E</u> A <u>BD</u> | | |
| | ZW | CBDAE | CBDAE | C <u>AEBD</u> | | |
| | SIM | CBDAE | CBDAE | C <u>AEBD</u> | | |
| _ | | No Cycle | | | | |

| Re | Results 2005 | | | | | |
|----|--------------|-----------|-------|---------------|--|--|
| | 2005 | Condorcet | Borda | Plurality | | |
| | WO | BADEC | BADEC | <u>AB</u> DEC | | |
| | ZW | BADEC | BADEC | <u>AB</u> DEC | | |
| | SIM | BADEC | BADEC | <u>AB</u> DEC | | |
| | | No Cycle | | | | |

| reem A dat | ent amo ta (Weak | ng winne Order M | ers 1odel) | Bootstrapped Confidence bold > 95% |
|---------------|---------------------|------------------------|--------------------|--|
| | Condorcet Borda | Condorcet Plurality | Borda Plurality | All 3 |
| 1998 | >.99 | >.99 | >.99 | >.99 |
| 1999 | >.99 | .79 | .79 | .79 |
| 2000 | >.99 | >.99 | >.99 | >.99 |
| 2001 | >.99 | >.99 | >.99 | >.99 |
| 2002 | >.99 | >.99 | >.99 | >.99 |
| 2003 | >.99 | >.99 | >.99 | >.99 |
| 2004 | >.99 | >.99 | >.99 | >.99 |
| 2005 | >.96 | .03 | .06 | <.03 |

| reem A dat | reement among winners A data (Partial Order Model) | | | | |
|---------------|---|------------------------|--------------------|-------|--|
| | Condorcet Borda | Condorcet Plurality | Borda Plurality | All 3 | |
| 1998 | >.99 | >.99 | >.99 | >.99 | |
| 1999 | .89 | .86 | .93 | .67 | |
| 2000 | >.99 | >.99 | >.99 | >.99 | |
| 2001 | >.99 | >.99 | >.99 | >.99 | |
| 2002 | >.99 | >.99 | >.99 | >.99 | |
| 2003 | >.99 | >.99 | >.99 | >.99 | |
| 2004 | >.99 | >.99 | >.99 | >.99 | |
| 2005 | .89 | .70 | .67 | .63 | |

| reem A dat | ient amo ta (Linea | ng winne r Order I | ers Model) | Bootstrappe Confidence Cold > 95% |
|---------------|-----------------------|------------------------|--------------------|---|
| | Condorcet Borda | Condorcet Plurality | Borda Plurality | All 3 |
| 1998 | >.99 | >.99 | >.99 | >.99 |
| 1999 | >.99 | 0.79 | 0.79 | 0.75 |
| 2000 | >.99 | >.99 | >.99 | >.99 |
| 2001 | >.99 | >.99 | >.99 | >.99 |
| 2002 | >.99 | >.99 | >.99 | >.99 |
| 2003 | >.99 | >.99 | >.99 | >.99 |
| 2004 | >.99 | >.99 | >.99 | >.99 |
| 2005 | 0.97 | 0.02 | 0.04 | 0.02 |

Conclusions

- Impossibility theorems and voting paradoxes
- Hypothetical profiles in text books

Behavioral Social Choice:

- Model dependence
- Replicability (bootstrap/statistical confidence)
- Condorcet Paradox appears to be rare
- Empirical consensus among consensus methods (in large scale data)

