Analysis of Equilibria in Iterative Voting Schemes

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What's Iterative Voting?

Luke

Leia

Han

R2D2

C3Po

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What We Know About It

(Meir et al., AAAI 2010)

Using plurality voting and linear tie-breaking, when players are myopic and using a best response strategy, they will always converge to a stable state, i.e., a Nash equilibrium.

What are these equilibria?

Theorem I

Given two profiles ***a*** and ***b***, it is NP-complete to decide if ***b*** is reachable from ***a*** using an iterative best-response strategy.

But is our model realistic enough?

Option 1: Truth Bias

When a voter doesn't have a way to influence the outcome, it returns to its truthful vote.

Convergence is not guaranteed. Even the existence of a Nash equilibrium is not guaranteed.

(Laslier & Weibull; Thompson et al.)

Truth Bias

Luke

Leia

Han

R2D2

C3PO

Truth Bias: Non-convergence

Luke

Leia

Han

R2D2

C3Po

Theorem II

Truth-bias equilibria have a single non-truthful voter.

We have an algorithm which finds all truth-bias Nash equilibria with complexity $\boldsymbol{O}(mn)$.

Option 2: Lazy Bias

When a voter doesn't have a way to influence the outcome, it can abstain. However, this is a one-time event, as a voter cannot "un-abstain".

Convergence is guaranteed,
but the existence of a Nash equilibrium is not.

(Desmedt & Elkind, EC 2010)

Lazy Bias

Luke

Leia

Han

C3PO

Lazy Bias

Luke

This is NOT a Nash equilibrium

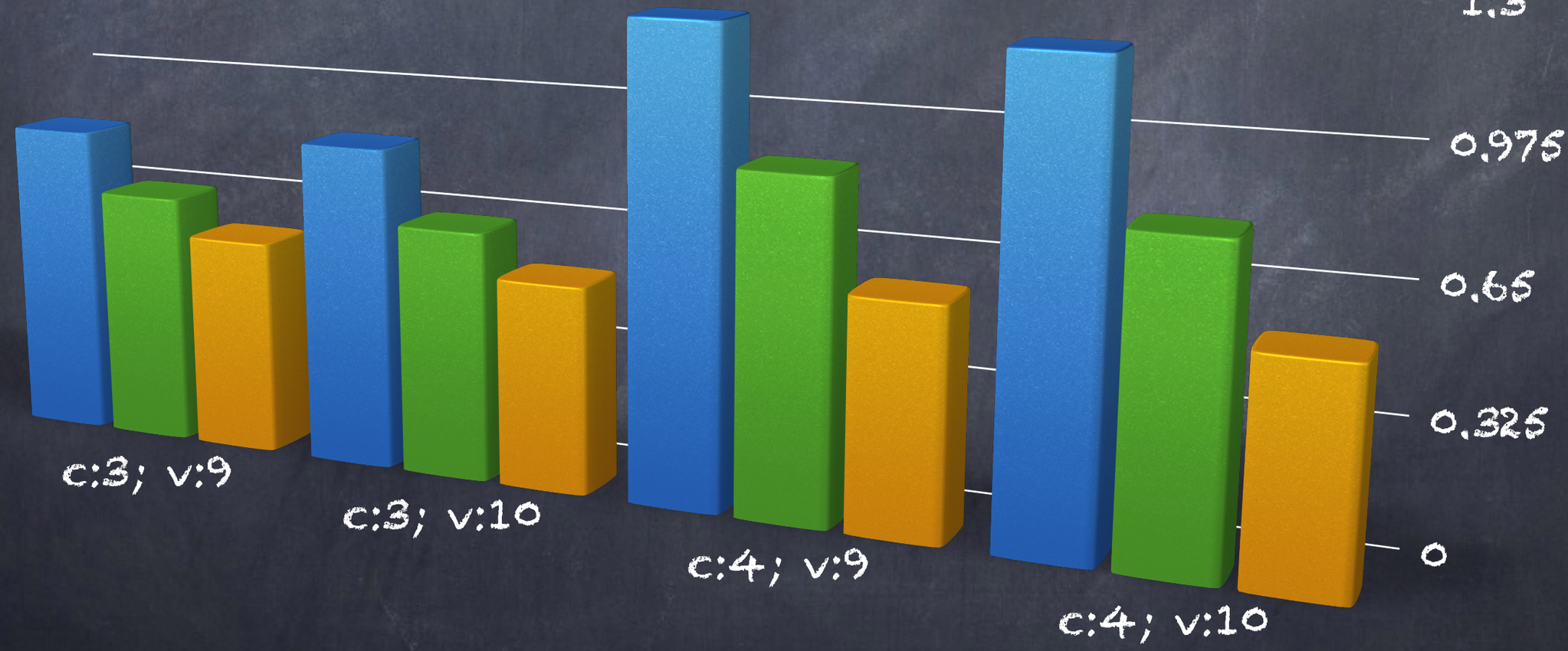
Theorem III

Lazy bias equilibria have a single non-abstaining voter.

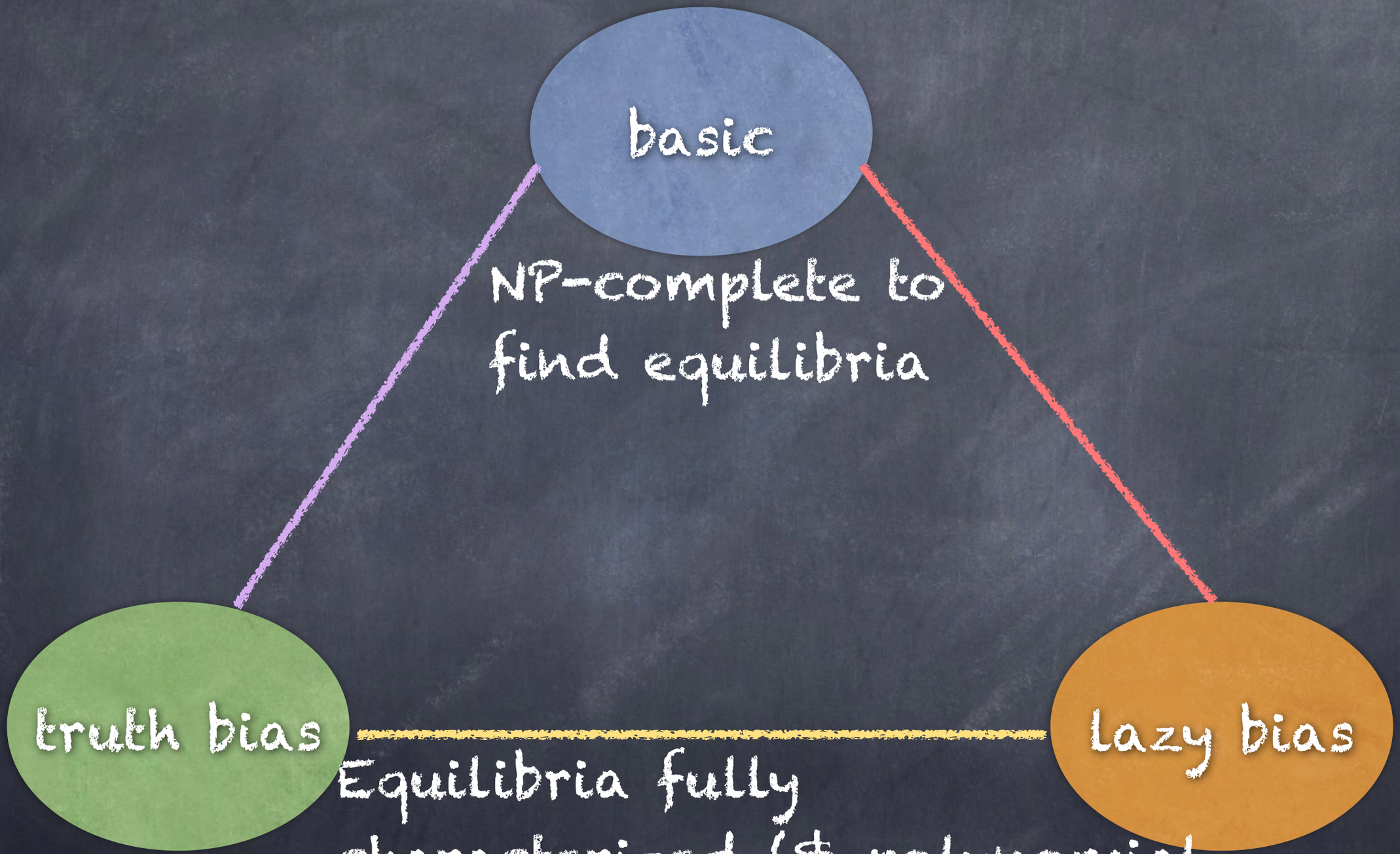
We have a polynomial algorithm which finds all lazy-bias Nash equilibria reachable from starting truthful position.

Empirical Results:
Truth bias winner quality

Unifrom Single peaked Single crossing



So what have we showed?



Where to go on from here?

More voting rules
(truth bias for veto/k-approval submitted)

More complex iteration model
(see previous presentation)

Empirical analysis using various distributions on these scenarios

Thanks for listening!

(turned out they were all extremely lazy biased)