Ambiguity and Climate Change

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Article

- Chambers and Melkonyan. "Ambiguity, Reasoned Determination, and Climate-Change Policy". *Journal of Environmental Economics and Management* 81 (2017):74-92.

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- Economic analyses of climate change are frequently conducted in the context of Integrated Assessment Models (IAMs) that "marry" a climate-science model with an economic model of how climate change affects economic factors

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- These models have proven quite controversial (for example, Pindyck 2013) and have been criticized on a number of grounds
- I'm not here to criticize IAMs. Instead I want to talk about one component of them−−the social benefit function

A Quote from A Donald

...there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don't know we don't know.

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- One reason denialism has been as successful as it has been is that some of the denials contain a grain of truth
- By virtually all accounts, the kind of climate change we're facing goes beyond human experience
- That rules out analyzing the issues in the traditional scientific fashion of gathering properly controlled data and statistically testing hypotheses

Model-Based Knowledge

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- And the models frequently disagree
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- "...the economics of climate change is the greatest application of subjective uncertainty the world has ever seen". (Weitzman, 2007)

Equilibrium Climate Sensitivity as an Example

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- This "parameter" is *not known*.
- In 2007, the Intergovernmental Panel on Climate Change (IPCC) reported no less than *18 probability distributions* for climate sensitivity while recognizing that "there is no well-established formal way of estimating a single PDF".

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- Savage defines a representation of uncertainty in terms of potential "states" of Nature and then uses a series of Axioms on "Rational Behavior" to derive the SEU as a choice criterion

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- Changing them leads to different decision criteria
- Paradoxes (Allais and Ellsberg) have emerged that suggest individuals don't behave according to the SEU criteria

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- *Ellsberg:* where odds are not known, or reasonably calculable on the basis of prior experience (*uncertainty*).
- *People prefer betting on risky rather than uncertain outcomes*–like to bet on games where they know the odds
- Cannot be reconciled with the SEU, which requires an individual to form a single probability measure to evaluate all uncertain outcomes.

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- We don't consider unknown unknowns (not to be taken lightly)

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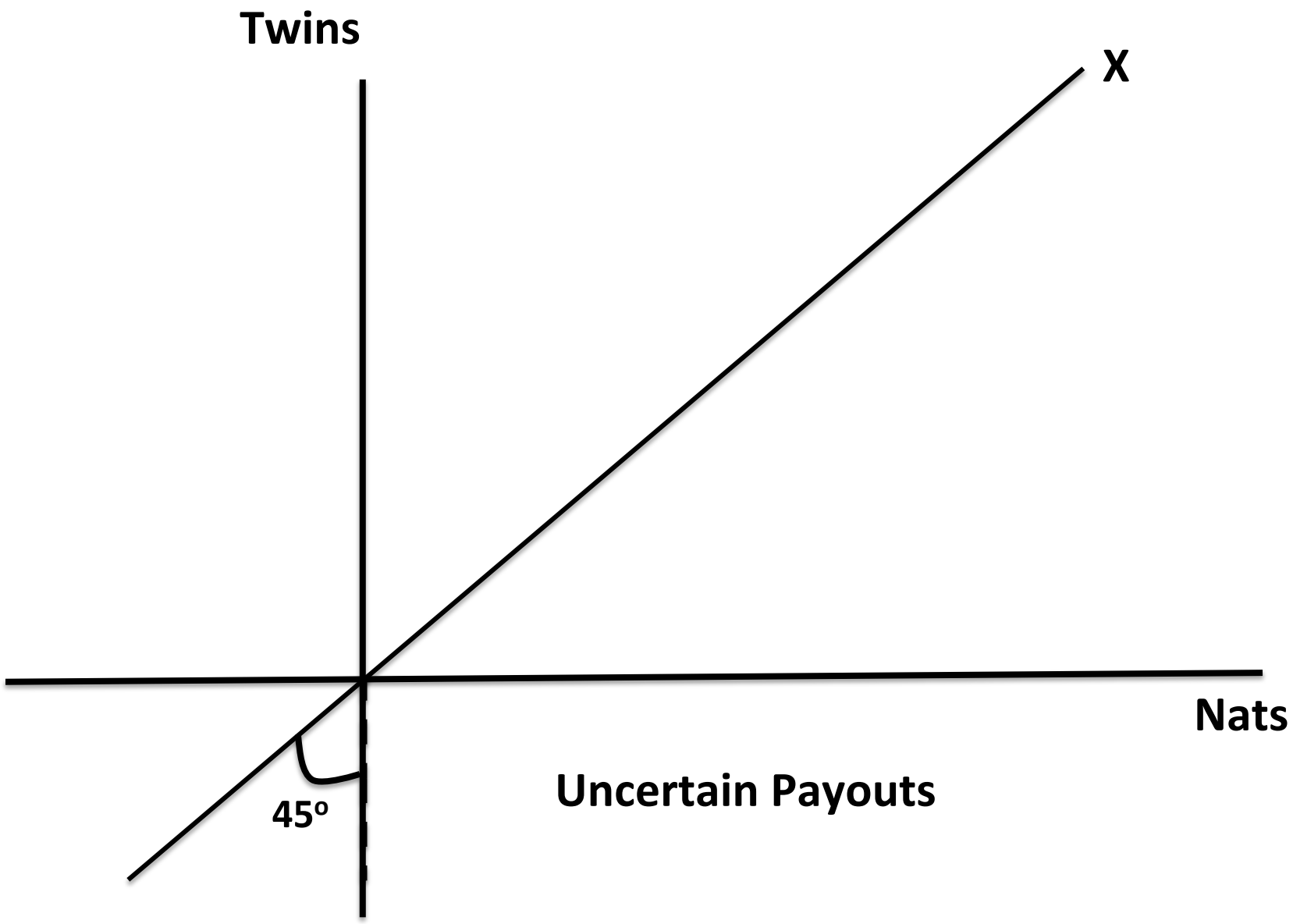
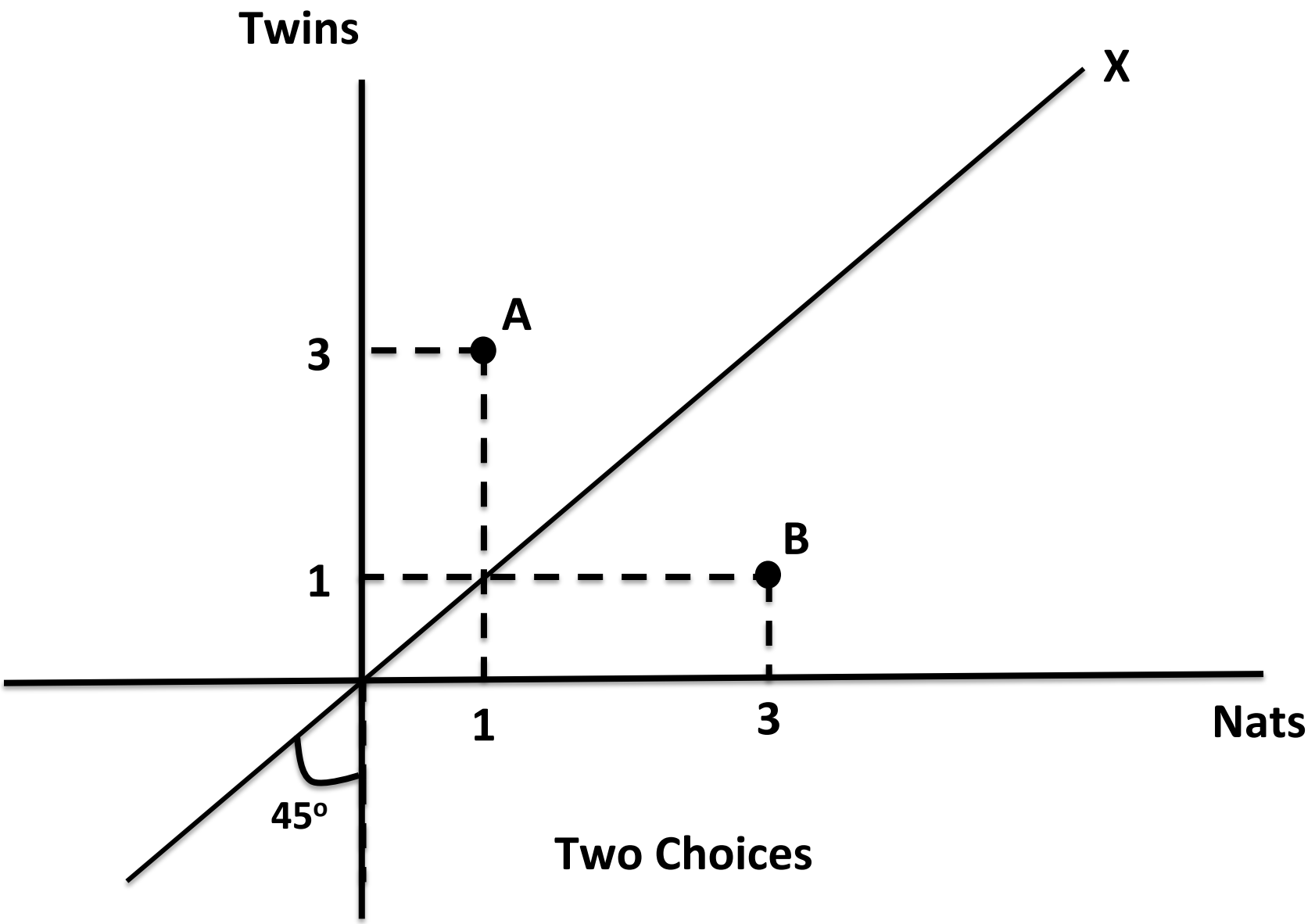
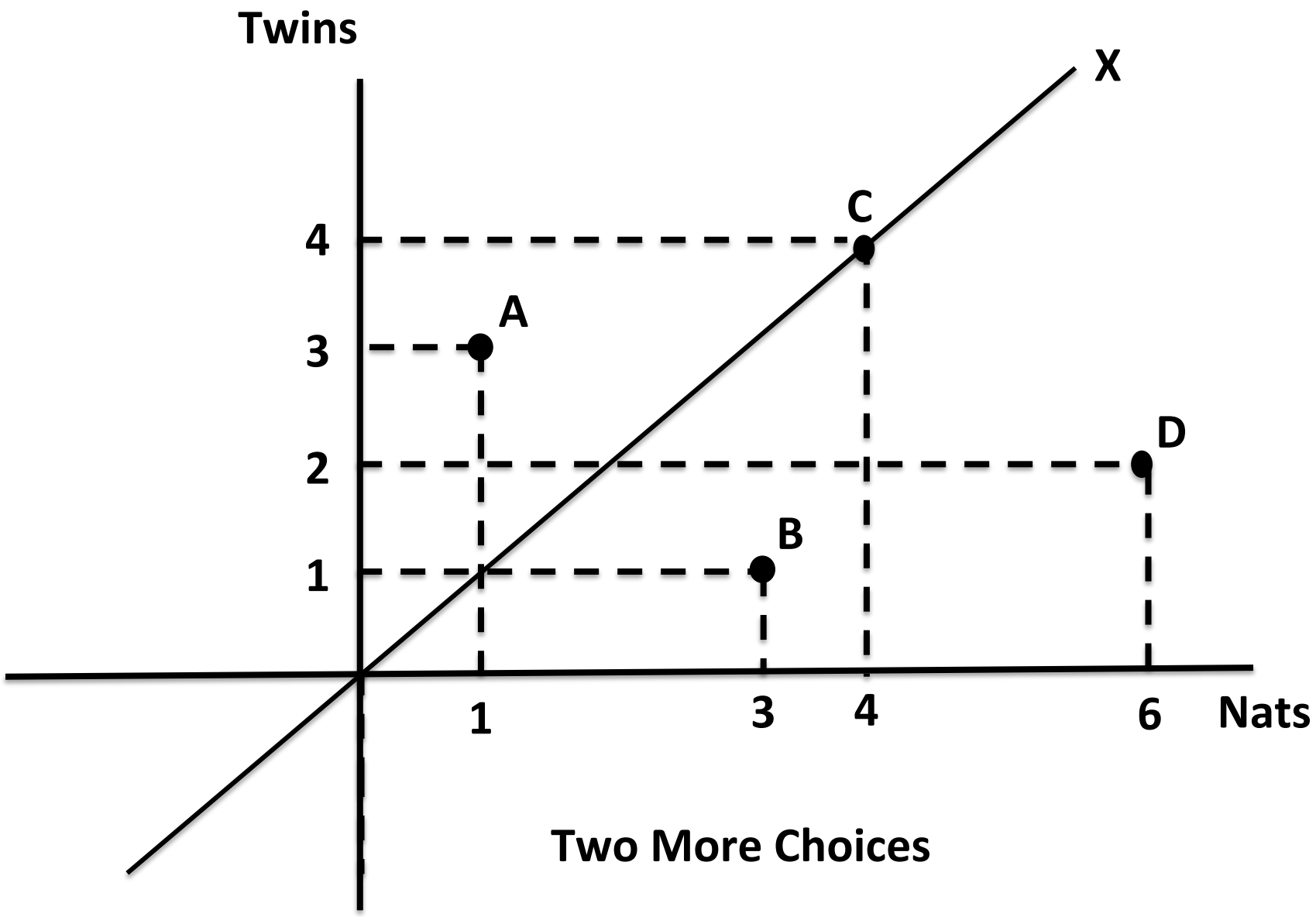
- Choice is to be made before I reveal my preference


Twins
X
Nats
45º
Uncertain Payouts



Two Choices



Two More Choices

Were You Rational?

- If A and then C $-$ $-$SEU rational

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- If B and then D $-$ $-$SEU rational

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- If B and C – –SEU rational??

Two Alternatives to SEU

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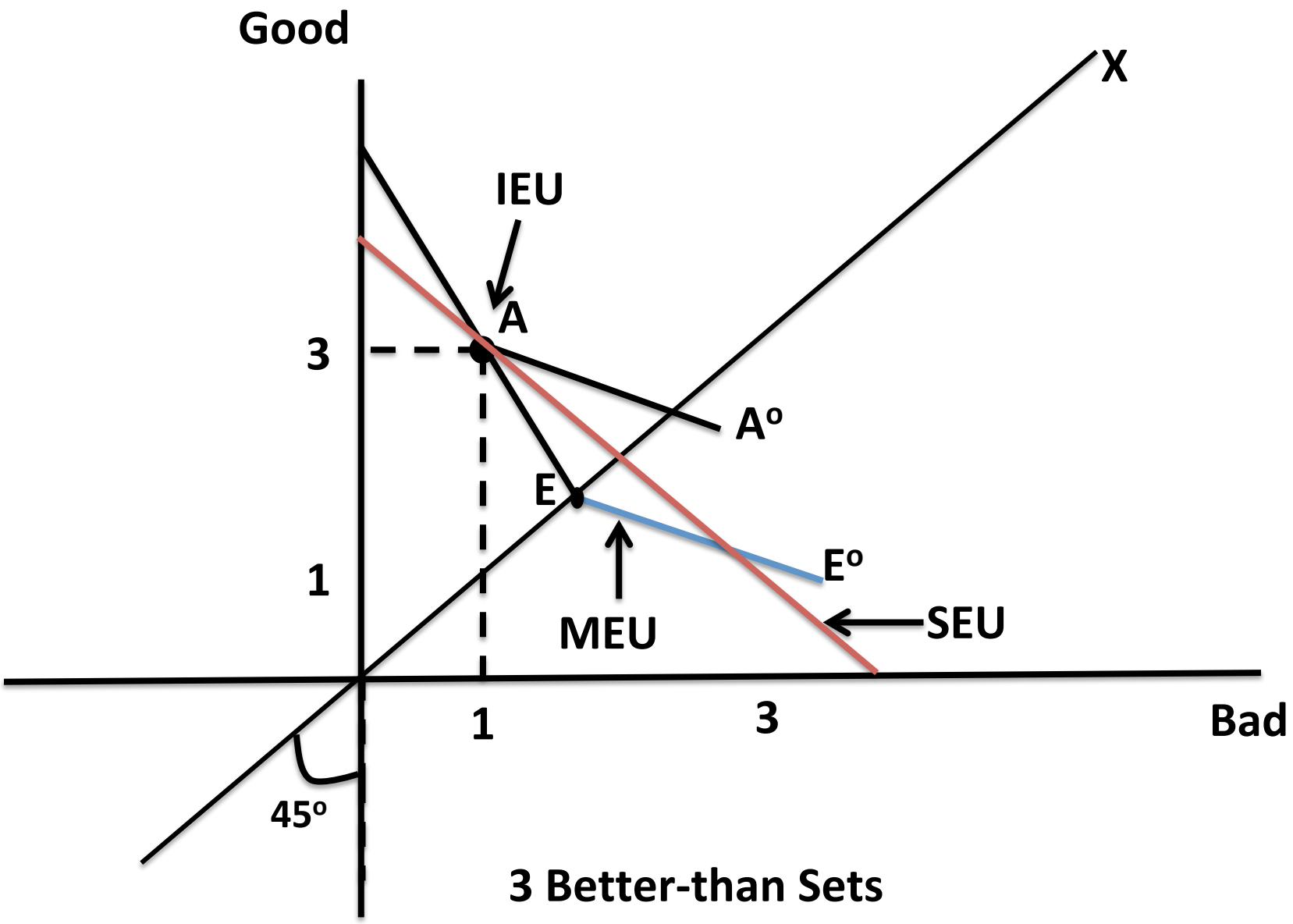
- Both MEU and IEU rank alternatives in terms of range of probabilities, but IEU is "more conservative" relative to the status quo and MEU is more conservative relative to the sure thing

A Quote from Dick?

If there's a 1% chance ...we have to treat it as a certainty in terms of our response. It's not about our analysis ... It's about our response (Suskind, 2001)



3 Better-than Sets

Implications for Climate Change Economics

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- SEU–somewhere in between (need to do something, but appears there's still time

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- *Objectively rational* requires making choices that a decision maker can convince others are correct (accords with unanimity in some voting models).

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- Calculated benefit-cost ratios for various scenarios

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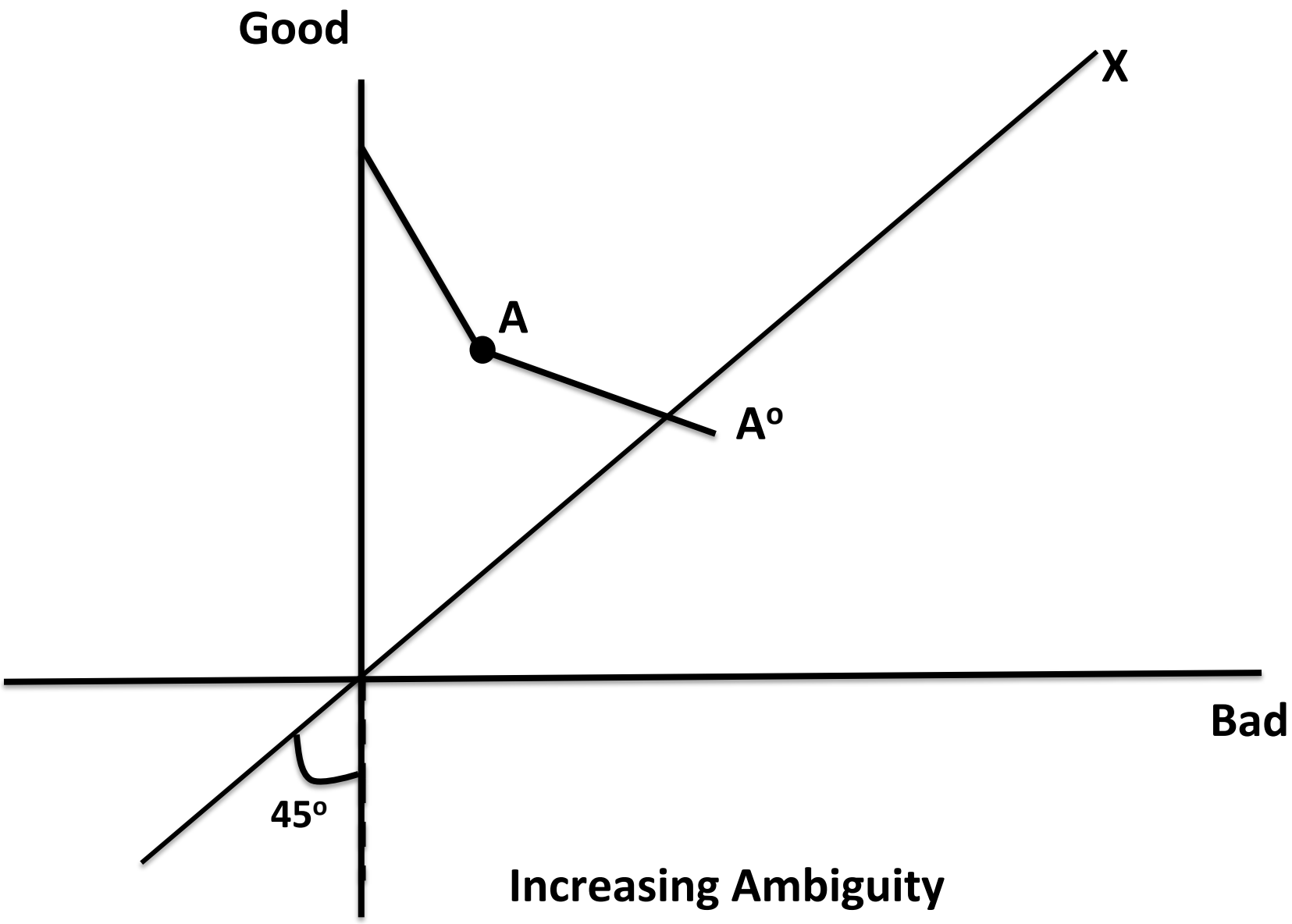
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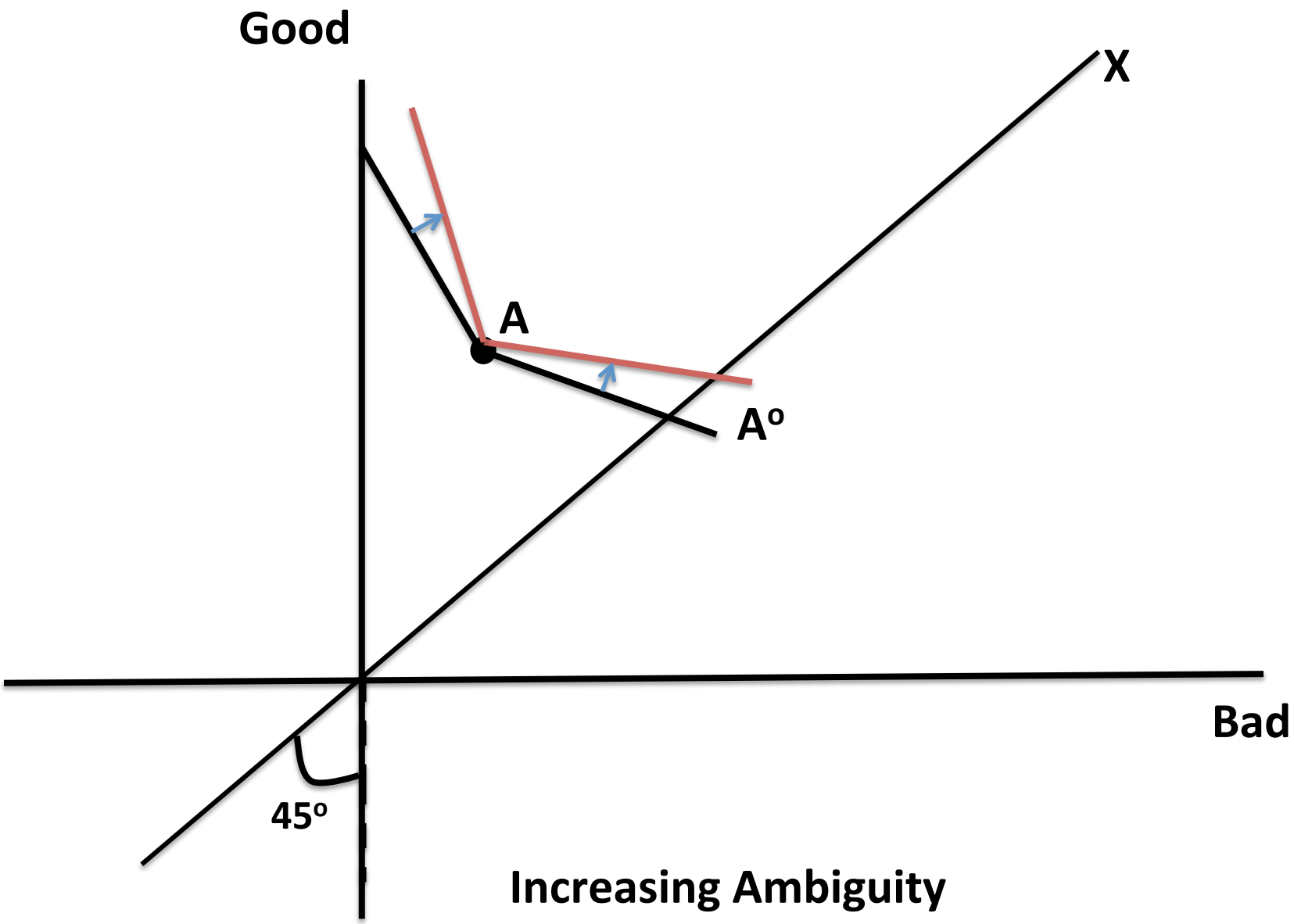
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- When ambiguity is "extreme" IEU will never abandon the status quo
- Worsening Ambiguity by increasing range of possible probabilities makes it less likely policy alternatives will be unacceptable under *IEU*
- Empirical (?) Results: Policy alternatives to address climate change never met benefit-cost criterion under IEU for broad range of specifications. Met benefit-cost criterion for SEU and and broader range of MEU

Final Bottom Line

" ...theories are tools for reasoning and rhetorical devices"
(Gilboa, 2009)