



Strategy and Planning for Deeply Uncertain Futures:

*Making Good Decisions
When You Lack Good Predictions*

Steven W. Popper

International Risk Assessment and Horizon Scanning Symposium

Singapore

13 October 2008

Outline of Presentation

- The problem of “deep” uncertainty
- Inability to characterize uncertainty leads to weak, poor, or catastrophic decisions
- Applying robust decision methods to strategy, policy and course-of-action analysis
- Example: Achieving global sustainability over the 21st century

Many Issues of Strategy and Policy Are Framed by Two Related Questions

- What are the possibly significant, long-term **consequences** of alternative near-term actions?
 - Research and development
 - Investment in new plant, equipment, products
 - Nuclear waste storage
 - Major infrastructure investments
 - Constitutional changes
 - Education reform

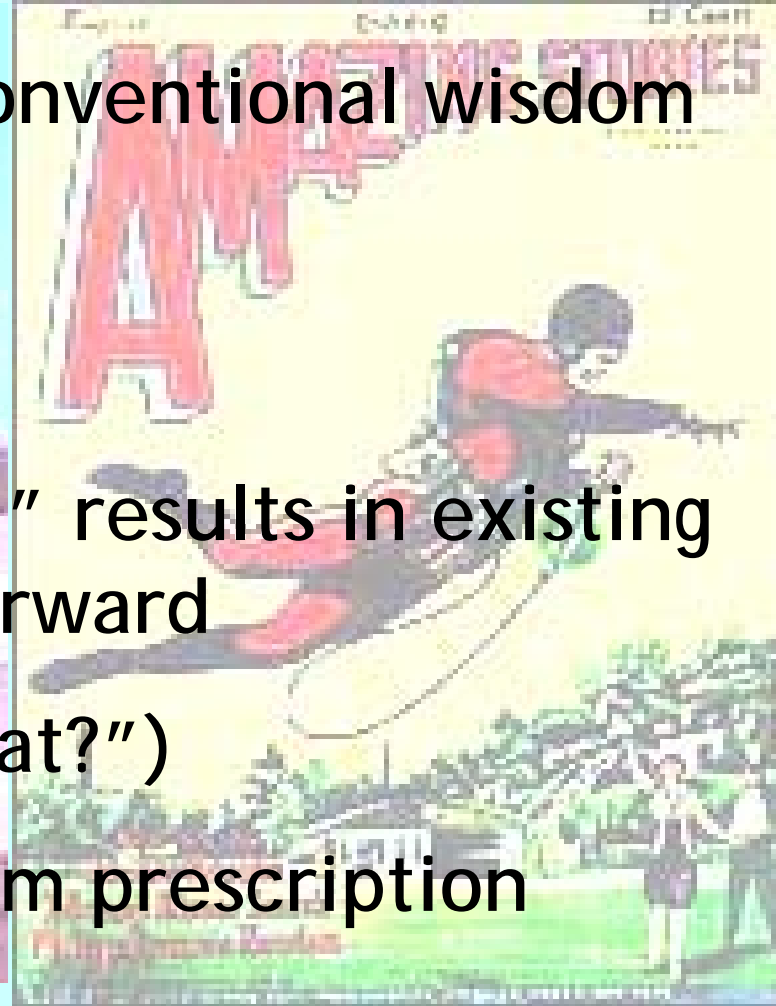
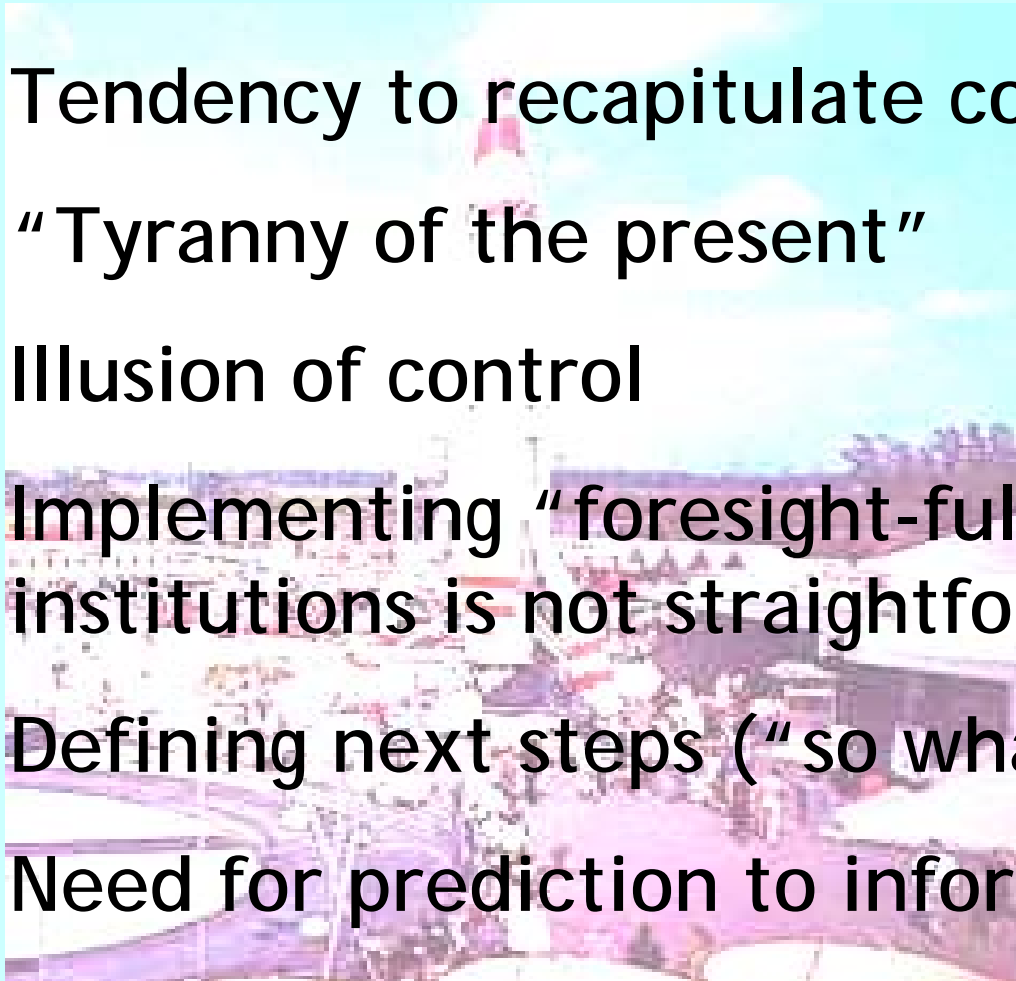


Many Issues of Strategy and Policy Are Framed by Two Related Questions

- What near-term actions are most likely to achieve desired long-term **objectives**?
 - Business strategies
 - Climate change
 - Combating terrorism
 - Technological innovation
 - National security
 - Most long-term societal goals

All Efforts to Apply “Foresight” to Strategic Planning Face Similar Challenges

- Tendency to recapitulate conventional wisdom
- “Tyranny of the present”
- Illusion of control
- Implementing “foresight-ful” results in existing institutions is not straightforward
- Defining next steps (“so what?”)
- Need for prediction to inform prescription



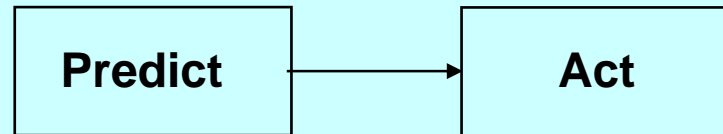
Horizon Scanning is a Crucial Component of Strategy Development

But it is not sufficient to inform our actions

- We must address the question, "So what?"
- Our ultimate question is not "What will happen?" but, "What should we do to best achieve our goals?"
- Deep uncertainty leaves us with a multiplicity of possible answers to "what lies beyond the horizon"
- The questions of action and decision choice should direct horizon scanning efforts:
 - Provide a focus on what we need to learn
 - Search for pre-defined "signposts"
 - Provide a context for assessment of findings

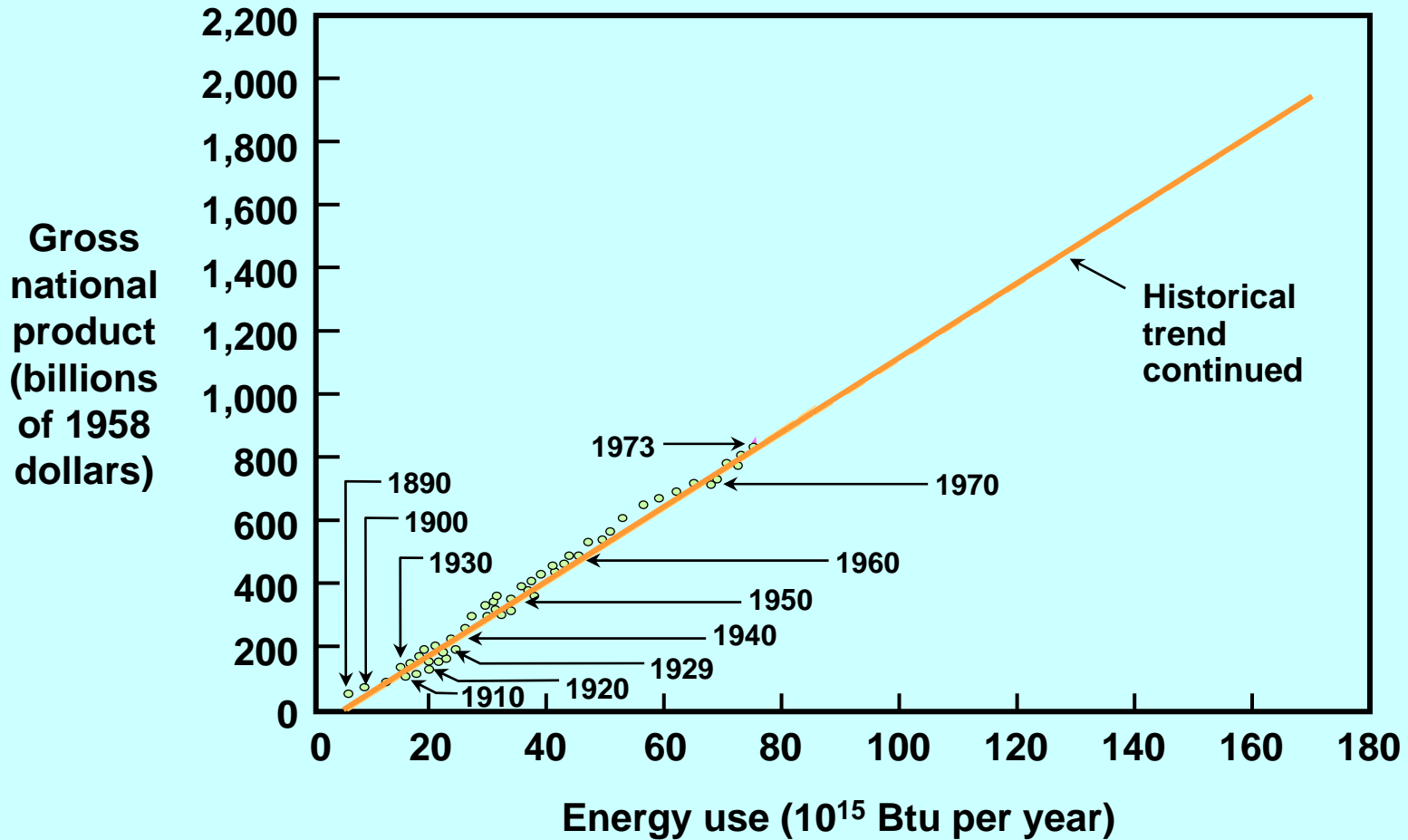
Traditional Strategic Analysis is Inadequate if Deep Uncertainty Prevails

- Traditional analytic methods first characterize uncertainties and then assess alternative decisions



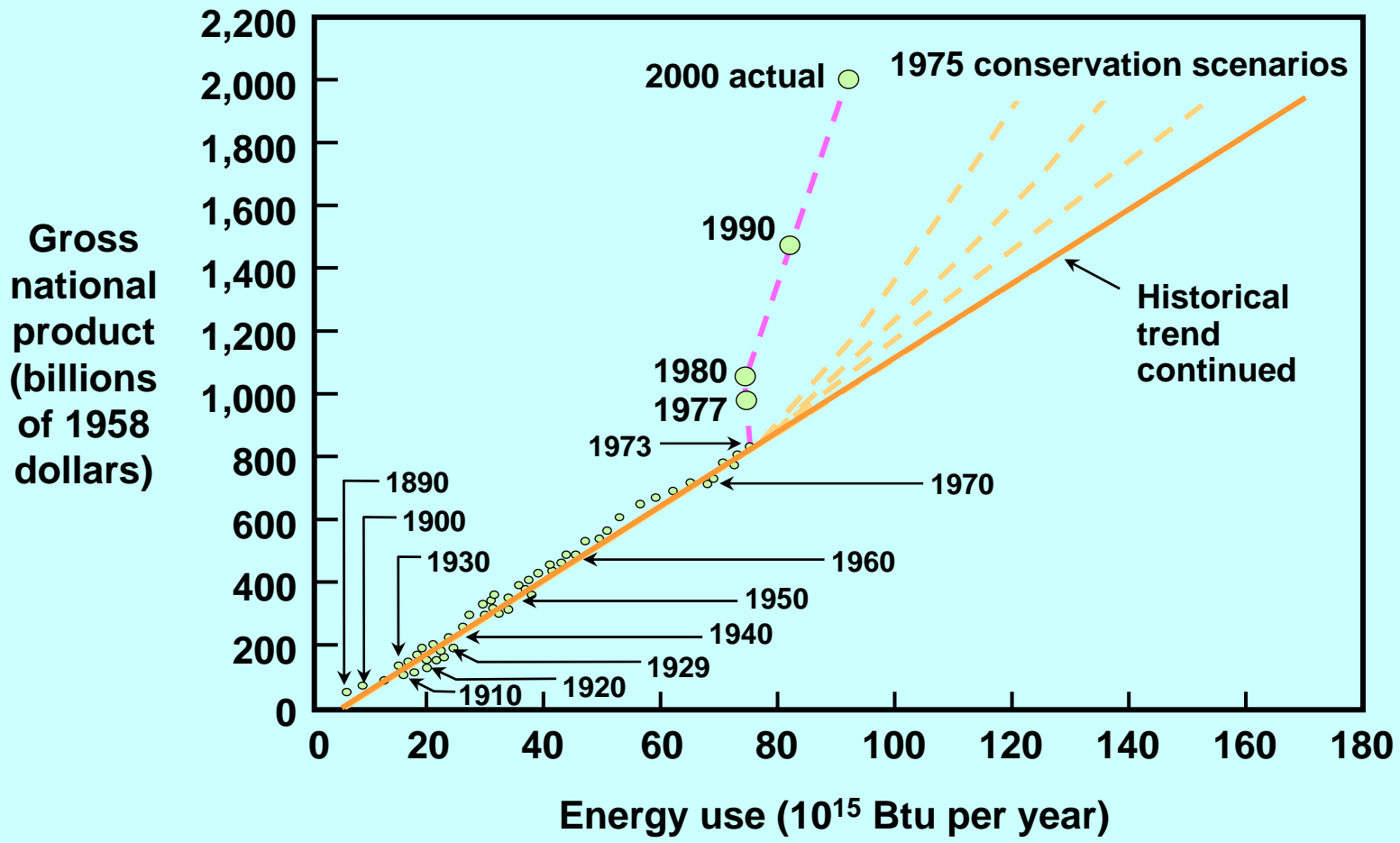
- Future challenges confront decisionmakers with **deep uncertainty**, where
 - They do not know, and/or key parties to the decision do not agree on, the proper probabilities, models, appropriate measures of outcomes
- Decisions **can go wrong** if decisionmakers assume risks are well-characterized when they are not
 - Uncertainties are **underestimated**
 - Competing analyses ==> **gridlock**; resulting strategies ==> **brittle**
 - Misplaced concreteness blinds decisionmakers to **surprise**

We Often Stumble When We Apply Formal Analysis to Deep Uncertainty



Adapted from Chauncey Starr, "Economic Growth, Conservation and Electricity" in Ruedisili(ed.) Perspectives on Energy, OUP, 1978 with updated data.

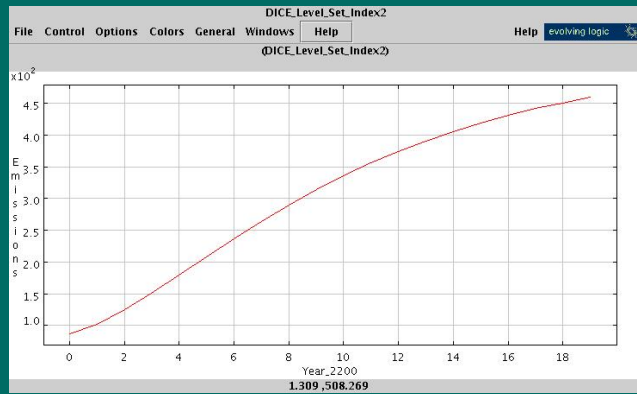
Trying to Forecast the Unpredictable Can Lead to Bad Decisions



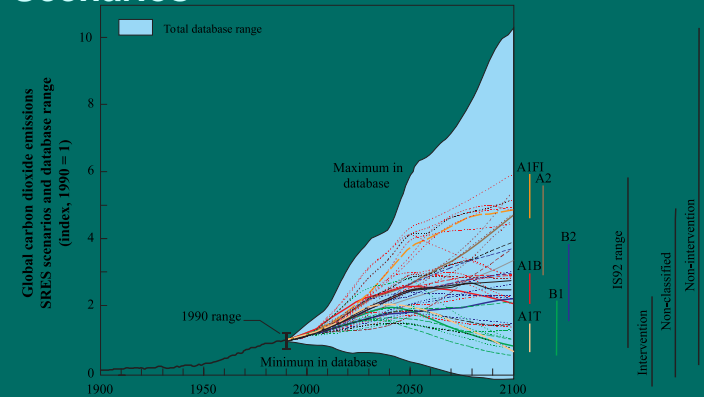
Adapted from Chauncey Starr, "Economic Growth, Conservation and Electricity" in Ruedisili(ed.) Perspectives on Energy, OUP, 1978 with updated data.

Many Approaches Can Characterize Uncertainty

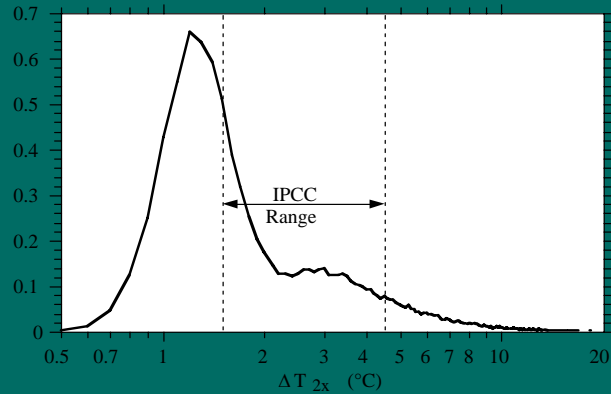
Best Guess



Scenarios

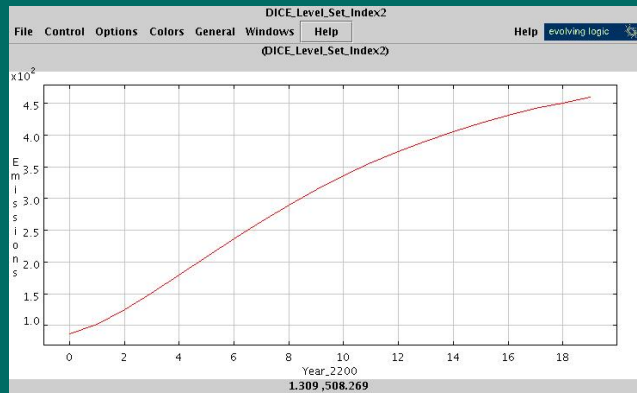


Probabilities

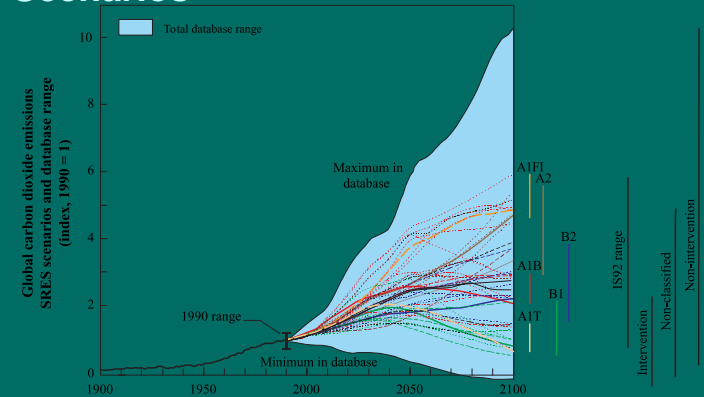


Robustness: Characterizes Uncertainties Based on Vulnerabilities of Strategies

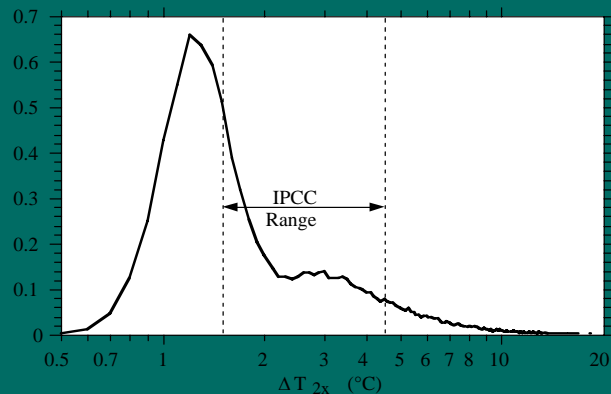
Best Guess



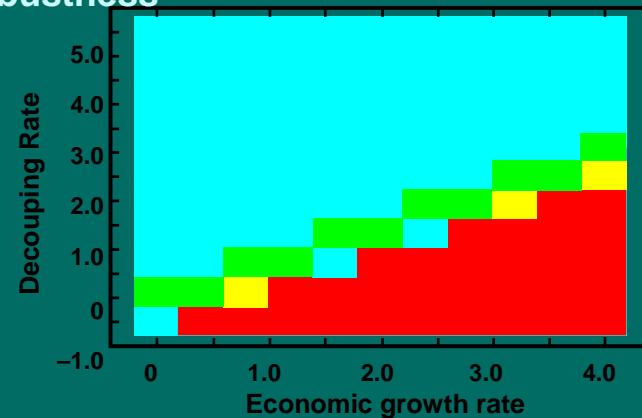
Scenarios



Probabilities



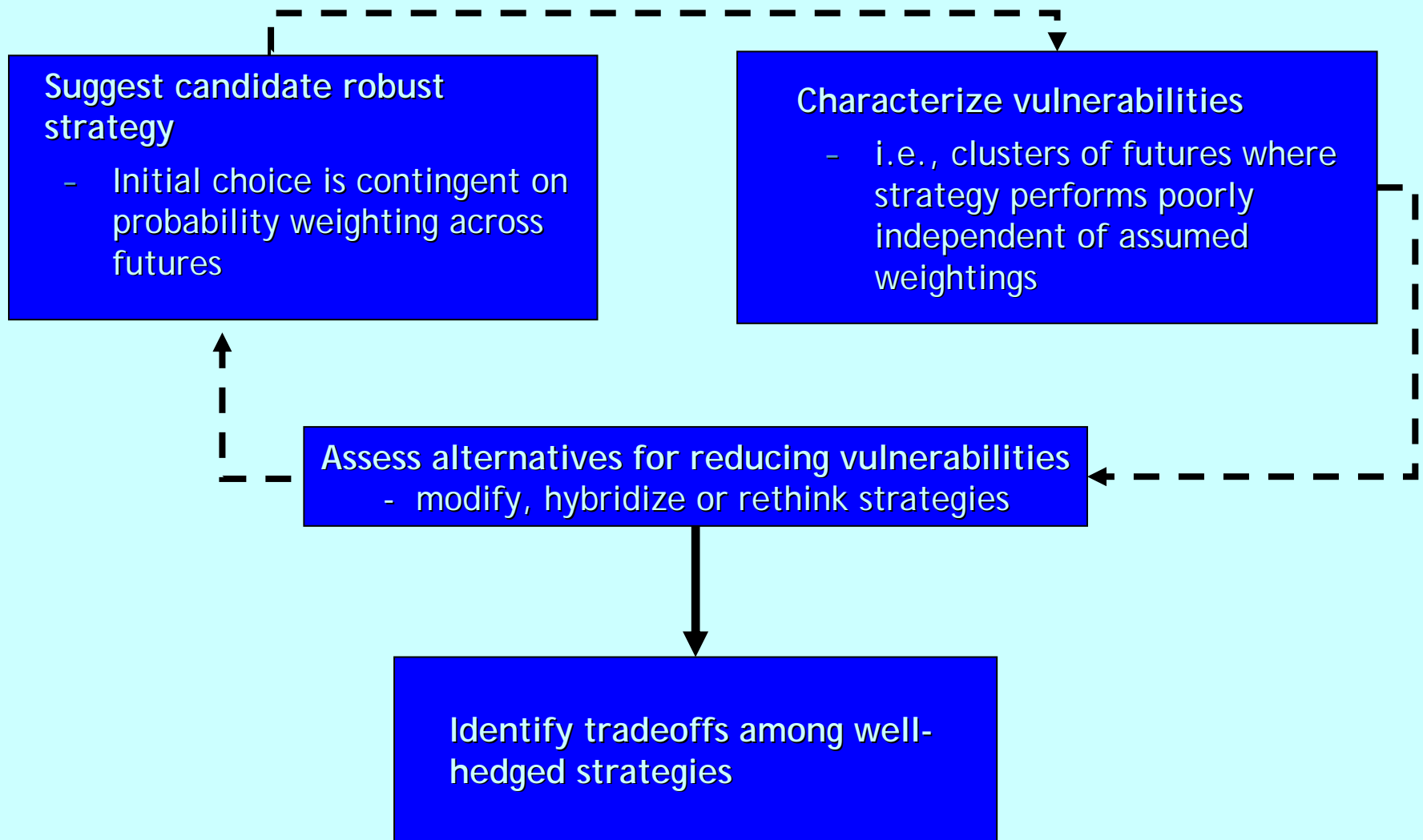
Robustness



“What Change in Assumptions Would Cause a Shift from One Strategic Course to Another?”

- Use many scenarios to imagine the future
 - Not a single forecast
- Seek robust strategies that do well across many scenarios assessed according to several values
 - Not optimal strategies
- Employ strategies that evolve over time in response to changing conditions
 - Not "fixed" strategies
- Use computer as “prosthesis for the imagination”
 - Not a calculator

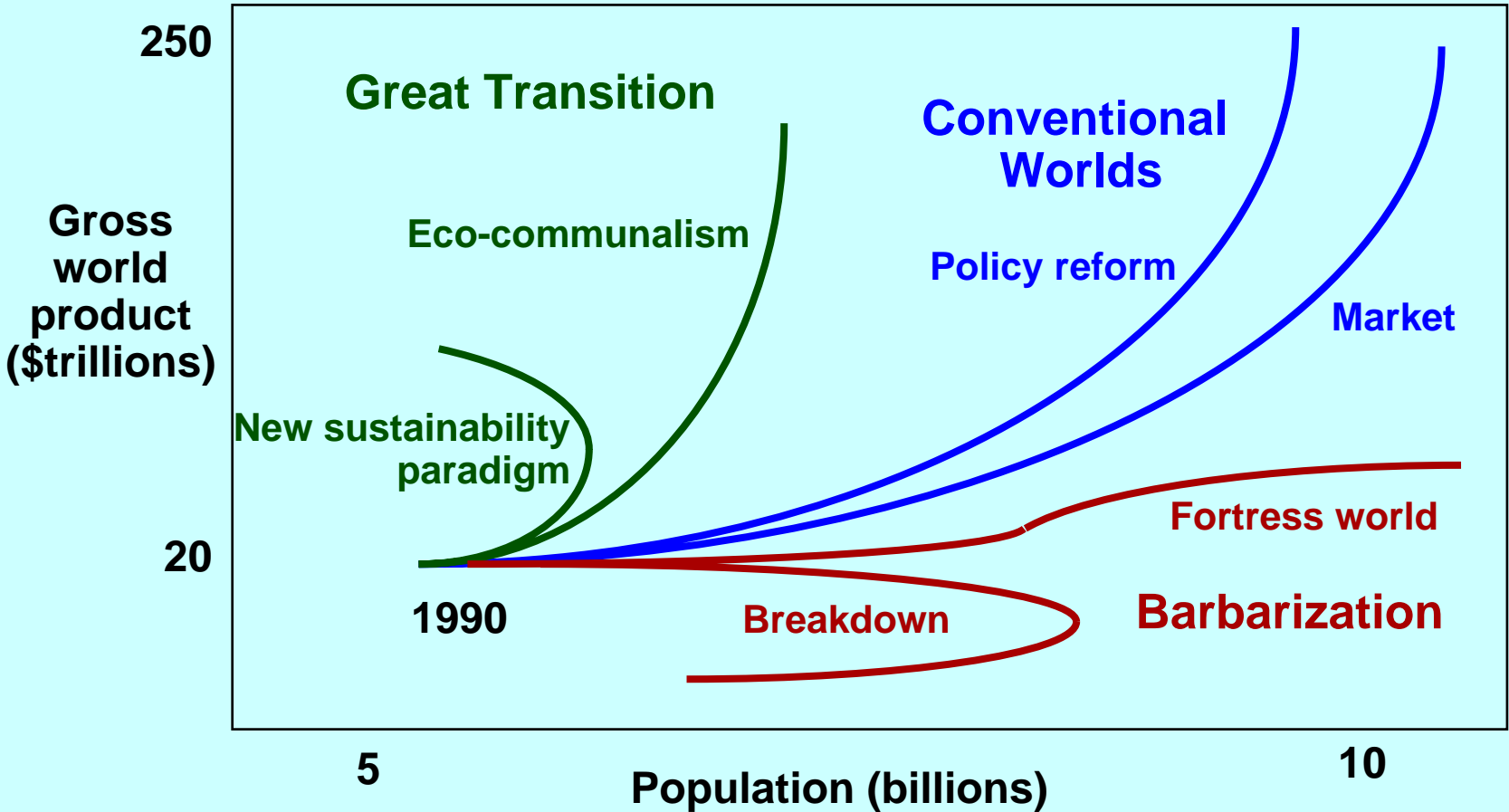
New Technology Allows Computer to Serve As "Prosthesis for the Imagination"



There Have Been Many Project Applications

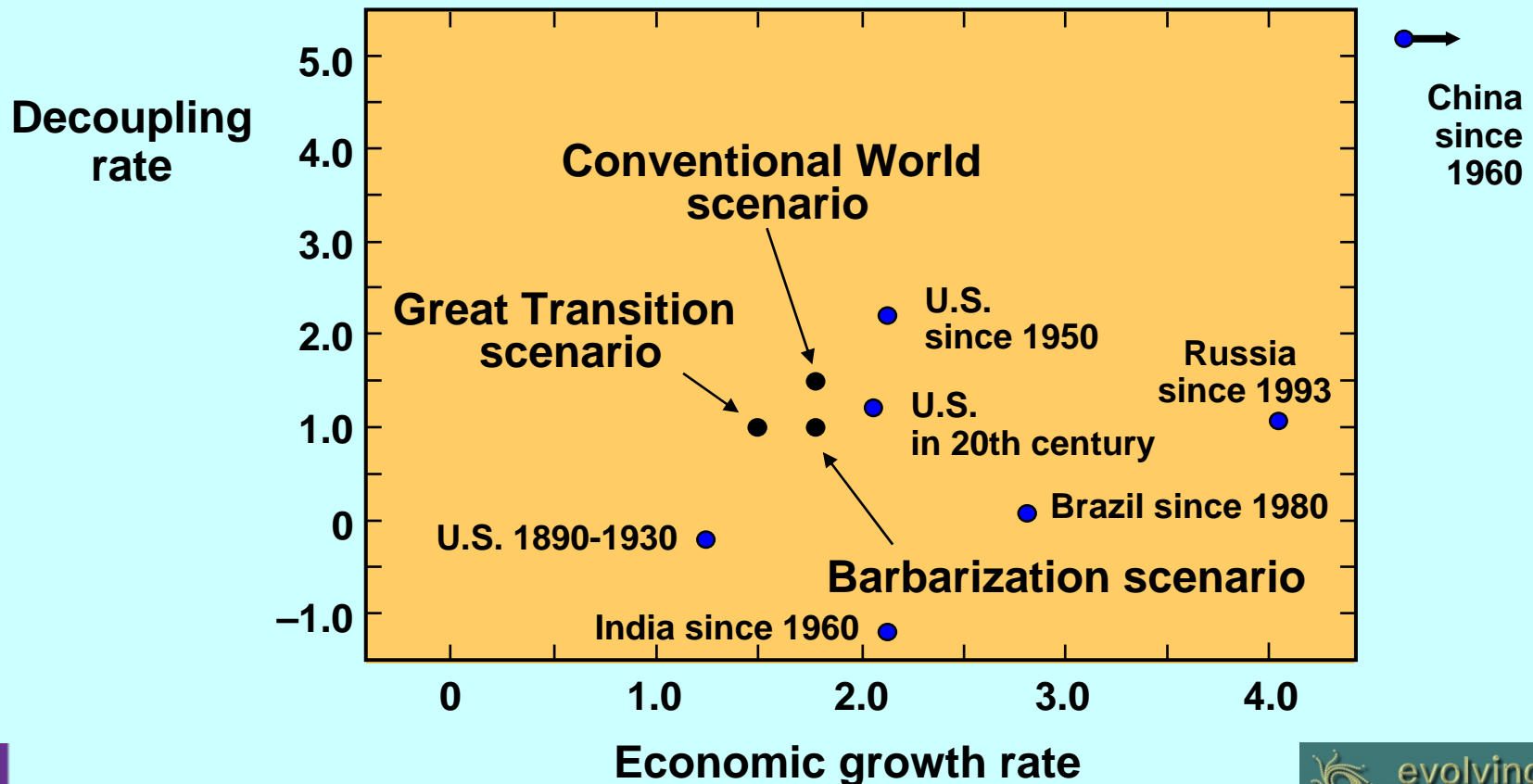
- Higher education planning (CA; KY; TX)
- Water resource planning in California
- Infrastructure planning in post-Katrina New Orleans and Gulf Coast
- Natural gas infrastructure and risk management in Israel
- National science policies, South Korea
- Social security solvency
- Counter-terror strategies / asymmetric warfare
- Emerging infectious disease policy and strategy
- Strategies for meeting Millennium Development Goals
- Natural resource management
- Pre-conflict management, anticipation and shaping...
- Corporate strategic planning
 - R&D investment planning
 - Product and process planning and design
 - Marketing foresight and planning

Example : What Strategies Would Lead to Sustainable World Growth in the 21st Century?

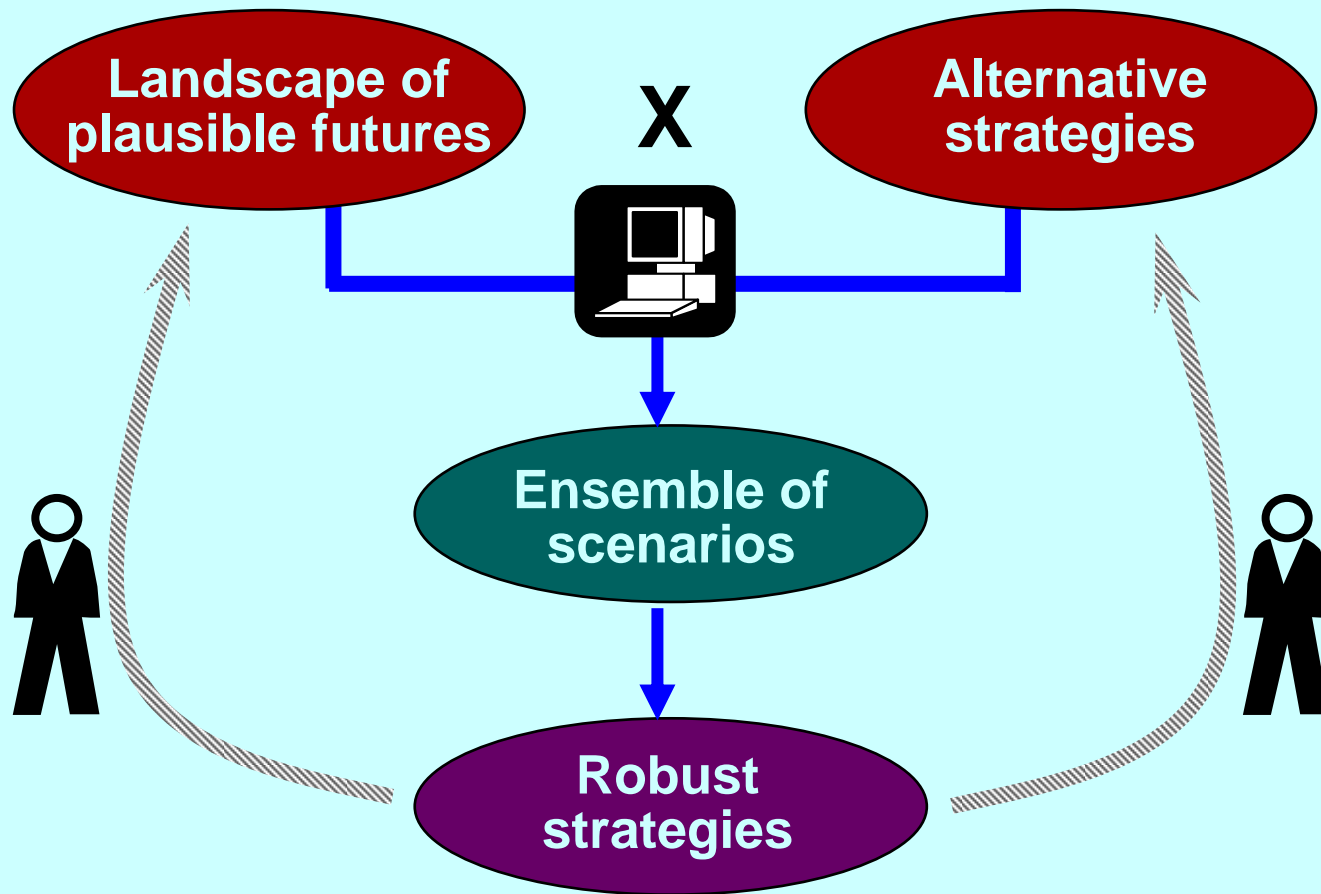


Climate Change Presents a Significant Global Challenge:

What Near-term Actions Can Ensure Economic Growth and Environmental Quality?



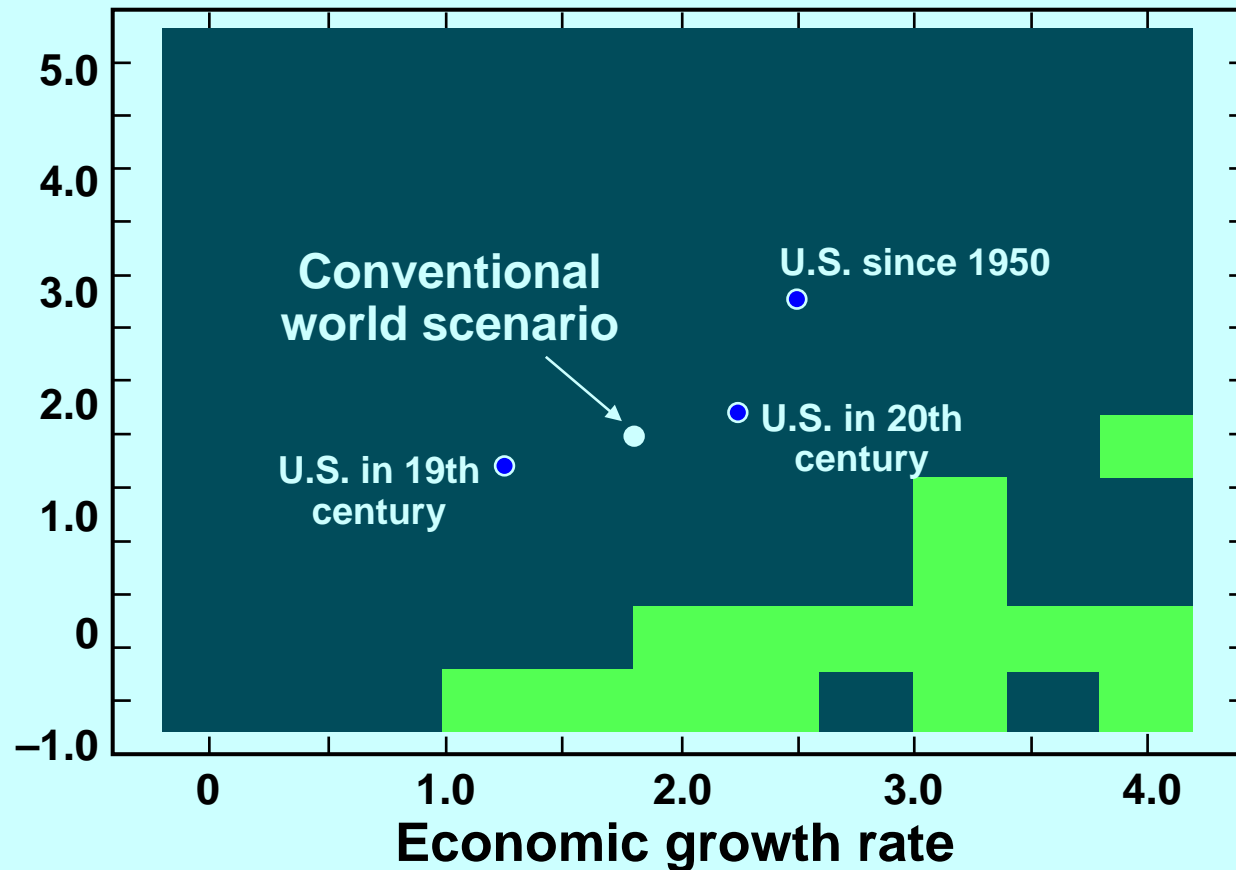
Look for Robust Strategies



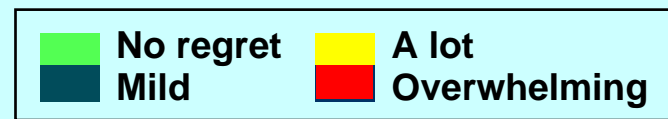
How Well Would Strategy Work in Different Futures Compared to Best Strategy?

“Slight speed-up”

Decoupling Rate

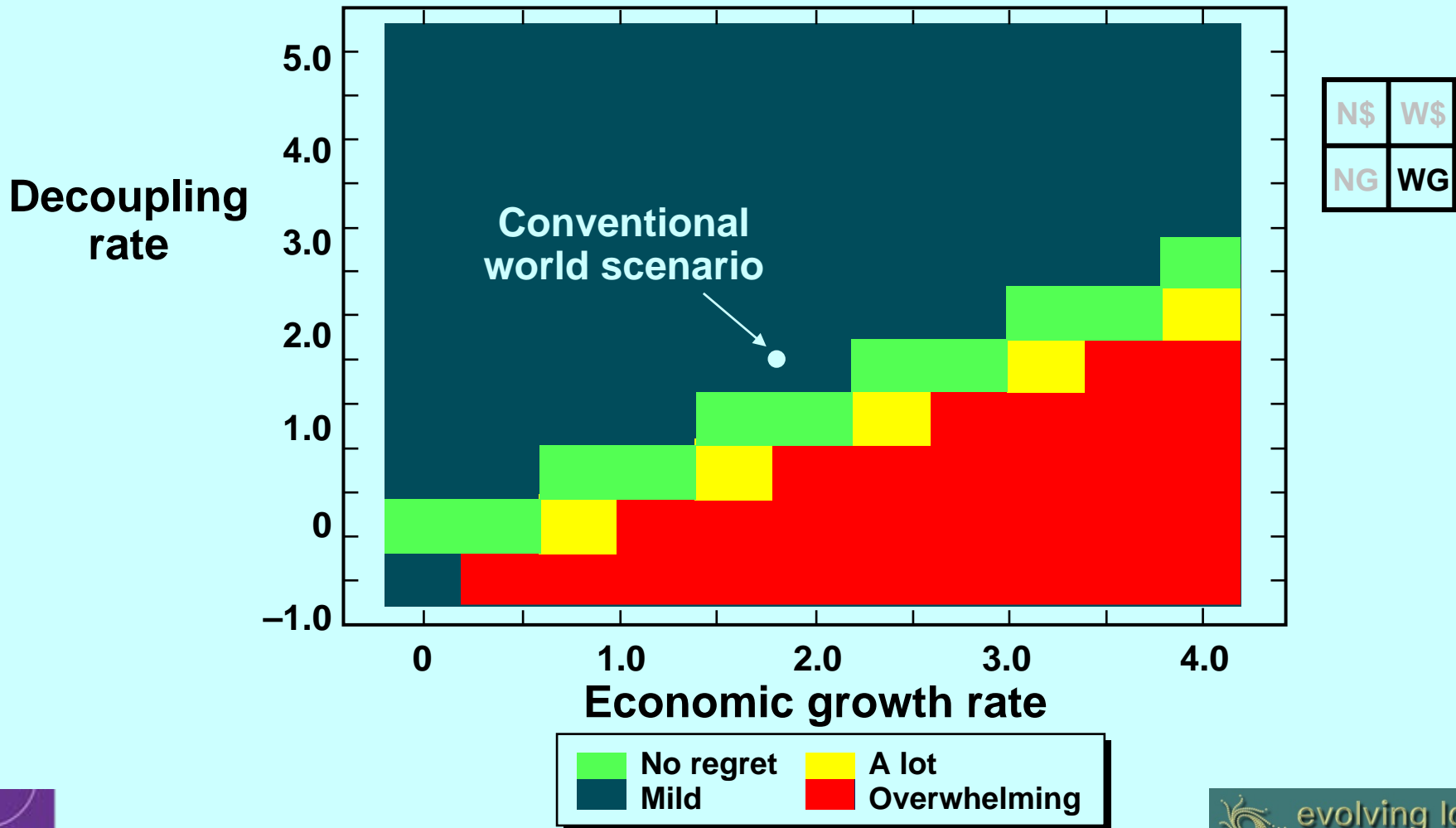


N\$	W\$
NG	WG



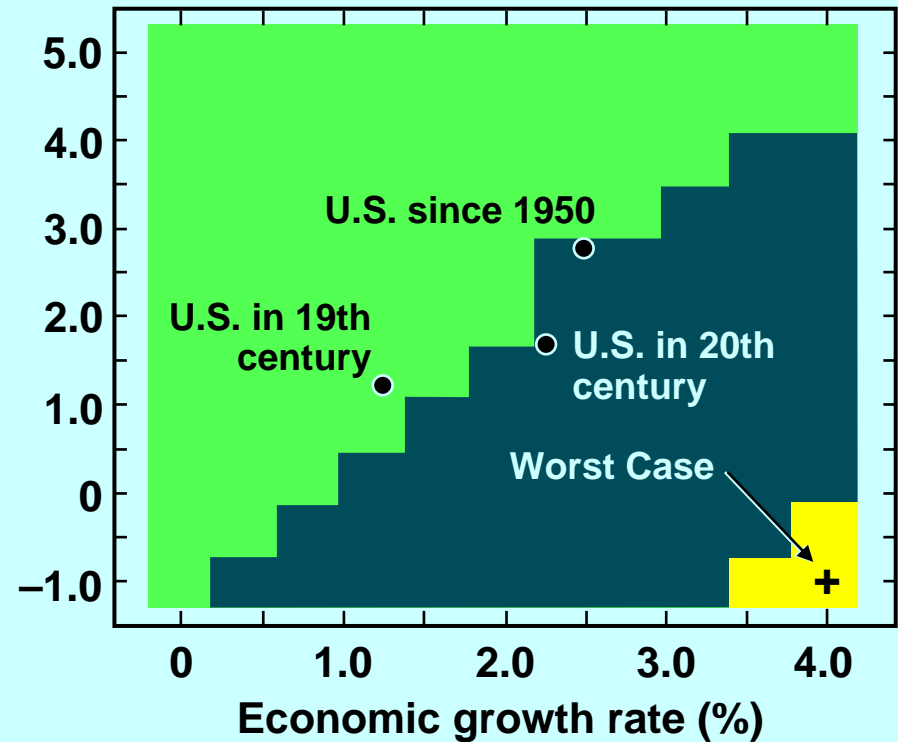
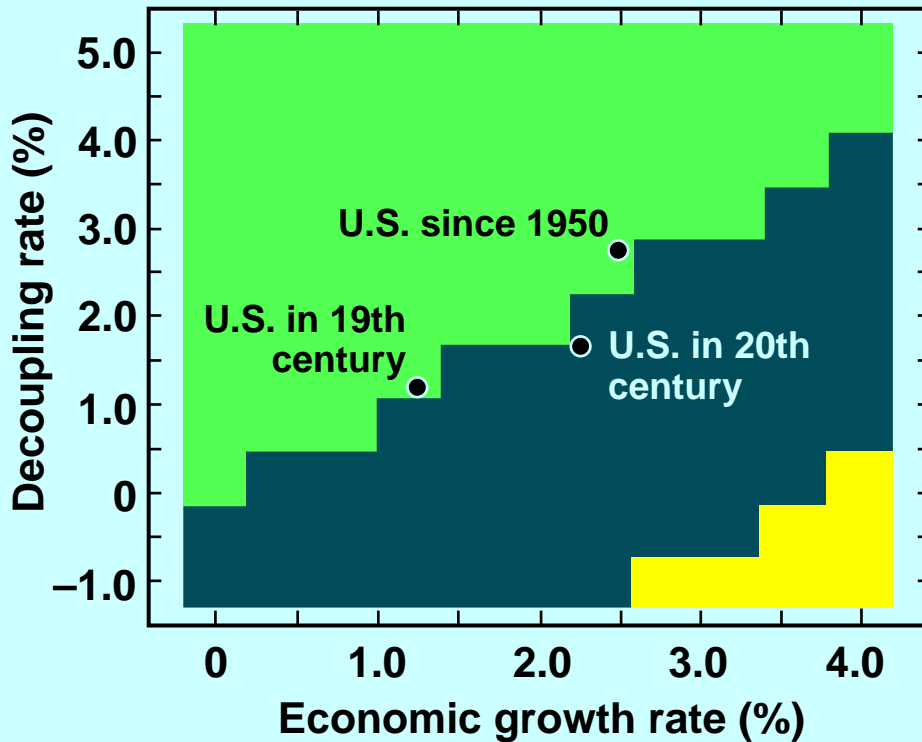
Success Measured by One Value Often Fails When We Measure by Others

Slight speed-up

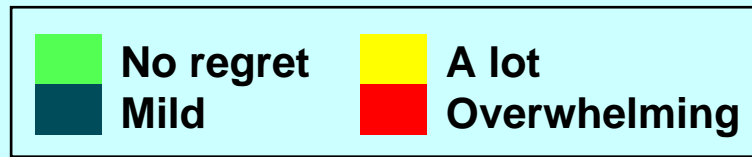


More Sophisticated "Milestone Strategy Performs Well Over Many Futures and Values

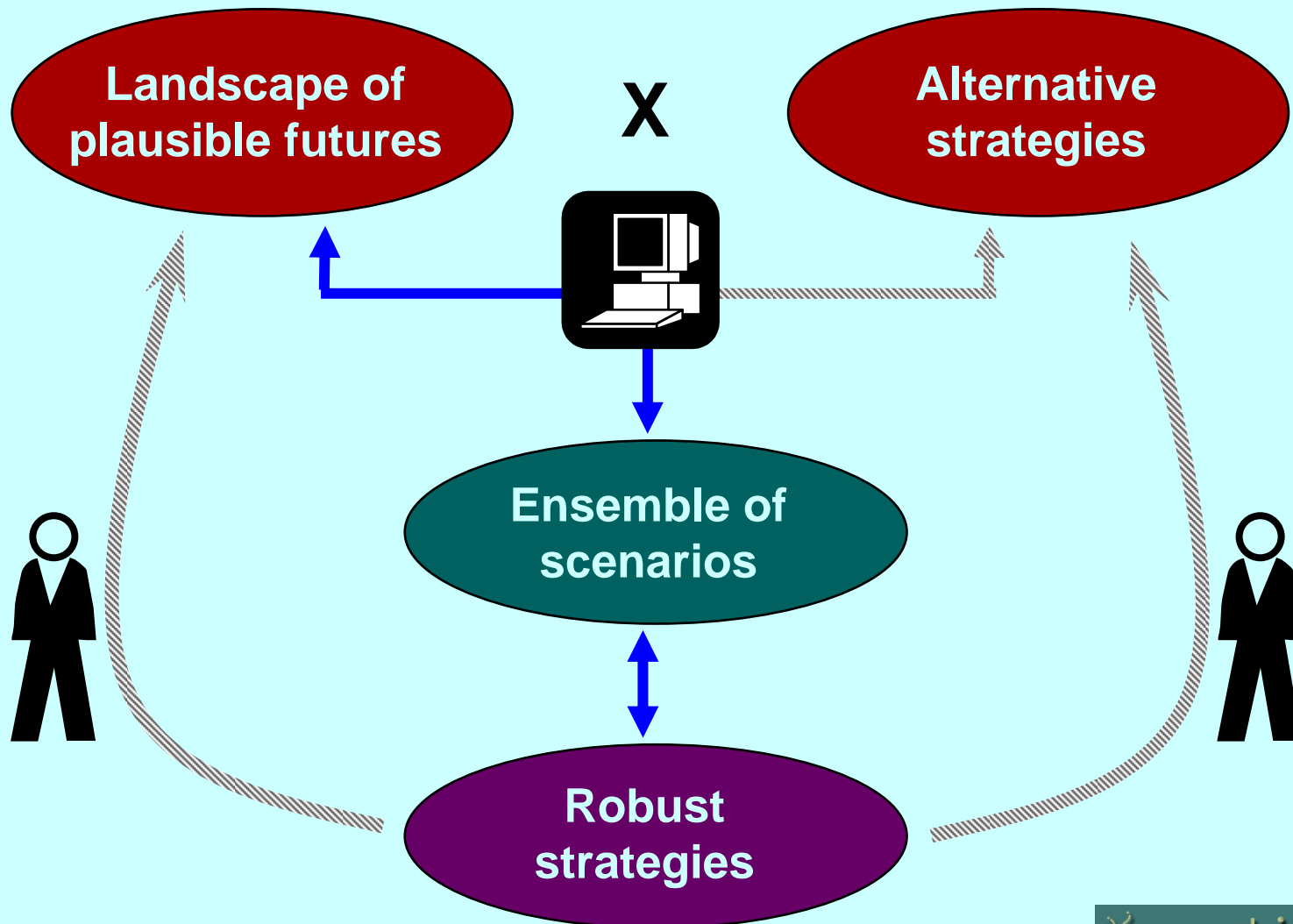
No increase



N\$	W\$
NG	WG

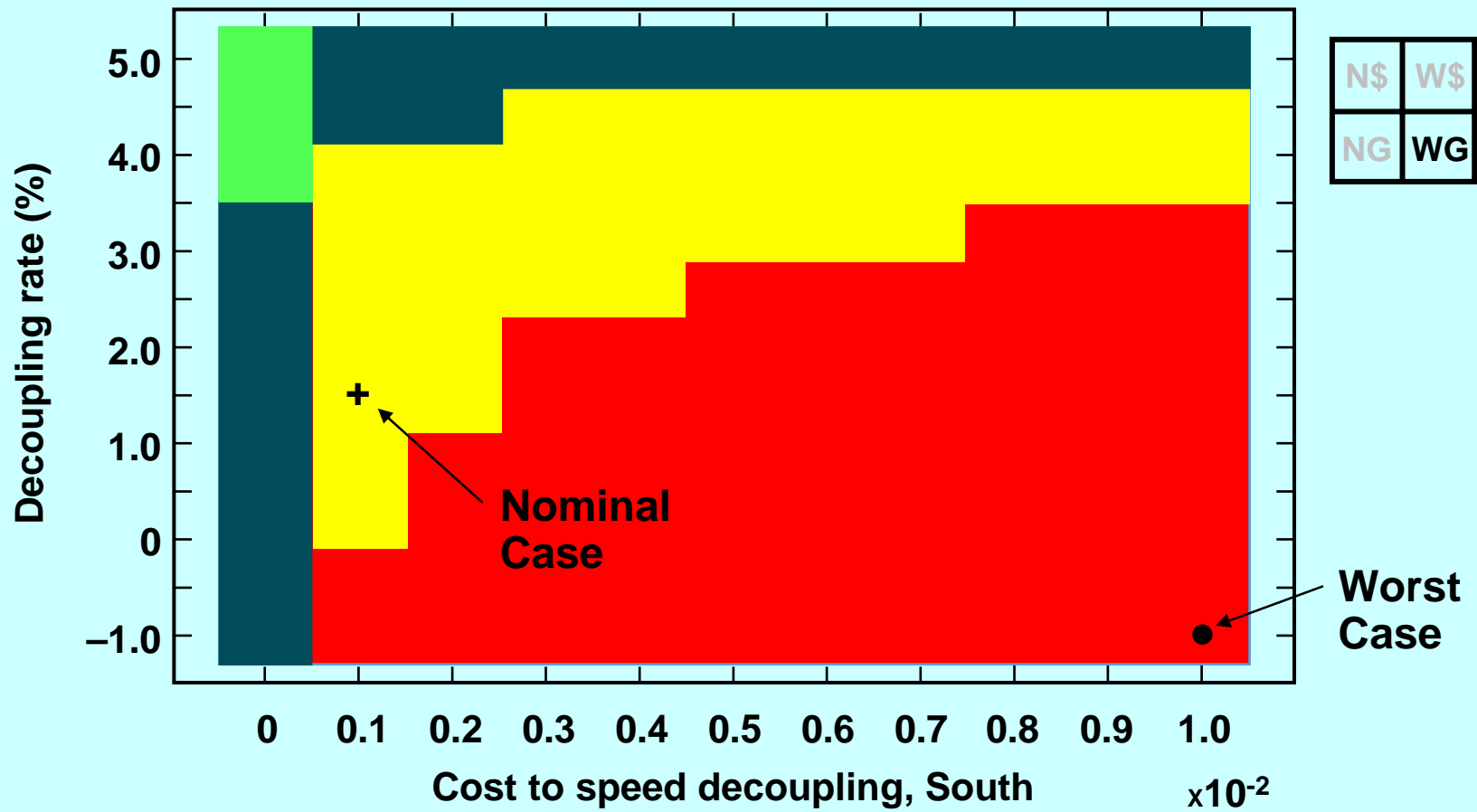


N\$	W\$
NG	WG

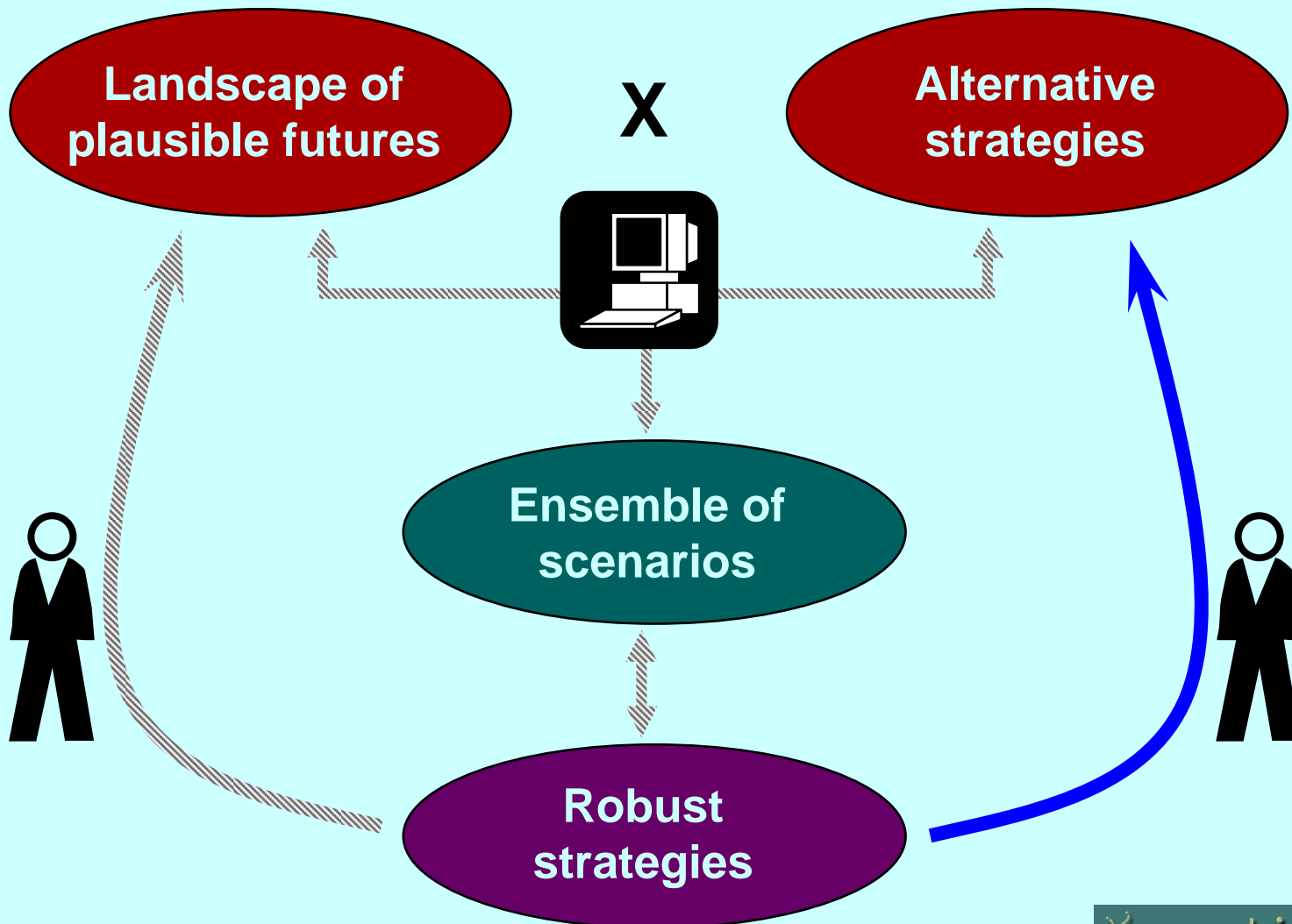


Computer Shows "Milestone" Strategy Can Fail Catastrophically

No increase

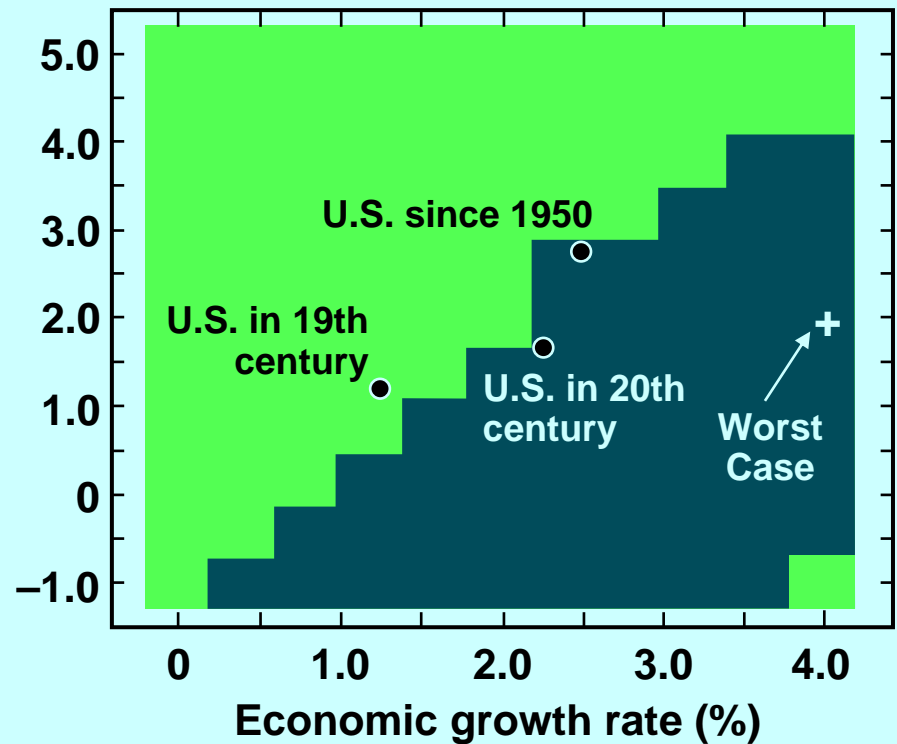
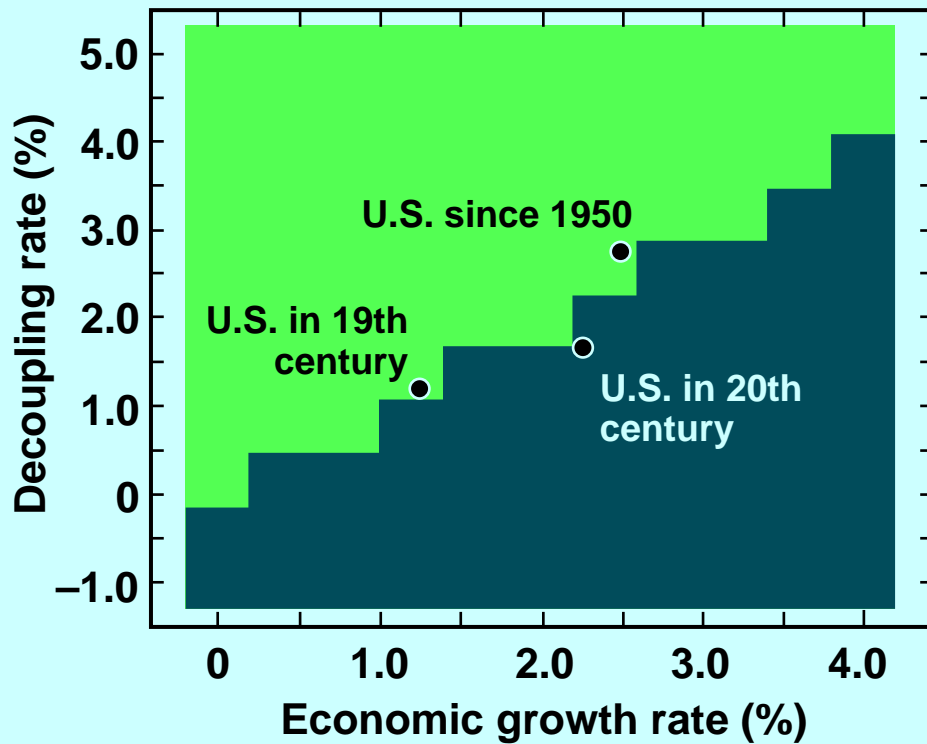


N\$	W\$
NG	WG

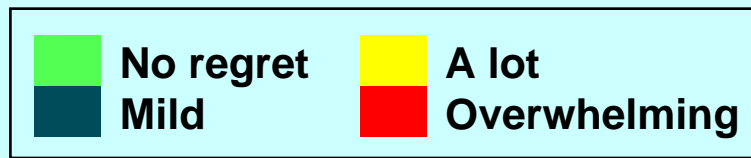


"Safety Valve" Strategy Appears Highly Robust

Safety valve



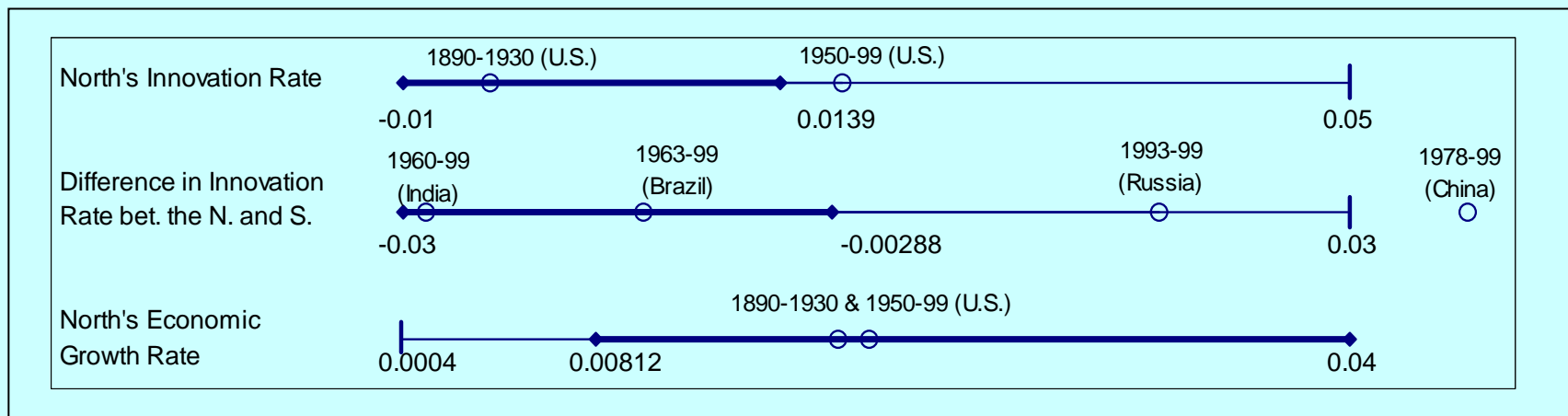
N\$	W\$
NG	WG



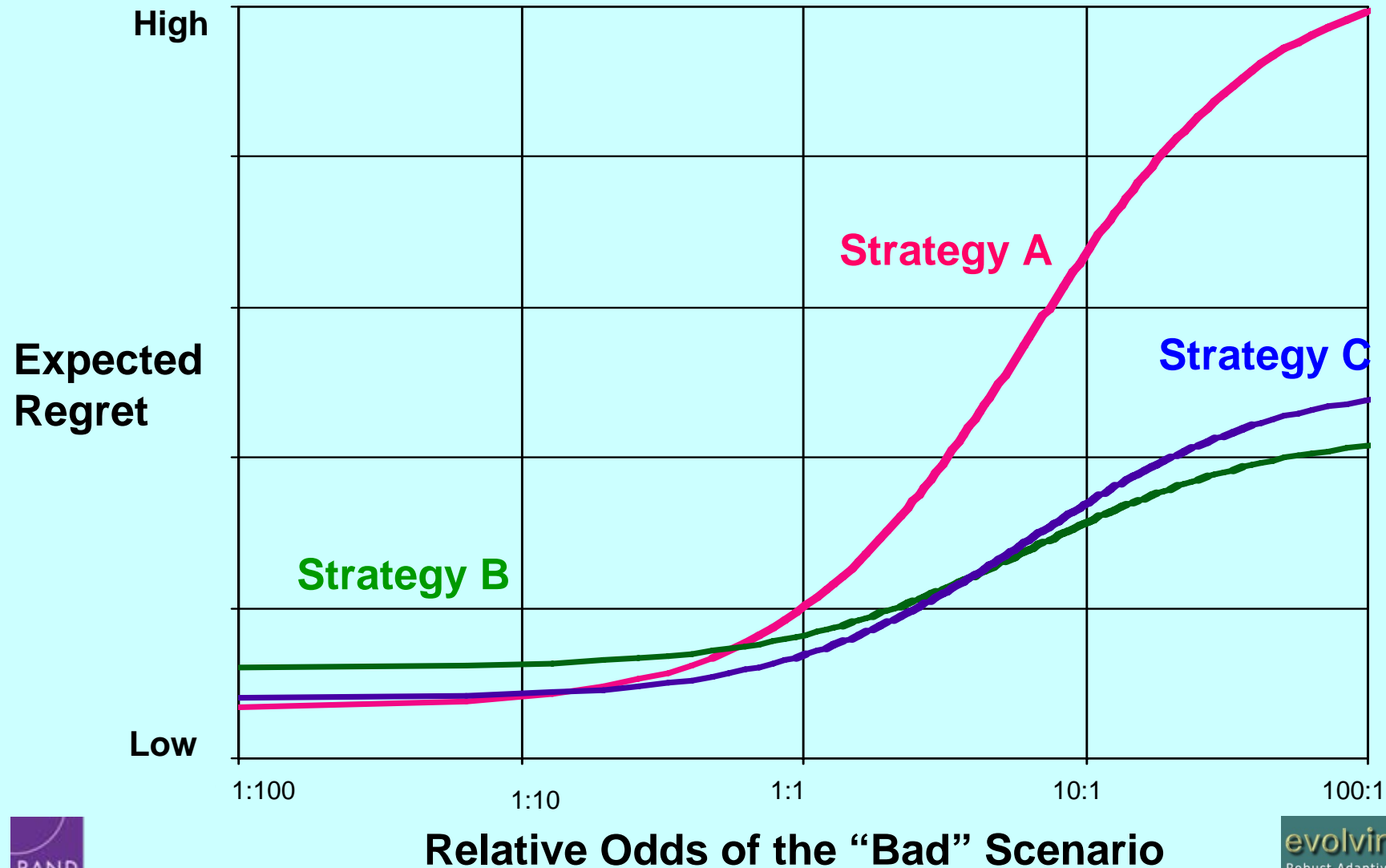
N\$	W\$
NG	WG

But We Still Find Failure Scenarios: What is Common Across Them?

- “Data-mining” method reduces many (in this case 41) dimensions of uncertainties to
 - an easy-to-interpret “Bad” scenario
 - where strategy performs poorly



What the Decision Maker Sees: The Choice Among Small Number of Key Tradeoffs



More Information

Steven W. Popper: "Adapting Social Security Policy for the Long Term", John Brademus Center for the Study of Congress, Research Brief No. 3, September 2007,

Robert J. Lempert, David G. Groves, Steven W. Popper, Steve C. Bankes: "A General, Analytic Method for Generating Robust Strategies and Narrative Scenarios," Management Science, vol 52, no 4, April 2006

Steven W. Popper, Robert J. Lempert, and Steven C. Bankes: "Shaping the Future," Scientific American, vol 292, no. 4 pp. 66-71, April 2005

Somi Seong, Steven W. Popper: Strategic Choices in Science and Technology: Korea in the Era of Rising China, [chapter 6] RAND MG-320-KISTEP

Robert J. Lempert, Steven W. Popper, Steven C. Bankes: Shaping the Next One Hundred Years: New Methods for Quantitative, Long-Term Policy Analysis, RAND MR-1626-RPC, Aug 2003