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Policy Analysis for Uncertain Futures

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Policymakers face demands to act today to protect against a wide range of future risks, and to do so without impeding economic growth. Yet traditional analytical tools—probabilistic decision analysis, benefit-cost analysis, risk assessment, etc.—may not be adequate to frame the relevant uncertainties and tradeoffs. Although some risks can be estimated using actuarial methods, others have unknown probabilities and potentially severe and widespread consequences. Challenges such as climate change, nuclear war, cyber-attacks against critical infrastructure, widespread natural disasters, global pandemics, and systemic financial crises don't lend themselves to decision rules designed for discrete policy questions and marginal analyses.

In brief…

Policymakers face demands to act today to protect against a wide range of future risks, and to do so without impeding economic growth. More flexible and dynamic decision-analysis approaches that anticipate the need to learn from experience (and that encourage learning) are essential. The GW Regulatory Studies Center commissioned four papers from leading experts in different fields to introduce better tools to anticipate risk and develop policies that mitigate consequences while encouraging growth.

We refer to such issues as "uncertain futures," defined as problems that appear to be intractable because of some combination of the following characteristics:

- They potentially cause irreversible changes;
- They are widespread, so that policy responses may make sense only on a global scale;
- Network effects are difficult to understand and may amplify (or moderate) consequences;
- Time horizons are long; and
- The likelihood of catastrophic outcomes is unknown or even unknowable.

The characteristics of uncertain futures tend to make them intractable to market solutions because property rights are not clearly defined, and essential information is unknown or unknowable. These factors also present significant challenges for policy officials who are charged with making collectively-binding decisions in the broader public interest. Traditional methods of analysis that focus on marginal changes can break down when dealing with global problems, large irreversible changes, and long time horizons.

Further, even if conventional tools can be employed to solve these challenges, experts who apply them tend to analyze future risks in isolation using marginal data and holding other factors constant. Analyzing risks in this way creates conditions whereby black swan or other low-probability, high-consequence events are ignored, making society more fragile and susceptible to them if they do occur. Committing vast resources to one problem may harm economic growth and make society less resilient and less able to cope with other (anticipated or unanticipated) events or challenges. Specialists in different policy areas, responding to the perceived *crise du jour* in their respective fields, may compete to bring attention to what each sees as the highest priority of the moment.

This does not mean that analysis is not essential to ensure policies support and enhance well-being. Rather, the diverse policy choices confronting decision-makers today call for a broader framework that incorporates uncertainties and tradeoffs across policy decisions. More flexible and dynamic decision-analysis approaches that anticipate the need to learn from experience (and that encourage learning) are essential. Policy analysis of these uncertain futures could benefit from cross-fertilization of ideas and interdisciplinary analytical tools.

To this end, the GW Regulatory Studies Center commissioned four papers from leading experts in different fields. We will be posting these papers, along with our own framing paper synthesizing their insights, over the next few weeks. In the papers:

- [Tony Cox](#) applies insights from machine learning—especially, deep multi-agent reinforcement learning—to suggest how incremental learning and improvement approaches ("muddling through") can supplement and reinforce traditional decision analysis.

- [W. Kip Viscusi](#) shows that adopting precautionary measures in the face of risk ambiguity can increase, rather than protect against, risks. Instead, policymakers should exploit risk ambiguity and opportunities for learning about uncertain risks, for example, by making incremental investments in the presence of irreversible effects. He also suggests that standard discounting procedures without any adjustment for temporally remote effects can properly weight future benefits and costs.

- Fred Roberts applies risk assessment to scenarios of terrorist attacks on critical infrastructure including U.S. sporting venues and the international maritime transportation system. He notes that risk assessments of terrorist attacks traditionally treat physical and cyber attacks separately and are inappropriate for considering the risk of combined attacks that include both a physical and cyber component. He proposes a framework informed by expert judgement to determine whether an attacker would likely prefer executing a combined or traditional physical attack on a given target.

- James Scouras identifies nuclear war as a global catastrophic risk and suggests that multidisciplinary studies that combine insights from "historical case studies, expert elicitation, probabilistic risk assessment, complex systems theory, and other disciplines" can address many of the shortcomings of single analytic approaches. He suggests that experts can address current gaps in their assessments of the consequences of nuclear weapons by further investigating understudied phenomena (e.g., the effects of electromagnetic pulses, nuclear winter, the prolonged effects of radiation).

Developing a body of research that cuts across disciplines to introduce better tools for anticipating and examining uncertain future risks can lead to policies that lower the probabilities and mitigate the consequences of these uncertain futures while encouraging economic growth and increasing resilience.

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