

Opposing Irreversibilities and Tipping Point Uncertainty

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Abstract

Irreversible environmental damage can lead to a more “conservationist” policy than would otherwise be optimal while sunk costs and political inflexibility create an economic irreversibility that leads to policies that are less “conservationist” than they otherwise would be. The economic irreversibility effect is often larger than the irreversibility associated with environmental damage. We revisit this result in a novel context with multiple uncertainties and an avoidable tipping point which triggers irreversible damage. An optimal stopping model over dynamic environmental lotteries is developed to characterize the optimal timing and stringency of an environmental policy subject to two kinds of irreversibility (economic and an environmental tipping point), two tipping point mechanisms (critical damage thresholds and random events), and two kinds of uncertainty (uncertain system dynamics and uncertainty in when the tipping point will be crossed). Using an example of Asian carp invasion into Lake Michigan, results illustrate how differing definitions of precautionary behavior and beliefs about the degree of environmental irreversibility may help explain persistent debates in environmental policy.