

## **Abstract**

Innovation is not a linear process, where one invention deterministically follows another. The problem of what project to work on, rather than simply how hard to work, is often the most pertinent. We model innovation as a network of inventions with state-contingent payoffs and difficulties. Comparing the optimal direction of research with equilibrium firm choices, we identify three reasons why competitive markets distort the direction of innovation even when the total effort expended on research is optimal. These distortions are qualitatively different from those in the patent race literature. They clarify formally the difference between optimal and suboptimal path dependence in the development of technology. As an application, we show that the existence of multiple paths to the future implies that broad patents may be inefficient, particularly for basic or fundamental research.