

RESEARCH PATHS, STRATEGIC DISCLOSURE AND EXIT

Nisvan Erkal
University of Melbourne
n.erkal@unimelb.edu.au

Guillem Roig
Universidad del Rosario
guillemroig182@gmail.com

Extended Abstract

We consider a stochastic innovation process with multiple research paths. We study firms' incentives to disclose research outcomes in a model with private information and private learning where firms choose research paths. All available research paths are risky, and over time firms receive positive or negative news about the feasibility of the path they are working on. From society's point of view, it is important to have timely disclosure of this information. However, for strategic reasons, firms may not always have the incentive to disclose the information they gather in research. For example, despite the commitment from the pharmaceutical industry to publish the results of clinical trials, whether they contain positive or negative results, drug makers do not typically publish information about projects that have failed at an early stage ("Seeking a Shorter Path to New Drugs," 14 November 2009, *New York Times*). In fact, negative results account for only 14% of published papers ("How Science Goes Wrong", 19 October 2013, *The Economist*). This reluctance to share information has high costs. For example, the costs for the development of new biopharmaceuticals are estimated to be over \$1.2 billion, where most of these costs are associated with earlier failed attempts.

In our model, firms have private information on both their research activity, i.e., the research path they are working on, and information arrival, i.e., any positive or negative outcome they obtain with research. Firms have no reason to keep positive results secret in our context. However, they may deliberately keep negative results secret in order to mislead their rivals and have they spend time on paths which are dead-ends.

We show that the incentives to disclose negative results depend critically on the characteristics of the competitor and the research path chosen in equilibrium. We consider a set-up with one strong (efficient) and one weak (inefficient) firm. Interestingly, the strong firm always has higher incentives to disclose negative results. This is because when the strong firm tells the weak firm that it has found a negative result, this changes the learning process of the weak firm about the feasibility of the remaining research path, making it more pessimistic. This is advantageous for the strong firm since the weak firm exits the innovation process earlier if there is no arrival of results. The weak firm, on the other hand, never has incentives to disclose negative results.

We show that withholding negative outcomes results in three types of inefficiencies. First, firms diversify, in their choice of research paths, too much. Efficiency dictates firms to join forces in the most promising research path and switch to the remaining path when

information arrives. In equilibrium, diversification emerges to reduce competition and incentivize information disclosure.

Second, firms suffer from dead-end inefficiencies, i.e., the costs associated with duplication of effort and time in researching negative findings. Such dead-end inefficiencies are minimized for the weak firm as the strong firm discloses negative results more often. However, the weak firm suffers from another type of inefficiency because it quits the innovation process too early. When the strong firm discloses a dead-end, the weak firm speeds up its learning process and becomes too pessimistic about the feasibility of the remaining research path. Moreover, in an equilibrium where both firms start on the same research path, the weak firm switches too early to the alternative research path. The lack of information on research outcomes is perceived by the weak firm as evidence that the strong firm has found a dead-end.

These results emphasize when policy makers should be more worried about information withholding and unnecessary research duplication. We also explore what happens if different research paths are for the same market, i.e., if there is competition between the different research paths. Finally, we consider an organizational remedy and study to what extent the problem of information disclosure is reduced by the incentives to form joint ventures.