Technological Positioning and Startup Innovation

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Extended Abstract

Startups often face high uncertainty and must interpret information to make strategic decisions. External shocks to an ecosystem, such as mergers and acquisitions (M&A), provide valuable signals that can inform firms' choices regarding innovation and strategic repositioning (McKeon, 2025; Eisfeld, 2024; Bacchiega and Garella, 2025). In this context, firms must choose between exploration, search for novel technological or market trajectories, and exploitation, which involves refining and leveraging existing knowledge (Dosi, 1982; March, 1991).

For instance, two effects can motivate firms' strategic choices. A demand effect, when markets become more attractive and signal firms to remain close to the market, given an initial acquisition of a startup that could increase the probability that another technologically related startup is subsequently acquired (Conti et al., 2021) or given the start of a wave of mergers and acquisitions(M&A) within the market (Harford, 2005). A second effect is competition, which occurs when an acquisition puts non-acquired startups at disadvantage; in such cases, it becomes strategically rational to move forward unexplored markets, suggesting that firms capable of spanning disconnected fields or deviating from dominant paths may gain a lasting competitive advantage (Arts et al., 2025; Bowen et al., 2023).

Previous research has studied the impact of external choice such as mergers and acquisitions (M&A) on strategic choices (McKeon, 2025; Eisfeld, 2024), relying on textual analysis to distinguish competitors and markets; or theoretical modeling, as in Bacchiega and Garella (2025). However, less attention has been paid to how these external shocks influence firms' technological repositioning across the core and peripheral areas of technological clusters where they operate.

In this paper, we examine the relationship between the technological position of startups and the behavior of their ecosystem after an external shock occurs, such as mergers and acquisitions (M&A). This contributes to the literature on how firms' innovation incentives are affected by their competitive environment (Cohen, 2010; Arrow, 1962; Schumpeter, 1942). Specifically, we assess how such shocks affect startup's innovation strategies in terms

of technological position (staying close to their initial position or exploring new flares) and their incentives for new startups to markets after a shock.

We propose to follow a two stage methodology. First, the employ the Mapper algorithm from Topological Data Analysis [1] (TDA) to map and capture the structure of the start-up ecosystem. Based on clustering and textual similarity, the Mapper algorithm provides a one-dimensional representation of the "shape" of high-dimensional data, allowing us to visualize and track the repositioning of firms across different technological clusters (Escolar et al., 2023). This approach bridges TDA with the literature on innovation, firm dynamics, and entrepreneurial strategy. A second stage involves obtaining network-based metrics from the topological map to explain economic outcomes, focusing on how distances between firms vary after an external shock, and whether the entry of new companies occurs and if happens in peripheral flares or in proximity to the acquired firm.

To conduct this analysis, we rely on two primary datasets. First, we use an unexplored dataset constructed from the online platform *Product Hunt*[2], a global platform for launching new digital products from a large number of technology startups'. The data covers product launches from 2013, the year in which the platform was founded. Second, we use Crunchbase, a well known database containing detailed information on startups. This dataset enables us to match product portfolios to their corresponding startups and obtain firm-level characteristics. Datasets are merged using the unique domain URL associated with each product and company.

The Product Hunt dataset includes, for each product, a set of launch tags (topics), which we will use as categorical features. Each product can be assigned up to three topics selected from more than 425 possible tags (e.g., Open Source, Software Engineering, Developer Tools). These multidimensional attributes will allow us to represent products in high-dimensional feature space suitable for the Mapper algorithm.

In addition, Product Hunt provides product descriptions, which we will exploit to measure technological similarity through text-based methods, complementing the clustering based on share portfolio topics. As a proxy for demand and product visibility, we will use the analytics on votes count received by each product. Combining this with financial information from Crunchbase could allow heterogeneity study across startups, for example, whether startup with higher funding rounds are less likely to move towards flares of the technological space.

Our main hypotheses to be tested are: H1: Following an acquisition of a main competitor, surviving startups within the affected technological cluster will tend to reposition towards peripheral flares and introduce product innovations as a response to increased competition. H2: Following an acquisition, new startups will enter the technological cluster of the acquired company, attracted by the market signal and increased perceived opportunities.

[1] Topological data analysis is a collection of powerful tools that can represent aspects of the structure of the data in a simplify graph; Mapper returns a 1-dimensional structure representing the shape of the data (Munch, 2017).

[2] https://www.producthunt.com

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