



# THOUGHT LEADERSHIP BRIEF

## Resource Allocation Among Competing Innovators

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### KEY POINTS

- ▶ Venture capitals (VC) and public funding authorities need to carefully consider the incentive issues of entrepreneurs when providing support.
- ▶ In allocating resources to potentially competing innovators, there is a trade-off between the risk of innovation failure and rent dissipation: Diverse investment lowers the risk of having no successful innovation but also reduces the expected profit from the post-innovation market.
- ▶ Successful innovation requires both abundant resources and effort exerted by innovators. Lack of resources or excessive competition discourages innovators from exerting effort at the innovation stage.
- ▶ When resources are scarce, a concentrated investment can guarantee active. As resources become abundant, diverse investment increases the overall success rate of innovation but eventually results in strong business-stealing effort among successful innovators. Therefore, the optimal diversification of investment exhibits a nonmonotone pattern.

Photo by Markus Winkler on Unsplash

### ISSUE

Innovation plays an essential role in economic growth by creating new products, developing new business models, and improving production processes. Governments, nongovernmental organizations, and private companies invest billions of dollars and other resources every year in research and development to foster innovation. Often, there are many innovators targeting the demand of a given group of consumers. For example, several pharmaceutical companies develop their new medicines in order to cure a disease. A government funds knowledge transfers of research on industrial robots to fulfill manufacturing firms' need for automation. A venture capital (VC) invests in a new business model such as ride-sharing apps to reap profits from the transportation market.



Many innovative products are designed to satisfy the demand of specific target consumers, and thus innovators with similar business ideas may become competitors in the post-innovation market. The bike-sharing market in China is also an outstanding example to illustrate the investor's predicament. By 2015, 162 bike-sharing companies had opened for business across China, attracting more than CNY 2 billion of investment. These companies provided similar bike-sharing services, which led to fierce market competition that drove the price to almost zero. Following a huge wave of bankruptcies, fewer than 10 companies remained active in 2019, with most cities having fewer than three active companies. The massive investment did not result in a prolific industry of share economy but many bicycle "graveyards" across the country.

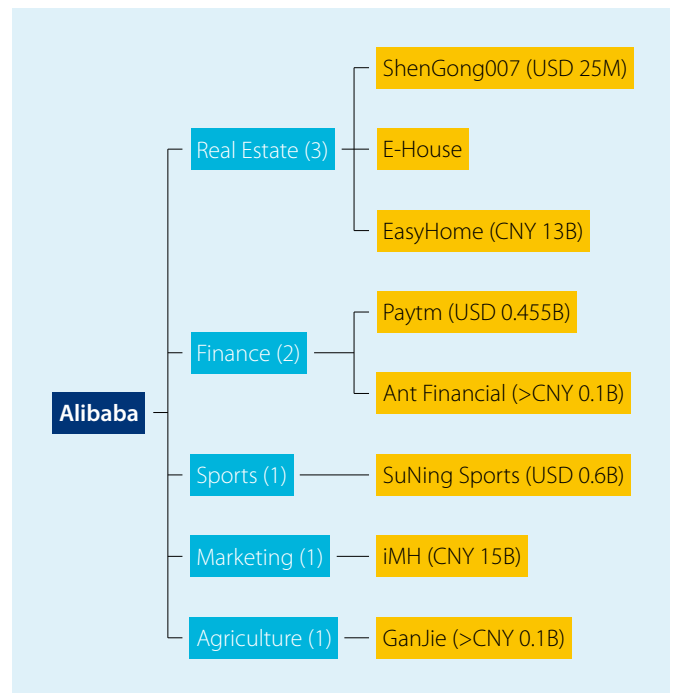
In reality, investors may apply different investment strategies in different industries. For example, in the real estate sector, Alibaba invested in Shengong 007 and Easyhome, which are competing in the areas of building materials and home furnishing. In the finance sector, Alibaba invested in Ant Financial and Paytm. They do not compete directly because their main businesses are in different regions (China and India, respectively). However, Alibaba invested in only one company in each of the sports, marketing and agriculture sectors.

**Figure 1. Bicycle "Graveyard" in Xiamen, China**



Sources: [www.theatlantic.com/photo/2018/03/bike-share-oversupply-in-china-huge-piles-of-abandoned-and-broken-bicycles/556268/](http://www.theatlantic.com/photo/2018/03/bike-share-oversupply-in-china-huge-piles-of-abandoned-and-broken-bicycles/556268/).

**Figure 2. Alibaba's Investment in Different Industries**



Source: [m.gelonghui.com/p/264672](http://m.gelonghui.com/p/264672).

## ASSESSMENT

In this background, we investigate how an investor should properly allocate limited resources to multiple potentially competing innovators. The interplay between allocated resources and market competition plays a pivotal role in crafting an innovator's strategy. Specifically, the investor needs to make sure that innovators have well-directed incentives. In many cases, the resources provided by investors including money, incubation, and consultancy are key inputs for successful innovation. An innovator will actively engage in innovation activities only if there are plenty of resources and the chance of success is sufficiently large.

The innovation activities of different innovators are independent, but their profits from innovative products are interdependent due to possible post-innovation competition. An innovator will exert effort and actively innovate only if he anticipates the profit from the post-innovation market can cover his costs, after taking into account the uncertainty of innovation. Competition factors in through innovators' strategic considerations, and this propagates to the investor's resource arrangement.



Under these incentive issues, the investor should strike a balance between the risk of innovation failure and rent dissipation due to competition. When facing uncertainty in innovation, a profit-oriented investor can lower the risk of having no successful innovation by investing in more startup firms. However, investing in multiple innovators means that each innovator receives few resources and is less likely to succeed. Moreover, the expected profit from the post-innovation market will shrink if multiple similar innovative products are successfully developed.

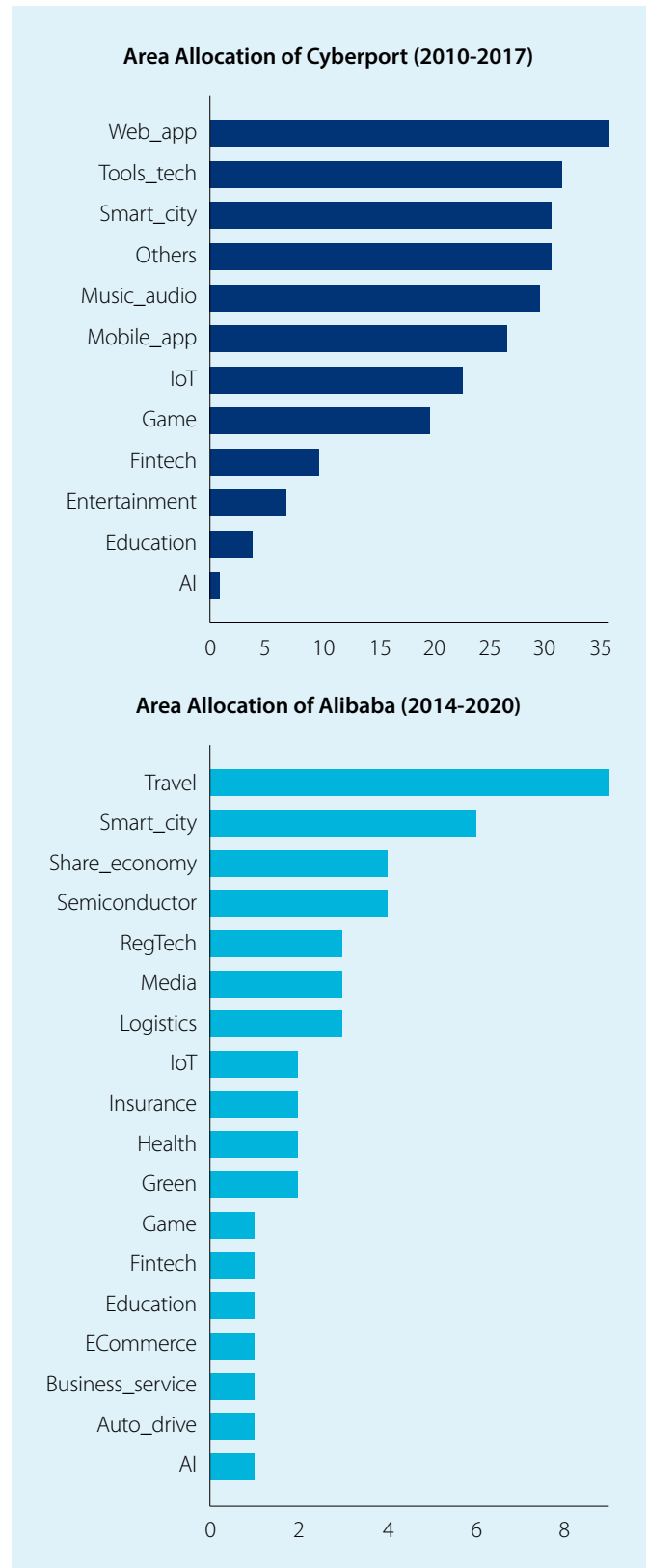
Our results can be applied to both profit-oriented investors and nonprofit funding authorities such as research foundations, government entrepreneurship supporting programs, and incubators. Although nonprofit funding authorities do not seek monetary returns from investment, they still need to be mindful of innovators' incentives because the ultimate success of innovation relies on their efforts. The resource capacity subsequently dictates the number of innovators that the investor can incentivize effectively. When resources are limited, some degree of concentration is necessary to guarantee the overall success rate of innovation.

We find the resource allocation strategy exhibits an interesting pattern that the level of diversification first increases and then decreases in the amount of resources. When the amount of resources is low, disseminating resources to multiple innovators will discourage them from exerting effort in the process of R&D. As resources become abundant, although investing in more innovators reduces the probability that all innovators fail, the post-innovation competition will erode profits when more than one innovator succeeds.

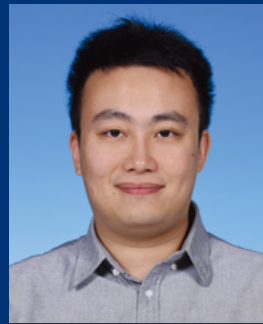
## RECOMMENDATIONS

1. Nonprofit funding authorities should invest resources more diversely than profit-oriented investors. When resources are abundant, nonprofit funding authorities will induce more successful innovations and higher social surplus but a lower profit. Depending on the policymaker's goal, some innovation areas should be directed by nonprofit funding authorities, while others by private VCs. For example, to develop a COVID-19 vaccine, funding decisions should be made by nonprofit entities because the success rate and social welfare outweigh the profit during the pandemic. However, the development of bike-sharing apps should be directed by private entities to guarantee the best use of financial resources and to avoid over-investment in this area.

**Figure 3. Innovation Areas Distribution of Funded Startups**



2. For different industries and different stages of R&D, diversifying innovation investment can lead to vastly different outcomes. As funding authorities devote more resources to innovation, it is possible that funding more innovators will lead to worse outcomes in innovation and knowledge transfers because too many similar products are introduced to the same market. In designing innovation policies and making funding decisions, the policymaker must carefully consider this possibility. For example, China currently has at least 1,500 incubators supported by the Ministry of Science and Technology, funding approximately 80,000 companies ([www.scmp.com/article/topics/invest-china/1727504/china-nurturing-start-ups-cash-incentives-boost-economy](http://www.scmp.com/article/topics/invest-china/1727504/china-nurturing-start-ups-cash-incentives-boost-economy)). Most of these companies are in several thrust areas such as advanced equipment manufacturing, new materials, and new-energy vehicles. The post-innovation competition intensity should be an important factor in determining the resource distribution and investment diversity in different areas. Concentrating resources in some areas while diversifying in others may substantially improve the performance of these incubators.
3. Without proper planning and coordination, funding authorities may support many innovators in one innovation area with similar ideas. For example, in Hong Kong, Lalamove funded by Science Park ([www.hkstp.org](http://www.hkstp.org)) and Gogovan funded by Cyberport ([www.cyberport.hk](http://www.cyberport.hk)) share the same business idea about matching cargo van drivers with consumers. Repetitive funding in similar startups results in the fierce competition in the post-innovation market, which may even discourage startup teams from exerting effort ex ante. Public funding authorities should carefully coordinate their focus innovation areas and coordinate with private investors.



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**Reference:**

Gao, Pin, Xiaoshuai Fan, Yangguang Huang, and Ying ju Chen, "Resource Allocation Among Competing Innovators," Working Paper (2020).

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