

Startups and the Growth of an Industrial Cluster

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Abstract-Cluster growth can be driven by established firms or startups. However, the pattern of the cluster growth in each case is different. This paper compares the pattern of clusters in a short run and long run between clusters that are driven by startups and clusters driven by established firms. The findings show that the number of startups in startup-driven clusters is lower than in the established-firm-driven clusters in a short run. However, in a long run, startup-driven clusters have more startups than the established-firm-driven clusters because innovative people in established-firm-driven clusters face a failure experience and are demotivated.

Keywords-Startups; Industrial cluster; Cluster growth; System dynamics; Simulation

I. Introduction

The development of the successful strategy depends on internal factors of the firm such as firm's knowledge and technology and external factors such as industrial trend. Because of that, Porter suggested cluster as a method of creating competitive advantage [1]. An industrial cluster is a business environment that allows firms to utilize their internal resources and results in firms' productivity improvement, cost saving, innovation creation, new business formation, and competitive resources securing. In addition to the firm's benefits, clusters also provides incentive to the country's economy through transforming employees to entrepreneurs, improving employees' income, and stimulating an economic growth [2, 3]. Therefore, cluster development is encouraged in many countries such as the US, Sweden, Germany, Scotland, Mexico, Costa Rica, and Thailand [1, 4-7].

A cluster can be developed through successful startup firms such as IT startups in Silicon Valley or through the investment of large established firms such as in automotive industry or a combination of both. However, the cluster development pattern in each case is different. Without understanding the cluster development pattern in each situation, related parties such as government or cluster promotion agency may come up with a wrong policy to stimulate cluster development. Firms in a cluster or firms that want to encourage cluster formation may also be unclear of what they should do to foster cluster growth. Therefore, this paper examines the cluster development pattern in the case of startup-driven cluster, established-firm-driven cluster, and the combination of both.

The results from the study show that established-firm-driven clusters have more startups than startup-driven

cluster in a short run, which is contradicted to the general belief. However, in a long run, clusters which are driven by startups have more startups than established-firm-driven clusters due to a demotivation effect from a failure experience that innovative people face.

II. The Pattern of Cluster Formation

Cluster formation is agglomeration economies of the firms with homogeneous need through an increasing return process. The cluster starts from the entrepreneurial activities. When the cluster starts to form, the formation process will reinforce itself and the clusters will be locked-in [8]. Therefore, Feldman and Francis disaggregate cluster formation process into three stages [9]. The first stage is when there is no entrepreneurial activity and there are some external factors that trigger the entrepreneurial action. The second stage is an increase of entrepreneurial activities which is a snowball from the initial trigger. In this second stage, firms in a cluster start to alter an environment to support a cluster growth. The last stage is when the cluster is formed and gains its reputation.

An external trigger that starts the cluster formation can be location-based factors or the government policy. In high-tech industries, the location of the cluster is based on the location of skilled labor with specific knowledge and expertise such as the Silicon Valley or a biotech clusters in Boston which is located near the universities [9-11]. Cluster can be developed through strategic resources such as automotive industry in Thailand which is developed from a need to find manufacturing hub with low cost [12]. Another source of trigger is the government policy through industrial parks or free-trade zones such as the electronics cluster in South Korea and Finland [13, 14].

Based on the literature review, many factors and patterns are identified. However, the existing research does not clearly categorize the pattern whether the cluster is triggered by a success of startup firms or an establishment of large firms. This is a knowledge gap that this paper will contribute.

III. System Dynamics

The cluster development pattern is studied using system dynamics approach. System dynamics approach is the mathematical simulation method which is developed from the feedback control system approach. The system dynamics

model is applicable to analyze the complex situations when there are many factors involved [15].

The system dynamics approach has been used extensively in business and management research which studies the dynamic pattern of the situation. The example uses of system dynamics in business research is the study on an industrial growth [16, 17] and the strategic management [18-20].

IV. Model

The model is developed from the growth of startups and its effect on the established firms. The successful startups can become established firms or they can be acquired by established firms to improve their profit. The profit from established firms can be used as funding for new startups to become a new successful startup as shown in Figure 1.

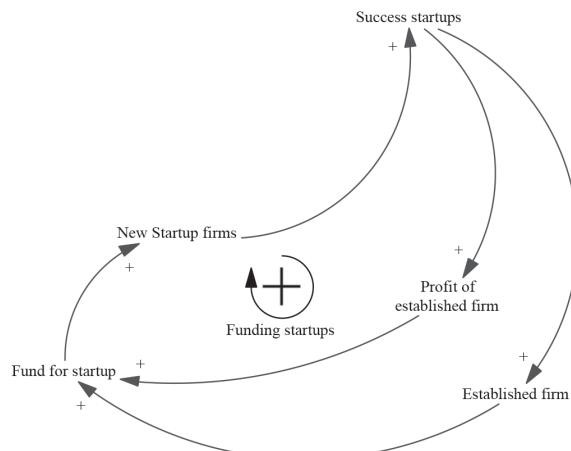


Figure 1 Model showing a funding of startups

The success story of the startup firms will create a good attitude toward startups. As a result, more people wants to start a startup, established firms want to support startups by providing seeding funds, and angel investors also happy to provide money to develop startups as shown in Figure 2.

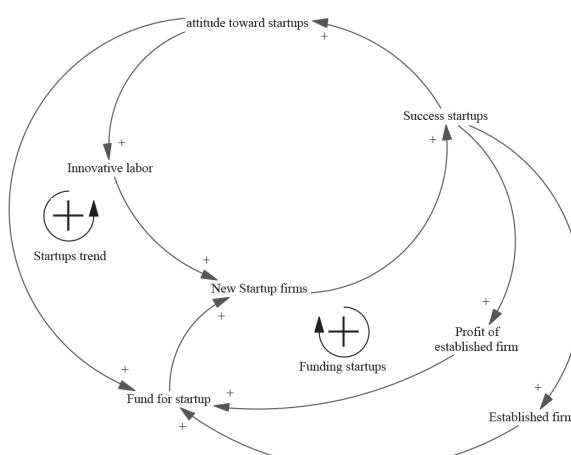


Figure 2 Model showing startup trends

However, not all startups are successful. A few success stories of startups such as Facebook can motivate people to pursue their business dream, leading to high volume of failed startups. Experience of failure can demotivate many innovative people to stop trying again. The startup failure also slows down the startup trends which will limit the startups funding. The explained relationship is shown in Figure 3 and this is the complete model.

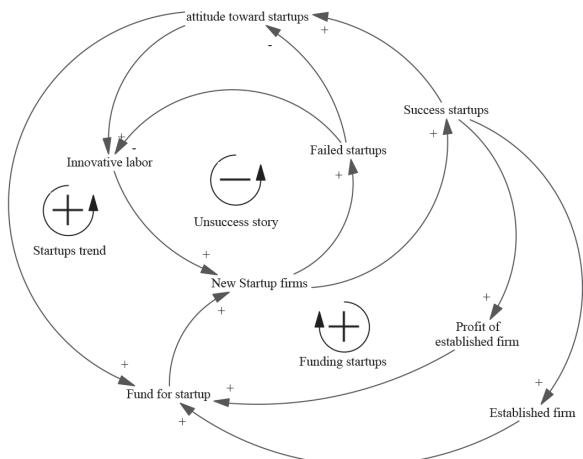


Figure 3 Model showing unsuccessful startup stories

V. SIMULATION RESULTS AND DISCUSSION

We develop three scenarios to analyze the situations which a cluster is driven by startups, by established firms, or a combination of both scenarios. The “startups” scenario is when the cluster is initiated with many startups but a few established firms. The “established” scenario is when the cluster is driven by established firms with a few startups. In the model, we set “startups” scenario as having 20 startup firms and 5 established firms at the starting point. “established” scenario is initiated with 5 startups and 20 established firms. Lastly, “combination” scenario is when having 10 startups and 10 established firms at the start.

The number of startups firms in each scenario shows an interesting graph. In “startups” scenario, the number of startups drops and then pick up later while startups in “established” scenario increases first and then drops later, as shown in Figure 4. However, the difference in number of startups does not affect the number of established firms. The number of established firms is increase in all scenarios and inline with each other as shown in Figure 5. Therefore, the interesting pattern of number of startups does not depend on the number of successful firms, but it depends on the number of new startups.

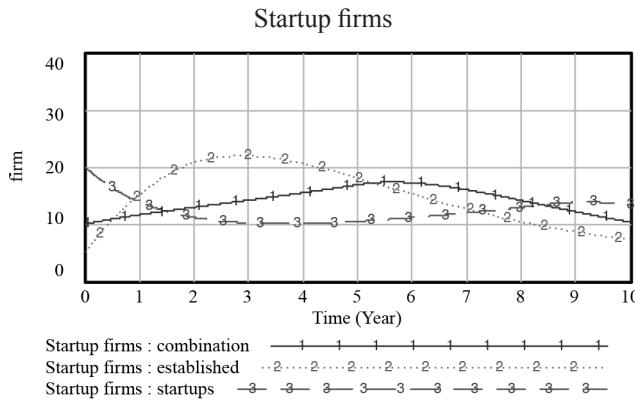


Figure 4 Number of startups in each scenario

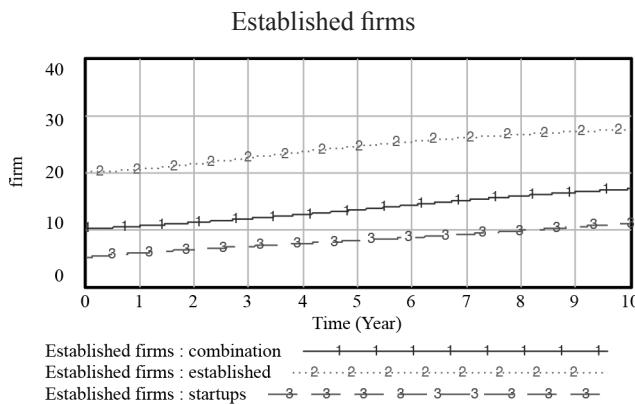


Figure 5 Number of established firms in each scenario

The number of new startups shows a mountain-like pattern. The case of “established” has a highest new startups during an early period. However, “startups” scenario has more startups during a late period, as shown in Figure 6.

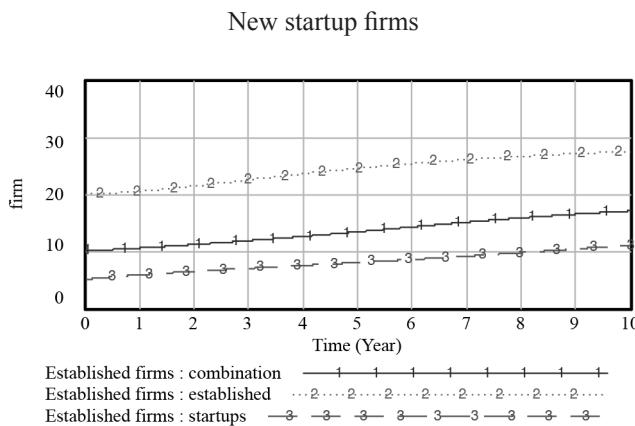


Figure 6 Number of new startups in each scenario

The number of startups depends on funding to support startup and innovative people. The funding for startups depends on the number of established firms and profit of established firms. Therefore, as shown in Figure 7, the pattern of funding is inline with the number of established firms that it is the highest in “established” scenario and the lowest in “startups” scenario. However, the number of innovative people in “established” scenario is the lowest in a long run as shown in Figure 8.

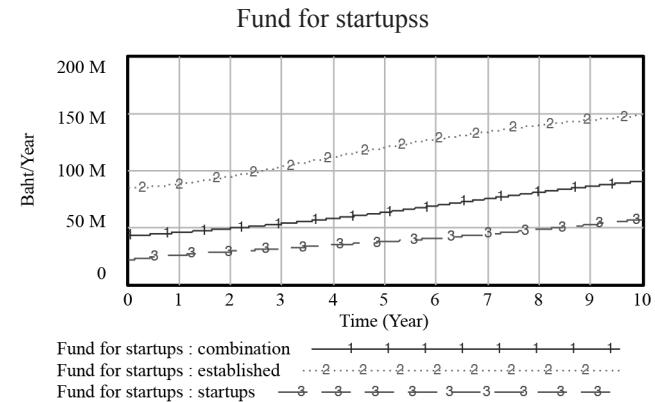


Figure 7 Funds for startups in each scenario

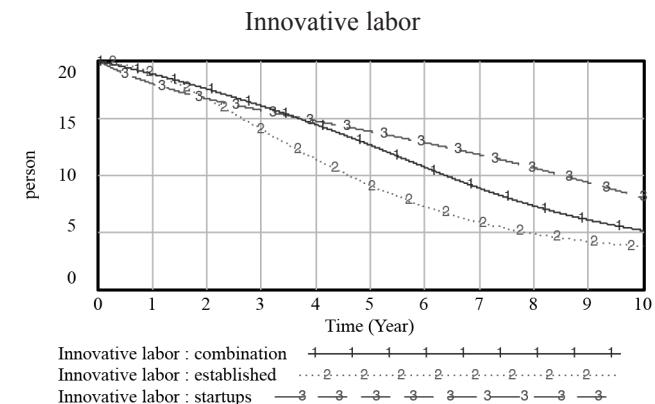


Figure 8 The number of innovative people in each scenario

A drop in number of innovative people comes from a demotivation effect from unsuccessful startups. The number of startups in “established” scenario is higher than that in “startups” scenario during a short-to-medium term. Therefore, there are more failed startups in “established” scenario which leads to a sharper reduction in the number of innovative people.

The findings are inline with the literature by Porter and other scholars that many clusters are developed from the establishment of established firms [1, 9, 12]. However, this paper shows that startup firms, which is the key dynamic of cluster formation, show different pattern. In a long run, startup-driven clusters have more startup firms than clusters initiated by established firms.

In summary, the assumption that startup-driven clusters have more startups than clusters with more established firms in a short run is rejected. On the other hand, the results show an opposite finding that clusters with more established firms have more startups in a short run due to higher supporting fund. However, a long run results are also contradicted with a short run results. Due to a high failure rate of startups in “established” scenario, many innovative people are demotivated which leads to lower startups in a long run.

VI. Conclusion and Implication

This paper compares the pattern of cluster development in a short run and long run between clusters that are driven by startups and clusters that are driven by established

firms. The results show that clusters which are driven by established firms have more startups than startup-driven clusters which is contradicted to an initial assumption. However, the pattern in a long run is opposite with a short run pattern. In a long run, startup-driven clusters have more startups than established-firm-driven clusters because innovative people in established-firm-driven clusters are demotivated from a failure.

The results from this research provides a new insight to startups and cluster development research. This research shows that a demotivation effect from a failure is critical to the growth and development of startups. However, this point has not been raised as an important issue in startups literature before. This is a key theoretical contribution of this paper which can be further researched later.

The results also provide a practical implication to the agencies who are responsible to the cluster development. The policy supporting startups which aims to reduce the failure rate should to implement, in addition to the policy encouraging an establishment of a new startup. A policy to create a new startup such as providing a seeding fund is not enough to create a cluster growth unless the policies to support them along the way until startups can stand on their own are in place.

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