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Dynamics of the Firm Population within an Established Market

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ABSTRACT

We investigate market entry of small firms and market characteristics that motivate such firms to penetrate markets. By emphasizing firm scales, we provide a dynamic picture of entrant-incumbent relations, and conditions on how, when, and where small entrants would penetrate markets. Conceptually, this paper generalizes and unifies both resource partitioning and mutual forbearance theories into one with much increased utility for applications. We show that penetration into markets is possible only when smaller entrants solidify large incumbents' positions while target niches large incumbents cannot occupy; market evolution can be measured by either integration or modularity of the large incumbents; etc.

KEYWORDS: entrant-incumbent relation, forbearing market, Red Queen rivalry, resource partition, and systemic yoyo

INTRODUCTION

Having a practically useful theory on the dynamics of firm competitions within a market is very important. It is because such knowledge explains how interactions among incumbent firms and between the incumbents and entrants shape industry logic, and helps corporate leaders understand entrant-incumbent relations so that decisions on either market entry timing or how to deal with entrants for the incumbents can be made with better precision and preparation. To the incumbents, entrants would most likely disrupt the market equilibrium with competitive offerings that potentially shift consumers' preferences, erode the expected performance of the existing firms, and displace underperforming players (Abraham, et al., 2007; Berry and Reiss, 2007). Hence, incumbents are motivated to take a stand: retreat, collaborate, or retaliate (Schumpeter, 1934).

The dynamics of firm competitions has been considered in diverse disciplines, such as industrial organization, economics, strategy, international business, entrepreneurship, marketing, sociology, and finance (Bresnahan and Reiss, 1991; Carroll and Swaminathan, 2000; Cockburn and MacGarvie, 2011; Damar, 2009; Dunne, et al., 1988; Falck, et al., 2011; Hochberg, et al., 2011; Stigler, 1968). However, most studies focus on players that share a similar profile: de alio (diversification from another market) entrants and incumbents use similar resources and business models, offer similar products, and cater to similar customers (Bresnahan and Reiss,

1987; Chen, 1996; Chen and Ross, 2000; Kotha, et al., 2011; Forrest, et al., 2017). That explains why such scholarship is often restricted to monopolistic, duopolistic, and oligopolistic markets, see example (Abraham et al., 2007; Singh and Zhu, 2008; Dowell and Killaly, 2009). The competing firms in these markets are almost always assumed to be the same size and profile. Thus, there is less known about the dynamics of firms of dramatically different sizes. That is essentially the focus of this paper.

The importance of such study can be justified with several practical reasons. Firstly, competitive outbreaks between small, de novo entrants and large incumbents are quite common in the business world (Morris, 2009). Secondly, firms of varying sizes, resource endowments, capabilities, and risk tolerance, behave differently (Greve, 2011). Thirdly and more particularly, the existing general theories on market dynamics are not refined enough to provide guidance on market entries of small firms, how micro, de novo startups enter markets that are dominated by large and powerful incumbents.

Comparing to the literature, this work points to the fact that even in theory firms of the marketplace are of different sizes; so accordingly they behave differently from each other. Other than how the population of firms diverges, as indicated by the literature, this paper specifies convergence, the mechanism of entry, entrant–incumbent relations, and markets' evolution through measurable expansion and contraction. Among others, one major contribution of this paper is to make the relationship between small entries more specifiable, predictable, and repeatable so that relevant decision makings could become more reliable.

The rest of the paper is organized as follows: Section 2 introduces the basics of systems science and the systemic yoyo model that will be used in the rest of the paper. Section 3 establishes our main results by using game theory on when small or micro entrants would appear within the market. Section 4 combines the resource partitioning and mutual forbearance theories into one general, unified, and more powerful theory. Section 5 discusses the usefulness of this general theory in the study of market dynamics and relations between small entrants and large incumbent firms. Section 6 concludes this presentation with a few open problems.

SYSTEMS SCIENCE AND SYSTEMIC INTUITION

Von Bertalanffy (1924) pointed out that the fundamental character of living things is their organization, the customary investigation of individual parts and processes cannot provide a complete explanation of the phenomenon of life. Since then, this holistic view of nature and social events has permeated the entire spectrum of science and technology (Lin, 2009). And in the past 90 some years, studies in systems science and systems thinking have brought forward brand new understandings and discoveries to some of the major unsettled problems in the conventional science (Klir, 1985; Lin, 1999). Because of these studies of wholes, parts, and their relationships, a forest of interdisciplinary studies has appeared, revealing the development trend in modern science and technology of synthesizing all areas of knowledge into a few major blocks, and the boundaries of conventional disciplines have become blurred ("Mathematical Sciences," 1985). Underlying this trend, one can see the united effort of studying similar problems in different scientific fields on the basis of wholeness and parts, and of understanding the world in which we live by employing the point of view of interconnectedness. As tested in the past 90 plus years, the concept of systems and results of systems research have been widely accepted by the world of learning (Blauberg, et al., 1977; Klir, 2001).

Similar to how numbers and algebraic variables are theoretically abstracted, systems can also be proposed out of any and every object, event, and process. For instance, behind collections of objects, say, apples, there is a set of numbers such as 0 (apples), 1 (apple), 2 (apples), 3 (apples), …; and behind each organization, such as a business firm, a regional economy, etc., there is an abstract, theoretical system within which the relevant whole, component parts, and their interconnectedness are emphasized. As a matter of fact, it is because of these interconnected whole and parts, the totality is known as a firm, an economy, etc. In other words, when internal structures can be ignored, numbers and algebraic variables can be very useful; otherwise the world consists of dominantly systems (or structures or organizations).

When the traditional science is joined with systems science that investigates systemhood, that collectively gives rise of a 2-dimensional spectrum of knowledge, where the traditional science, which is classified by the thinghood it studies, constitutes the first dimension, and the systems science, which investigates structures and organizations, forms the genuine second dimension (Klir, 2001). In other words, systems research focuses on those properties of systems and associated problems that emanate from the general notion of structures and organizations, while the division of the traditional science has been done largely on properties of particular objects. Therefore, the former naturally transcends all the disciplines of the classical science and becomes a force making the existing disciplinary boundaries totally irrelevant and superficial.

The importance of this second dimension of knowledge cannot be in any way over-emphasized. By making use of this extra dimension, the exploration of knowledge has gained additional strength in terms of the capability of solving more problems that have been challenging the very survival of the mankind since the beginning of time. Such strong promise that systems research holds relies materialistically on the particular speaking language and thinking logic – the systemic yoyo model (Lin, 2007), Figure 1, similar to how the Cartesian coordinate system plays its role in the development of modern science (Kline, 1972).

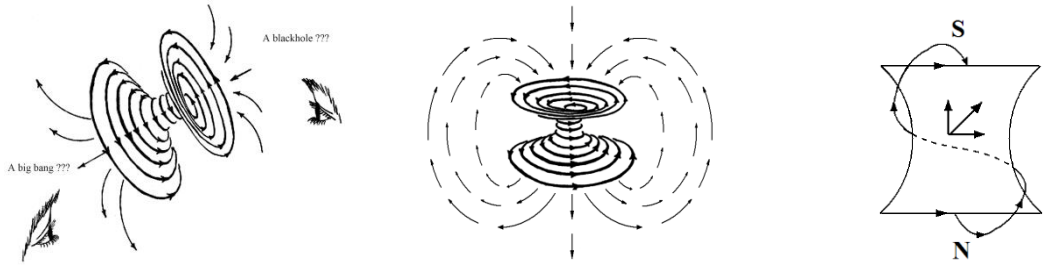


Figure 1. (a) Eddy motion model of the general system; (b) The meridian field of the yoyo model; (c) The typical trajectory of how matters return

Specifically, on the basis of the blown-up theory (Wu and Lin, 2002) and the discussion on whether or not the world can be seen from the viewpoint of systems (Lin, 1988; Lin, et al., 1990), the concepts of black holes, big bangs, and converging and diverging eddy motions are coined together in the model shown in Figure 1 for each object and every system imaginable. That is, each system is a multi-dimensional entity that spins about its axis. If we fathom such a spinning entity in our 3-dimensional space, we will have a structure as artistically shown in Figure 1(a). The black hole side pulls in all things, such as materials, information, energy, profit, etc. After funneling through the “neck”, all things are spit out in the form of a big bang. Some of the

materials, spit out from the end of big bang, never return to the other side and some will (Figure 1(b)). For the sake of convenience of communication, such a structure as shown in Figure 1(a), is referred to as a (Chinese) yoyo due to its general shape.

What this systemic model says is that each physical or intellectual entity in the universe, be it a tangible or intangible object, a living being, an organization, a culture, a civilization, etc., can all be seen as a kind of realization of a certain multi-dimensional spinning yoyo with an eddy field around. It stays in a constant spinning motion as depicted in Figure 1(a). If it does stop its spinning, it will no longer exist as an identifiable system. What Figure 1(c) shows is that due to the interaction between the eddy field, which spins perpendicularly to the axis of spin, of the model, and the meridian field, which rotates parallel to axis of spin, all the materials that actually return to the black-hole side travel along a spiral trajectory.

As expected, this yoyo model has successfully played the role of intuition and playground for scholars who investigate the world and explore new knowledge holistically, just as what the Cartesian coordinate system did for the traditional science (Lin, 2009; Lin and Forrest 2011; Forrest 2013; 2014; Forrest and Tao, 2014; Ying and Forrest, 2015). In particular, this yoyo model of general systems has been successfully applied in the investigation of Newtonian physics of motion, the concept of energy, economics, finance, history, foundations of mathematics, small-probability disastrous weather forecasting, civilization, business organizations, the mind, among others. Along this same line of logic, in this paper we will use this model as our intuition to establish our conclusions.

WHEN WILL MICRO ENTRANTS POTENTIALLY APPEAR?

Assume that the oligopoly market of our concern consists of m firms, $m = 1, 2, \ldots$, providing consumers with mutually substitutable products, with their respective shares of loyal consumers. To protect their turfs while potentially increase their consumer bases, they compete over the switchers with adjustable prices charged to their customers in order to deter the potential entrance of new competitions (Forrest, et al., 2017). So, assume that these firms produce their horizontally differentiated products at constant marginal costs, which is set to zero without loss of generality. Assume consequently the managements of these m firms are well aware of the pricing strategies of the other firms and have established their best responses by playing the Nash equilibrium through pure self-analyses.

Speaking differently, the market is in a state of mutual forbearance, where incumbent firms mitigate rivalry by dividing markets in proportion to firm strength (Bernheim and Whinston, 1990). They cede dominance to their stronger competitors in those market segments where they are less efficient, while in exchange the latter do the same in segments where the former are more efficient (Li and Greenwood, 2004). The firms' codependence gradually motivates them to de-escalate rivalry (Yu and Cannella, 2012). Eventually, the rates of entry and exit in the market decrease (Fuentelsaz and Gómez, 2006), and interfirm hostility declines (Haveman and Nonnemaker, 2000).

So, without loss of generality, let us consider the aggregate of the incumbent firms as one firm, whose share of occupancy of the market is α so that $\beta = 1 - \alpha$ represents the

size of the market segment of switchers who base their purchase decision on which price is lower. Then, the following result holds true:

Theorem 1. In the previously described oligopoly market, a sufficient and necessary condition for at least one micro firm to enter the market profitably, as a competitor of the incumbent firms, is that the consumer surplus $\beta = 1 - \alpha > 0$.

By micro firm it is meant to be such a firm that it is extremely small when compared to any of the incumbents. The previously assumed market condition generally means that the technology involved and the relevant business operations have been standardized. So, for a new micro firm to enter such a market with profit potential, it is reasonable to assume that this firm has come up with a more efficient technology and/or operation that can greatly reduce the overall business expenditure. Further assume that this micro entrant uniformly randomizes its price P over the interval [0,1] as long as the firm could make profits on the average. Again, the constant marginal costs of this micro entrant are set to zero without loss of generality.

Before we provide a detailed proof for this theorem, let us first see intuitively why such a result holds true. To this end, let us fathom the market place is as an abstract yoyo field, and we look at the multi-dimensional yoyo body at a distance from above either the convergent side or the divergent side, while imagine that everything here takes place in our 3-dimensional space. That is, we are looking at a pool of spinning fluid, where the word “fluid” is an abstraction of movement of all kinds of media, such as goods, information, money, credit, etc., that appear and exist in business activities. In other words, graphically one is looking at the market of concern as the pool of spinning fluid shown in Figure 2.

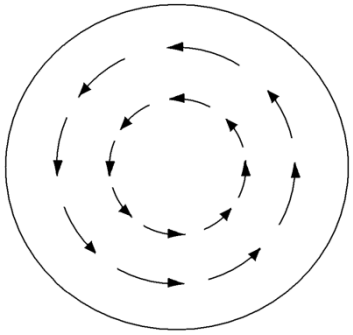


Figure 2. The systemic birdseye view of our marketplace of a previously prosperous market

Associated with this end of intuition, the well-known dishpan experiment, which was initially conducted successfully by Raymond Hide (1953) of Cambridge University, England, and then by Dave Fultz and his colleagues of University of Chicago (1959) independently, shows that when the movement of the fluid within the rotational dish is under enough pressure created by either the sufficient speed of rotation or sufficient difference in the temperature between the center and the periphery of the dish, the pattern of uniform movement, as shown in Figure 2, will develop into the chaos, as shown in Figure 3. The number of local eddy leaves is determined either by the rotational speed or by the temperature difference or both and increases with the speed and the temperature difference.

Now, this systemic intuition and laboratory experiment suggests that the fluid nowhere within this spinning dish could avoid being disturbed by the flows, either orderly or chaotically, of the pan. And being disturbed regionally means that a local flow pattern will appear inevitably.

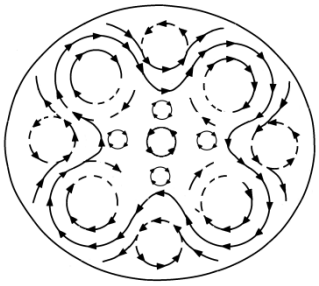


Figure 3. Asymmetric flow observed in Fultz's dishpan experiment

Proof. (⇒) Suppose that by randomizing its price over the interval [0,1] a micro firm enters into the oligopoly market of *m* firms, which are collectively seen as one aggregate firm, because these *m* firms are in a state of mutual forbearance. So, the consumer surplus must satisfy $\beta = 1 - \alpha > 0$.

(⇐) Assume that the consumer surplus satisfies $\beta = 1 - \alpha > 0$. Firstly, let α_0 be a real number so that $\beta = 1 - \alpha > \alpha_0 > 0$, and $\alpha = \ell\alpha_0$, where ℓ is a large natural number, indicating that the market has been largely taken by the incumbent firms.

Secondly, let us imagine that the aggregate firm is divided into ℓ many identical "firms", named *i*, *i* = 1, 2, …, ℓ. Each of them provides consumers with identical products and enjoys the market share $\alpha_0 = \alpha/\ell$ of loyal consumers. These imaginary firms compete over the switchers with adjustable prices. Because these imaginary firms are really equal partitions of the same aggregate firm, they have the same constant marginal cost, which is set to zero without loss of generality, the managements of these firms are fully aware of the pricing strategies used by all the firms (because the firms are managed by the same administrative unit), and they establish their best, identical responses by playing the Nash equilibrium through their unified self-analyses.

Thirdly, these ℓ imaginary firms do not have any symmetric pure strategy Nash equilibrium. (For the setup here, there is no need to consider asymmetric pure strategy Nash equilibrium, because all these imaginary firms take identical actions). In fact, for any symmetric pure strategy portfolio $(x_1, x_2, \dots, x_\ell)$, where $x_i = x_j$, for *i*, *j* = 1, 2, …, ℓ, a randomly chosen Firm *j* ($\in \{1, 2, \dots, \ell\}$) can slightly lower its price from x_j to x_j' to produce additional profits for all the firms as long as $x_j'\beta > (x_j - x_j')\alpha$, which is possible to do by adjusting x_j' sufficiently close to x_j. So, $(x_1, x_2, \dots, x_\ell)$ is not an Nash equilibrium. Even so, (Forrest, et al., 2017) shows that these ℓ firms do have a symmetric mixed-strategy Nash equilibrium.

For the rest of this proof, it suffices to show that there is one micro firm that will be expected to profit by entering this market through uniformly randomizing its price strategy over the interval [0,1].

Let $F(P)$ be the price distribution of Firm *j*, one of the imaginary firms of the aggregate firm. The aggregate firm or equivalently each of the ℓ imaginary forms sets its price after taking into account the price of the new firm and those of all other imaginary firms. Hence, the profits for Firm *j* from its loyal consumers is $\alpha_0 P$ and those from its share of the switchers is $\sum_{i\neq j}^{\ell}(1 -$

$P)[1-F(P)]\,\beta P = \beta P(1-P)[1-F(P)]^{\ell-1}$. Hence, the profits Π Firm *j* generates when the firm sells its product at price P are

$$\alpha_0 P + \beta P(1-P)[1-F(P)]^{\ell-1}$$

and the objective function of Firm *j* is

$$max_{F(P)} E(\Pi) = \int_{-\infty}^{+\infty} \{\alpha_0 P + \beta P(1-P)[1-F(P)]^{\ell-1}\} dF(P)$$
$$= \int_{0}^{1} \{\alpha_0 P + \beta P(1-P)[1-F(P)]^{\ell-1}\} dF(P)$$

where $E(\Pi)$ stands for Firm *j*'s expected profits for all possible prices, and the objective for Firm *j* is to maximize its expected profits by choosing its price distribution $F(P)$. The reason why the upper and lower limits of the integral are changed respectively from $+\infty$ and $-\infty$ to 1 and 0 is because when $P < 0$ or when $P > 1$, the profits are zero.

The equilibrium indifference condition of Firm *j* is

$$\alpha_0 \times P + \beta \times P(1-P)[1-F(P)]^{\ell-1} = \alpha_0 \times 1 \quad (1)$$

So, for the ℓ imaginary firms, solving equation (1) leads to their symmetric equilibrium pricing strategy as follows:

$$F(P) = 1 - \left(\frac{\alpha_0}{\beta P}\right)^{\frac{1}{\ell-1}} \quad (2)$$

From $\beta > \alpha_0$, it follows that $\alpha_0/\beta < 1$. So, for any Price *P*, satisfying $1 \geq P \geq \alpha_0/\beta$, equation (2) is a well-defined probability distribution. This end implies that for the ℓ imaginary firms, or equivalently, the aggregate firm, the lowest allowed price is α_0/β.

To complete this proof, it suffices to show that the micro entrant actually expects to make profits in this new market. To this end because $lim_{P\to 1^-} F(P) = 1 - (\alpha_0/\beta)^{1/(\ell-1)} \neq F(1) = 1$, the cumulative price distribution function $F(P)$ has a jump discontinuity at the reservation value $P = 1$, where the amount of jump is $(\alpha_0/\beta)^{1/(\ell-1)}$. That is, $F(P)$ has a mass point of size $(\alpha_0/\beta)^{1/(\ell-1)}$ at the reservation price $P = 1$. So, the expected profits of the micro entrant are the following:

$$E(\Pi) = \int_0^{\alpha_0/\beta} \beta P dP + \int_{\alpha_0/\beta}^{+\infty} \beta P[1-F(P)]^{\ell} dP \quad (3a)$$
$$= \int_0^{\alpha_0/\beta} \beta P dP + \int_{\alpha_0/\beta}^{1} \beta P[1-F(P)]^{\ell} dP + \beta \left(\frac{\alpha_0}{\beta}\right)^{\ell/(\ell-1)} \quad (3b)$$

where the first term in the right-hand side of equation (3a) stands for the expected profits of the micro entrant when it charges the lowest price in the marketplace and captures the entire segment of the switchers, and the second term is the micro entrant's expected profits when it is in direct competition with the ℓ incumbent firms.

Because the first term in the right-hand side of equation (3b) satisfies

$$\int_0^{\alpha_0/\beta} \beta P dP = \frac{\alpha_0^2}{2\beta} > 0,$$

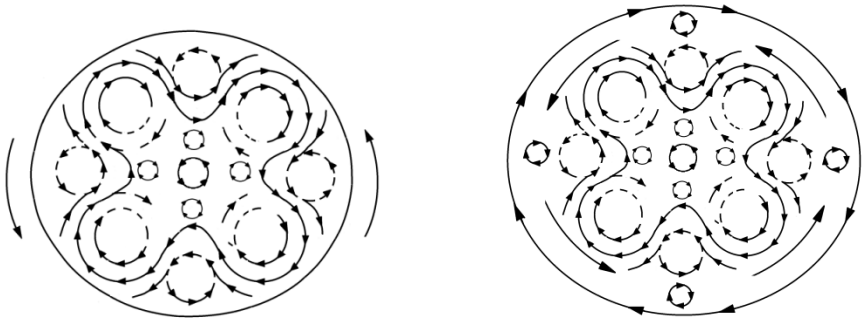
the second term is ≥ 0, because the integrant is positive and the third term is positive, it can be concluded that the expected profits of the micro entrant $E(\Pi)$ is greater than zero. This end implies that if the consumer surplus $\beta = 1 - \alpha > 0$, there will be at least one micro entrant that will enter the market to compete with the incumbent firms. QED

Corollary 1. In the previously described oligopoly market, a sufficient and necessary condition for at least one micro firm that introduces a particularly improved version of the product to enter the market profitably, as a competitor of the incumbent firms, is that the market segment of consumers who are looking for that particularly improved version is of a size > 0.

To show this result, we only need to identify the market segment of consumers who are looking for that particularly improved version as part of the market switchers in the proof of Theorem 1.

Corollary 2. If the condition in Corollary 1 holds true, then the micro entrant can charge a higher price than that of the incumbents, where the amount of additional charge depends on how badly consumers look for that particularly improved version.

To show this result, simply multiply the expected profits in equations (3a) and (3b) by a scale *k* while the rest of the argument is kept the same.



(a) The periphery spins with the entire dish (b) The periphery spins in different direction

Figure 4.A systemic yoyo model for the coexistence of generalists and specialists

A SYSTEMIC THEORY OF ENTRY AND MARKET PARTITION

Because in the market money flows can be used as a measure of how the goods change hands, let us model the market place in abstract terms as a spinning dish with money (of different kinds) as the fluid within the dish, Figures 1 and 2. When the market appears initially, the movement of money is depicted as the uniform motion in Figure 2. As the market grows with its strength and magnitude, the flow pattern in Figure 2 gradually evolve into that shown in Figure 4. That is why in any chosen industry, there seems to have two ecologic trends: (1) The gradual increase in market concentration by a few large generalists that accommodate to a broad consumer base in heterogeneous segments of the market; and (2) The appearance of smaller specialists in a

greater numbers, as observed by the resource partitioning theory (Carroll and Hannan, 2000; Carroll and Swaminathan, 2000).

This systemic yoyo model provides us an intuition for how generalists and specialists of different scales appear and co-exist, assuming the entire dish spins counterclockwise. Here, the largest whirlpools (or eddy leaves) within the dish represent the generalists, the smaller pools specialists, while the periphery stands for areas of the market that are underserved and the center areas overserved. And if the market is expanding, the periphery moves outward, making the dish larger; if the market contracts, the periphery moves inwardly so that the total area within the dish becomes smaller.

In this systemic yoyo model of the market place, when two adjacent pools spin in opposite directions, smaller pools are naturally created in the area between the adjacent pools, Figure 5. That explains why each specialist serves a narrower and more homogeneous segment of the market when compared to the generalists. Because of their large magnitude, the generalists dominate the most profitable market segments (the largest areas in the spinning dish). And during the time when the market is formulated, that is when the spinning speed of the dish picks up, the fledgling generalists grow quickly by emerging several regional pools, making it appear that larger and stronger generalists outcompete smaller ones and that as weak generalists exit or disband their market segments are reoccupied (Carroll and Hannan, 2000; Carroll and Swaminathan, 2000). However, as the market matures, that is when the spinning the dish eventually reaches its maximum speed, the surviving generalists reach their largest magnitudes and their total number stabilizes.

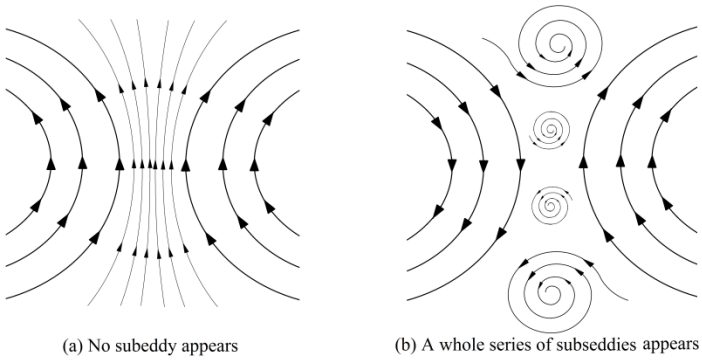


Figure 5. How small eddy pools are created

This systemic yoyo model shows that when the market ages, that is when the spinning speed of the dish gradually slows and the size of the dish shrinks, the existing eddy leaves in Figure 4 will slowly dissolve and eventually become one pool as shown in Figure 2. That is when the surviving generalist of the antiquated market becomes a specialist within another prospering new market.

Next, let us see how the systemic yoyo model in Figures 1 and 2 well illustrates empirical observations and expands the conclusions of the resource partitioning theory (Markman and Waldron, 2014):

- Interactions among a few large generalists affect the division of markets and the position of more numerous specialists. It is because all sub-eddy pools in Figure 4 are determinately configured by the largest eddy leaves.

- Generalists cannot capture or control every market segment. And even without antitrust laws, their market dominance has practical limitations. It is because the largest whirlpools in Figure 4 exist in equilibrium and between them there are always spaces for specialists or micro firms to exist.
- As inter-generalist competition approaches monopoly equilibrium, the size of each of the generalists grows to its maximum and the total number of generalists decreases, while the total number and variety of specialists increase. It is because as the dish in the dishpan experiment increases to its maximum from its initial standstill, the uniform distribution of the fluid (money) starts to be disturbed and the initial chaos in the fluid is gradually taken over by orderly existence of the largest whirlpools, while many more regional pools naturally appear, as confirmed theoretically by Theorem 1.
- Specialists cater to narrower market segments that are less attractive to generalists. In fact, our systemic yoyo model suggests that specialists only exist in narrower market segments that are not possible for the generalists to occupy due to the mutual constraints imposed by the generalists on themselves.
- All the firms in the market place are divided into two strategic categories: fewer generalists and scores of specialists (Kuhn, 1962). Considering the unique characteristics of micro firms, particularly regarding their entry into the market, (Markman and Waldron, 2014) treat these micro firms as a separate and distinct strategic group (Carmeli and Markman, 2011; Porter, 1980; Sheth and Sisodia, 2010). However, our systemic yoyo model suggests that in the general marketplace, there should be a good number of different strategic categories if we consider firms' scales, how they fit in the marketplace, etc. In particular, anywhere in the market when the adjacent whirlpools spin in different directions, there will appear smaller local whirlpools. That end is exactly what Theorem 1 shows. For example, the hospitality industry includes a few large generalists, such as Hilton, Starwood Hotels, Wyndham, Hyatt, and Marriott, and many specialists, such as undersized, independent, and unaffiliated hotels, motels, inns, and hostels. At this same time, this industry also includes much smaller players, such as bed and breakfasts, rental vacation homes, and furnished apartments for rent, that operate very differently from generalists and specialists.
- Most offerings in a narrow niche are unique so that buyers rarely make head-to-head choices between micro firms' offerings and those of generalists and specialists. It is because niche areas only exist within the spaces between the pools of generalists and specialists.
- Some generalists improve their position by facilitating the penetration of micro entrants (McCann and Vroom, 2010). Based on our systemic yoyo model, all generalists should make use of micro firms to enhance their market positions, because instead of helping to create the niche opportunities for micro firms, generalists could as easily make use of the momentum of the micro firms to strength their own spin fields.
- Market expansions and contractions are rooted, at least in part, in whether incumbents focus on integration (i.e., managing most activities internally) or modularity (i.e., increasing partnering with and outsourcing to other players) (Markman and Waldron, 2014; Baldwin and Clark, 2000). However, our systemic yoyo model suggests that market expansions and contractions can be practically measured with time lag by using whether the incumbents focus more on integration or more modularity, because the field structure of the market, as presented in Figure 4, either expands with the periphery pushes outward or contracts with the periphery moving inwardly toward the center due to forces beyond the existing eddy pools. Such holistic development of the field structure of the market is really caused by the overall dynamics of all interacting markets which impose constraints on individual markets, such as the historical interactions between the

markets of travel and computers, initially two unrelated industries. So, the incumbents only react to the changing environment of the market. If the market expands, the incumbents will be spending all their efforts on grabbing as much territory as possible, as new territories become available, which, to observers, would seem to be integrating. On the other hand, if the market contracts, some of the originally profitable segments of the market become at least not as profitable. So, consequently, the incumbents have to trim their operations in these relevant segments. That end, to observers, seems to be the case that the incumbents focus more on modularity.

- Integration is associated with higher power and concentration of the generalists, which demotivates entry, while modularity entices micro entrants and specialists to penetrate generalists' markets (Baldwin and Clark, 2000; Christensen et al., 2004; Markman and Phan, 2011). To this end, our systemic understanding illustrates that integration is a manifestation of the available higher power and concentration of the generalists used to occupy more territories within the ever expanding scale of the market. So, along the process of conquering, new entrants, most of which are weaker than the generalists, will be crushed. On the other hand, modularity means that areas of the territories originally occupied by the almighty generalists have to be trimmed, which opens doors for micro entrants and specialists to penetrate the generalists' lands.

In terms of the relationship between micro entrants and incumbent firms, the drastic size difference induces micro and large firms to act differently, which is particularly apparent when they compete against each other (Carmeli and Markman, 2011; Markman et al., 2009). Therefore, because firms of different scales behave differently due to the fact that they fill different spaces in the spinning dish, our theory developed on the systemic yoyo model, which generalizes the resource partitioning theory, immediately become appropriately applicable in terms of describing and predicting market behaviors. In particular, smaller firms enter the market explicitly in the areas located along the periphery and the center (Markman and Waldron, 2014) as represented by the systemic yoyo model in Figure 4, the former symbolizes the boundary between different market segments, while the latter characterizes the region within the market that does not contain customers loyal to any of the incumbents. It is because these market areas cannot sustain the growth requirements of large incumbents (Christensen et al., 2004).

Because micro firms enter the market by targeting the narrowest market slivers under different value propositions, they are generally not affected by traditional entry barriers (Hochberg, et al., 2010). For instance, while the large incumbents sell large volumes of a limited number of popular items, micro entrants penetrate the market by selling small volumes of hard-to-find and "non-hit" items to sufficient number of customers (Anderson, 2006). They often collocate with and thrive in the shadow of large incumbents (Hotelling, 1929). The sheer size of large incumbents makes micro entrants less threatening while the latter generally lack scalability and migratory capability. So, at least initially their forays encounter minimal resistance from the larger incumbents. After entry, micro entrants have no choice but avoid growth outside their niche, because their very survival is only possible within the zones between large incumbents, unless some of the large incumbents start to weaken and fall apart. In other words, if we look at the static photo shot of the marketplace, then micro entrants' growth that widens a niche into incumbents' core business is particularly detrimental because such growth puts entrants and incumbents on a collision course (Markman and Phan, 2011). In fact, smaller entrants need to identify ways to combine, complement, and augment their offerings with those of larger incumbents in order to generate synergies and agglomeration effects (Brandenburger and Stuart, 1996). By becoming enablers, smaller entrants demonstrate that their entry would yield greater gains to larger incumbents (Anderson and Tushman, 1990; Teece, 1986). That is,

because smaller entrants expand the reach of the larger incumbents, they in effect contribute to market equilibrium (Gnyawali, et al., 2006), and are often promoted into the market based on their fit (DeVaro, 2006; Lazear and Rosen, 1981).

If the magnitudes of the eddy pools in Figure 4 are interpreted as either firms' market topography or location effect, then this systemic yoyo model implies that other than size difference, incumbents' reactions to new entrants are influenced by whether the entrants attack the market's epicenters or periphery. Practically, entry directly into the epicenters poses an imminent threat to the incumbents because these epicenters hold considerable economic utility. Therefore, the incumbents will react decisively (Chen, 1996).

Next, let us look at another condition that also influences the entrant–incumbent relationship: mutual forbearance.

The mutual forbearance theory maintains that incumbents mitigate rivalry by dividing the market in proportion to firm strength (Bernheim and Whinston, 1990). When such market partitioning occurs, mutual forbearance ensues, where the incumbents surrender dominance to their stronger competitors in those market segments where they are less efficient (Greve, 2000; Li and Greenwood, 2004). As generalists compete in a large number of segments of the market, they learn their competitors' strengths and weaknesses and become aware of their codependence within the market ecosystem. So, they gradually motivate players to de-escalate rivalry (Yu and Cannella, 2012). That leads to decreasing entry and exit rates in the market (Fuentelsaz and Gómez, 2006; Stephan, et al., 2003), and decreasing interfirm hostility (Baum and Korn, 1999; Haveman and Nonnemaker, 2000; Jayachandran, et al., 1999). That is, a state of mutual forbearance rules.

If we compare what are described in the previous paragraph with the systemic yoyo model in Figure 4, it clearly indicates that the mutual forbearance theory describes the evolution from when a market initially appears to when the market matures and stabilizes. That explains why this theory is important for entry research, because it explains how subduing competition leads to attractive outcomes: stability in market-shares and, generally, high returns on the capital (Jayachandran, et al., 1999). On the other hand, it also explains the necessity for firms that aim at becoming large and dominant in a (future) mature market to experience and actively participate in intense competitive contests, which at times might seem to be like Red Queen rivalries, where by Red Queen rivalry, it means such a situation that each firm is forced by the actions of its rivals to retaliate and escalate its actions, leading to such a context that each player races as fast and as hard as possible just to maintain its competitive parity (Barnett, 2008).

However, this attractiveness naturally invites competitions from new entrants (whose appearance is guaranteed by the theoretical results in Section 2). That of course will potentially destroy the market equilibrium and industry logic established and enjoyed jointly by the incumbents, either large or small. The symmetrical motivation between the incumbents, who seek to protect their territory and sustain their industry status quo, and new entrants, who seek to get into the market to share the visible prosperity, naturally puts the two sides on a collision course unless the entrants only look at occupying segments of the market that are either in the periphery (underserved areas) or the center of the spinning dish in Figure 4 (overserved areas).

If entrants and incumbents compete over access to and control of the same space, conflicts escalate (Chen, 1996), creating intense rivalry and market disequilibrium over that pierce of the

market. By referencing back to the systemic yoyo model in Figure 4, it can be seen clearly that when an entrant compete with the incumbents for one of the largest whirlpools in the spinning dish, other than escalating counter-entrant retaliations, the relatively stable inter-incumbent relationship is also impaired. The devastating warfare will eventually provide the winners a new stability and equilibrium. Along with conflicts, the bitter rivalry depresses the return on capital for all the involved players (Porter, 1980); and the existing forbearance erodes, market equilibrium deteriorate, leading to a creative destruction (Schumpeter, 1934) or maybe even a Red Queen competition (Derfus, et al., 2008). The increased competitive pressure undermines post-entry survivability (McGahan, 2006). At this junction what is also very important to note is that the appearance of new entrants that are potentially becoming as large and as powerful as the generalists of the market is generally warranted by the characteristics of the market (Forrest, et al., 2017). So, the consequent powerful struggle between the incumbents and entrants is really a visible reflection of the changing characteristics of the market.

If we identify the forbearance of the market as the stable movement of the systemic yoyo model in Figure 4, it can be seen naturally that when a firm attempts to enter the market, the existing forbearance would motivate the incumbents to hold back and react to the attempt proportionally to the entrant's strength. It is because the entrant's strength fundamentally foretells the incumbents what scale level of the existing whirlpools the entrant is aiming at. This observation naturally indicates that micro entrants would attract limited attention of the larger incumbents and therefore encounter minimal resistance (Markman and Waldron, 2014). Practically, it is because aggressive retaliations create uncertainty in terms of the directionality, impact, and scope of damage to the established market equilibrium; so the adjacent generalists and specialists would be reluctant to swing into reaction to entry. Instead they would rather be busy with maintaining their established market equilibrium (Baum, 2004; Gimeno and Woo, 1999; Greve, 2008).

What is just concluded, weaker and smaller entrants draw weaker and minor reactions while larger entrants elicit stronger reactions, naturally explains the reason behind the concept of proportional reprisal and leads to the following conclusion: The smaller a player is, the safer its entry will be. By employing the systemic yoyo model in Figure 4, this end is quite clear because micro entrants can only survive in the insignificant areas of the spinning dish (the market) the incumbents do not care to reach and to occupy or they do not have the capability to reach. In other words, the initial foray of micro entrants does not disrupt the established market equilibrium and does not interrupt the momentarily accepted industry logic. This conclusion is consistent with the work of (Gelman and Salop, 1983; Wang and Wen, 1998) that large incumbents tolerate very small, single-market entrants while aggressively fighting against large-scale intruders.

As noted above, when the market conditions change, which, in terms of the systemic yoyo model in Figure 4, means that the difference between the center and the periphery of the spinning dish varies, the configuration of the existing eddy pools will have to change accordingly. So, this end confirms the past research that entries are conceptualized as an adversarial, creative-destructive process that brings about market disequilibrium (Chen, 1996; Markman and Phan, 2011). It is because the appearance of new entrants stands for occurring changes in the market conditions that naturally lead to market disequilibrium from which a new equilibrium will be developed if the new set of market conditions stays invariant for at least a while. Now, if new entrants are disproportionately smaller than incumbents, although the established firms acknowledge the arrival of micro entrants, the powerful forbearing ties of the incumbents constrain their individual reactions, because any unilateral counter-entrant retaliation might very

well throw the respective incumbent into a disadvantageous situation in its competition with other incumbents. Such an unilateral action would very likely increase market perturbation and cost of business at least for the individual incumbent that retaliated against new micro entrants. At the same time, comparing with micro entrants, the incumbents should be the main focus of maintaining the forbearing ties of any of the incumbents. To this end, if the incumbents want to eliminate the potential of entry by anybody, Theorem 1 indicates that they should compete with each other to dry up the consumer surplus $\beta = 1 - \alpha$. In this sense, the appearance of micro entrants stands for a creative-constructive process (Markman and Waldron, 2014) that unearths how acute size asymmetry leads different forbearing relations and entrant–incumbent dynamics.

In the previous discussions based on the systemic yoyo model in Figure 4, all incumbents, large or small, share characteristics that are similar within their respective category groups and react to situations collectively as groups due to the fact that all boundary conditions for the incumbents in a category group are assumed to be symmetric. However, in real life, no two companies share identical constraints and resources. So, in reality incumbents would react to any given situation differently. For instance, when an entrant has a similar profile with the incumbents in a category group, the stronger players would react first, as suggested by the extant literature (Chen, 1996). It is because these players, as represented by relatively larger pools in the category group (when the boundary conditions are symmetric, these pools are exactly the same magnitude), could afford to spare some of their energies and resources to deal with the new comer while still maintaining their competitive advantage over other peers within the category group. However, when looking at micro entrants and large incumbents, this systemic yoyo model suggests that the strongest and swiftest reaction should come from weaker incumbents or incumbents represented by smaller eddy fields in Figure 4 (Markman and Waldron, 2014). It is because micro entrants only enter the market at places without much coverage by the large incumbents. So, the incumbents represented by smaller eddy fields face the greatest head-on competition and a potential threat of displacement. Therefore, they are compelled to react first (Schumpeter, 1934), while market leaders follow a wait-and-see policy (Fuentelsaz and Gómez, 2006; Más-Ruiz, et al., 2005).

DISCUSSION

This new theoretical formulation based on the systemic yoyo model in Figure 4 can be very practically employed in the research of market entry and market partition, as how resource partitioning theory and/or mutual forbearance theory has been used in the past.

First of all, the resource partitioning theory holds that market is partitioned into generalists and specialists, while this new theory points out the fact that in any given market other than generalists, which are represented by the largest whirlpools in the spinning dish in Figure 4, there are also firms of different scales. And all the heterogeneous firms from different scale groups compete with each other in different ways, at varying times and places, over diverse reasons. Our established results indicate that as long as there is a profitable opportunity there might be entrants of the scale corresponding to the magnitude of opportunity (Theorem 1). That explains why startups, as micro entrants, represent a distinct strategic group different from any of the established incumbents, and can operate with some impunity within the markets of larger incumbents (Carmeli and Markman, 2011), as indicated by small eddy pools in Figure 4.

Secondly, other than firms' vital signs, such as founding, human resources, mortality rates, etc., and market division, resource partitioning theory has concentrated on how the totality of firms diverge (Swaminathan, 2001). To this end, our new theory shows that other than the observed

divergence of firms, as represented by the difference in spinning directions of the eddy fields of firms, there are also convergences in places the eddy fields of firms spin in the same direction. In other words, firms of smaller scales can only successfully enter the market and survive profitably within such areas that their spin directions do not go against those of the more powerful neighboring firms' eddy fields. That is, new entrants have to converge with the established incumbents within their market segments in order to enter successfully and survive profitably. This end sheds new light on the dynamics between groups of firms of different scales.

Although it was suggested by (Markman and Waldron, 2014) that market's modularity and integration are respectively related to market expansion and contraction, our theory specifically points out the fact that market's modularization and integration are consequences of the latter and can be practically employed as indicators of the latter for purposes of decision making regarding new entries. For example, if the ecosystem of the market is in a stage of modularization, then the market is currently expanding and micro entries would most likely be encouraged by the generalists; on the other hand, if the market is in a stage of contraction, then the incumbent generalists would focus on consolidating its territory by integrating as many segments of the market as possible so that new entries are discouraged.

Our new theory calls attention to market share stability (as a sign of the maturity of the market) and high return on capital, two hallmarks of mutual forbearance theory. These market characteristics motivate incumbents to tightly control their established market territories while entice new competitions to enter the market although only micro entrants would mostly likely to succeed. Because of their dissimilar contexts, different resource-capability mixes, and diverse objectives, as indicated by the sizes and locations within the spinning dish in Figure 4, firms, be large or small, be incumbents or new entrants, make use of very different competitive repertoires. For instance, although generalists are larger and stronger, antitrust laws and existing ties with adjacent incumbents limit their full competitive might against micro entrants and micro firms, while these micro entities, despite their size and scale disadvantages, operate with some impunity from their mightier opponents, because their niches cannot sustain the profitability needs of larger incumbents. In other words, micro firms only occupy market segments where larger incumbents are unable to take due to various practical reasons. However, to enter and to survive profitably, smaller firms, including micro ones, must introduce offerings that complement, extend, and solidify incumbents' positions simultaneously, as shown in Figure 5 by the fact that sub-eddies can only exist within areas where the adjacent incumbents' fields spin in opposite directions by spinning along in same directions. Therefore, our theory recognizes variations in firms' scales within the competitive dynamics, where smaller players enter into and survive within the market not to displace larger opponents but as enablers who solidify and extend latter's positions.

While making the mutual forbearance theory more general, our theory brings evolution and development into our understanding about the dynamics of market competition. For example, adherence to the concept of market equilibrium has made mutual forbearance theory static as suggested by (Baum and Korn, 1996; Fuentelsaz and Gómez, 2006). And because our theory focuses on players of multi magnitudes beyond the simple classification of incumbents and entrants, it can beautifully reveal how single-product micro entrants can penetrate a forbearing market. That in reality helps to make mutual forbearance theory more dynamic and more practically useful.

Instead of being indivisibly homogenous, our theory indicates that forbearing markets are also made up of heterogeneous segments, each of which consists of firms of similar scales. And

different areas of the market bear different boundary conditions. For example, the market core, as the areas occupied by the largest eddy leaves in Figure 4, enjoys stronger barriers, while peripheral segments and the overserved center lack strong isolating mechanisms and therefore are more vulnerable to entry. Because the assumption of homogeneity is relaxed, our theory infuses more realism and dynamism into mutual forbearance and thus expands our understanding of how smaller entrants could penetrate markets dominated by larger incumbents. This new theory also contextualizes forbearing markets as a spectrum with Red Queen markets located at one end and monopolistic cartels at the other. Although this contextualization is not new to empirical research, what is developed in this paper formally appends such empirical realization to theory. The importance of this theoretical elevation can be clearly seen in the facts that the relationship between entrants and incumbents are more dynamic than how mutual forbearance had previously described and that the relationship is more predictable than what resource partitioning theory had assumed.

SOME CONCLUDING REMARKS

By employing the systemic yoyo model as intuition and game theory as logic of reasoning, we generalized and unified two existing theories on market dynamics, resource partitioning and mutual forbearance, by emphasizing the fact that in a marketplace, firms are of difference magnitudes although the generalists are the largest and most powerful players. And it is demonstrated that this general theory is able to articulate how, when, and where small entrants could penetrate a market that is dominated by large and powerful incumbents without causing additional market rivalry. Through analyzing expansion and contraction of the market, this new theory implies that such dynamics of the market evolution can be practically measured by using generalists' ongoing integration and/or modularization, while new entrants have to complement the offerings of the incumbents in order to survive profitably. It is shown by the discussions above that this conceptual work enhances the applicability of both resource partitioning and mutual forbearance theories while provides additional flexibility and dynamism for practical applications.

There is a lot to be desired in terms of possible future works. Let us look at this end from two angles: connect what is established in this paper with practice and further develop the theory along the lines considered in this paper.

From the first angle, one could study: How and why specifically has the rate of entrepreneurial failure been high? Does the failure rate fluctuate with the integration and modularization of the market constellation? What particular methods can be developed to measure market integration and modularization? Studies, addressing these and related questions, would potentially provide practical guidelines for entrepreneurs.

And from the second angle, one could explore inter-entrant competitions and alliances. Other than competing with the incumbents, entrants could also be fighting against each other for the opportunity of taking the same market space or associate with each other to strengthen their joint foray into the market against all odds. Another meaningful topic will be the study of potential alliances between entrants and incumbents through various means, such as joint ventures, direct investments, minority equity holdings, etc., as an offense strategy for the entrants to penetrate the market, and as a defense strategy for the incumbents to compete against other incumbents and unexpected competitions. And by combining what is established in this paper with (Lavie, et al., 2007), one could also investigate entrant–incumbent relations in multi-partner alliances.

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