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Coopetition and Firm Survival in a Cluster: Insights from the Population Ecology on the Yacht Industry in an Emerging Economy, 1957–2010

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ABSTRACT Firms that are located in a cluster may confront cooperation and competition at the same time. The advantage of cooperation and the disadvantage of competition on a firm may need to examine the firm survival in a cluster as the cluster evolves. Employing the population ecology viewpoint, this study tries to address coopetition issues in a cluster to examine the impact of coopetition on firm survival rate. Analyzing yacht industry data in Taiwan from 1957–2010, this study indicates that the founding rate of yacht firms will be positively related with the cluster size. Additionally, during the competition period, those firms located inside the cluster may have a higher dissolution rate than those firms outside the cluster, indicating the disadvantage of competition on the firm. Finally, this study finds that those firms located inside the cluster will be more likely to become larger and have capabilities to survive. The results in this study provide insights on addressing coopetition issues in a cluster.

KEYWORDS cluster, coopetition, population ecology, yacht industry

INTRODUCTION

The phenomenon that firms in the same industry tend to locate in the same geographical area has been a significant issue since Alfred Marshall (1920). This interest was further strengthened by the increasingly important role played by clusters in the global economy. Although knowledge about the causes of clusters has been significantly advanced, researchers have yet to agree about the impact of industrial clusters on individual firms. While many theorists insist that these impacts are largely positive (e.g., Porter, 1990, 2000), many empirical studies find a more complicated picture (Bell, Tracey, & Heide, 2009; Kukalis, 2010; Sorenson & Audia, 2000). How to account for this issue posts an important challenge to studies of industrial clusters.

The aim of this study is to fill this research gap in two ways. First, at the theoretical level, we introduce the concept of 'coopetition', namely the coexistence of

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cooperation and competition among organizations (Bengtsson & Kock, 2000, 2014; Czakon, Fernandez, & Minà, 2014), to account for the complicated and sometimes paradoxical relationship between a cluster and individual firms. Coopetition involves value creation and value appropriation (Brandenburger & Nalebuff, 1996). The tension between cooperation and competition mainly comes from when and in what stage firms cooperate on value creation or firms compete on value appropriation (Gnyawali, He, & Madhavan, 2008; Tidström, 2014). In the case of clusters, networks and spillovers among firms in the same cluster facilitate cooperation and knowledge sharing (e.g., Arikan, 2009; Krugman, 1991; Maskell, 2001). However, the geographical concentration may also bring stronger competition among firms due to the reduction of search cost for customers and the difficulty of monopolizing important information and technology (Hendry & Brown, 2006; Kukalis, 2010; Shaver & Flyer, 2000). How firms compete or cooperate with each other in a cluster may demonstrate an evolutionary scenario (Kukalis, 2010; Pouder & St. John, 1996), and thus the locus of coopetition among firms may present dynamic nature (Gnyawali et al., 2008) and accordingly impacts firm performance (Czakon et al., 2014).

Second, at the empirical level, we follow the research program of organizational ecology and focus on the long-term evolution caused by the emergence and dissolution of organizations. In addressing the coopetition issues in clusters, scholars need to deal with how the firm's coopetition strategy may evolve over time accompanied by the cluster development process (Czakon et al., 2014; Gnyawali et al., 2008). The typical case studies provide detailed evolution of coopetition strategy inside a firm but hardly provide the overall picture in an industry (Gnyawali et al., 2008). In this study, we employ the viewpoint of population ecology (Carroll & Hannan, 2000; Hannan & Freeman, 1989) to examine the dynamics of yacht manufacturing firms in Taiwan from 1957–2010. We argue that the population ecology perspective provides a good lens to investigate how and why industry clusters are performance enhancing for firms by differentiating the mechanisms of the birth and dissolution of firms in industrial development. Following this line of logic, employing the population ecology perspective is helpful to untangle the value creation and value appropriation created from coopetition among firms in a cluster. The yacht manufacturing industry data in Taiwan, which is characterized by geographical agglomeration and the evolution cycle of an organizational population, namely legitimation, competition, and revival (Hannan, Carroll, Dundon, & Torres, 1995; Hannan & Freeman, 1989), affords a good example to advance the understanding of coopetition among firms in a cluster.

This study contributes to the literature in three ways. First, it addresses the dynamic dimension of cluster formation and evolution (Carroll & Hannan, 2000; Pouder & St. John, 1996). By focusing on the emergence and survival of firms rather than static correlation of profitability and firms' attribute, this study argues that the impact of coopetition strategy is not only a game model for a

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firm (Brandenburger, & Nalebuff, 1996; Padula & Dagnino, 2007) or illustrates the firm's linkages or positions in a network (e.g., Gnyawali, He, & Madhavan, 2006; Gnyawali & Madhavan, 2001; Tsai, 2002); instead, it is possibly an outcome of a process that co-evolves with the stage of industrial life cycle. Focusing on the emergence, survival, and dissolution of firms can demonstrate the co-evolution of industrial cycles and the impact of cluster on the firm. Second, this study contributes to the debate on coopetition (Brandenburger, & Nalebuff, 1996; Gnyawali et al., 2008). While the literature of coopetition is concentrated on the static tradeoff between value creation and value appropriation in value chains (Bengtsson & Kock, 1999, 2000; Brandenburger & Nalebuff, 1996; Gnyawali et al., 2008), this study introduces a dynamic model focusing on evolutionary logic (Czakon et al., 2014). Third, by examining the evolution of a cluster in the yacht manufacturing industry in Taiwan, this study provides important information of the cluster evolution in emerging economies that allows further comparison with Western economies, which is crucial for understanding the dynamics of the contemporary global economy (Hoskisson, Eden, Lau, & Wright, 2000; Hoskisson, Wright, Filatotchev, & Peng, 2013; Sonobe & Otsuka, 2006). Firms from emerging and the mid-ranged economies play increasingly salient roles in global markets over the last several decades (Hoskisson et al., 2000, 2013; Ramamurti & Singh, 2009) and their competitive advantages usually come from either participating in the global value chain (Mathews, 2002, 2006) or good market positions in domestic markets (Hoskisson et al., 2000, 2013). The cluster is a crucial phenomenon in in both occasions (Sonobe & Otsuka, 2006). Therefore, the studies on clusters can provide a better understanding on global economy.

THEORETICAL DEVELOPMENT AND HYPOTHESES

Coopetition and Cluster

The first theory addressing the causes of industrial clusters can be traced to Alfred Marshall (1920). He observed the phenomenon of industrial clusters and indicated three major causes – lower transportation cost among buyers and suppliers, bigger pools of labor, and intellectual spillover. Since the mid-1970s, the rise of several important clusters inspired another wave of studies on clusters. While the inquiry about clusters never ceased, not until the 1980s when several successful clusters played salient roles in the global economy did the theory of clusters made substantial progress. Sable and Piore (1984) argued that the textile industry in northern Italy shows that the movement of flexible specialization embedded with clusters of small and medium enterprises has replaced the paradigm of mass production carried out by large firms. The most influential theory about clusters may be Michael Porter's (1990, 2000) argument that attributes competitive advantages of firms and nations to clusters. He identifies three mechanisms through which a cluster may enhance a firm's competitiveness. First, a cluster can increase the

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productivity of a firm; second, it can encourage firms' innovation; and third, it can stimulate new companies.

Kuah (2002) summarizes later studies and shows that many of the theories on clusters, including externalities (Romer 1990), positive feedback (Swann, Prevezer, & Stout, 1998) and so on, are built on Marshall's and Porter's theories about the benefits brought by clusters to individual firms. Despite the substantial theoretical progress, empirical studies have yet shown consistent results. While much of the literature assumes that the impact of a cluster on individual firms is all positive (e.g., Arikan, 2009; Figueiredo, Jr., Meyer-Doyle, & Rawley, 2013; Porter 1990; Tallman, Jenkins, Henry, & Pinch, 2004), many studies show some negative or at least inconclusive results (Bell et al., 2009; Sorenson & Audia, 2000). For example, Kukalis (2010) shows that firms locating in a cluster perform worse than those outside the cluster in the late stage of the industrial life cycle. Saxenien's (1994) classical analysis also shows that while the innovative culture characterizing Silicon Valley creates entrepreneurship and prosperity, the resulting fierce competition also leads to higher failure rates for extant firms. In other words, unlike the assumptions shared by many studies suggest, growth of a cluster may not necessarily result in higher survival rates for firms. How to account for these contradictory impacts remains a challenge for studies of industrial clusters.

In this study we argue that the recent literature of 'coopetition', namely the coexistence of competition and cooperation, may provide new insights that can be helpful for accounting for the contradictory effects of a cluster on individual firms (Bengtsson & Kock, 2000, 2014; Czakon et al., 2014). As Oliver (2004) shows, inter-firm relationship in knowledge intensive industries such as the biotech industry are often composed of collaboration and competition. Gnyawali et al. (2006) also show the deep impact of simultaneous cooperation and competition on a firm's competitive behavior. Padula and Dagnino (2007) put competition and cooperation into the context of networks and see cooperation as positive interdependence, and competition as negative interdependence.

Surprisingly, despite the fruitful studies on coopetition, few try to bring it into the studies on industrial clusters. We argue that integrating the concept of coopetition can highlight the contradictory effects of an industrial cluster on individual firms. On the one hand, the network externality and spillover effects among firms in the same cluster facilitate cooperation and knowledge sharing (e.g., Arikan, 2009; Krugman, 1991; Maskell, 2001). On the other hand, the geographical concentration may also bring stronger competition among firms due to the reduction of search costs for customers and the difficulty of monopolizing important information and resources (Hendry & Brown, 2006; Kukalis, 2010; Shaver & Flyer, 2000). The concept of coopetition, especially the value creation and value appropriation concept caused by coopetition (Brandenburger, & Nalebuff, 1996; Gnyawali et al., 2008) will bring new insights to the studies of clusters.

For individual firms, the tension between cooperation and competition is highly contingent on the tradeoff between collective value creation and struggles

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on value appropriation (Gnyawali et al., 2008; Tidström, 2014). While the current literature mainly addresses the motives, processes, or consequences of coopetition strategy at different levels (e.g., Bengtsson & Kock, 2014; Czakon et al., 2014; Dagnino, Di Guardo, & Padula, 2012; Park, Srivastava, & Gnyawali, 2014) or highlight the inherent paradoxical nature caused from the coopetition strategy (e.g., Chen, 2008; Raza-Ullah, Bengtsson, & Kock, 2014; Smith & Lewis, 2011), evolution of coopetition strategies is rarely addressed (for an exception, see Ritala & Tidström, 2014). We argue that putting this tension into the evolution of clusters and industries can bring new insights to both the coopetition and cluster literatures (Czakon et al., 2014; Gnyawali et al., 2008).

In order to untangle the effects of value creation and value appropriation on firms in a cluster, we employ the viewpoint of population ecology to examine the creation, survival, and dissolution of firms in an industry (Carroll & Hannan, 2000; Hannan & Freeman, 1989). Organizational ecology is summarized as follows. First, the evolution of an organizational population is driven by selection, not collective adaptation to the environment. In other words, the most important mechanisms shaping a population is the vital events, namely the birth, death, and survival of organizations. Second, organizational density, which is measured by the number of existing firms, is a crucial factor shaping the birth and death of organizations. In terms of density, there are at least two stages of organizational evolution: legitimation and competition (Carroll & Hannan, 2000; Hannan & Freeman, 1989). In the stage of legitimation, the newly formed population begins to gain 'cognitive legitimacy' by which the specific form of organizations is accepted by more organizations and decision-makers in the industry. In this stage, the birth rate of organizations is higher than their death rate. In the stage of competition, the space for new organizations is statured and the density decreases. However, the overall size of the population may not decrease as well (Barron, 1999). In addition to these two basic stages, Ruef (2000) suggested that many organizational populations experience the third stage – resurgent. In this stage, firms that pass a threshold can gain the capability on innovation as well as on getting competitive advantage. In addition to the two basic propositions, organizational ecology also indicates that age and size of an organization may have significant impact on its chance of survival. However, these propositions are much less conclusive (for a more comprehensive review on organizational ecology, please see Baum, 1996; Carroll & Hannan, 2000; Hannan & Freeman, 1989).

While the ecology literature largely overlooks the impact of spatial concentration, some studies find that geographic location is crucial for firms' founding, survival, and death. Wenting and Frenken (2011) find that geographic concentration in the global ready-to-wear fashion design industry is caused by higher entry rates in these areas. Folta, Cooper, and Baik (2006) also find that although the spillover effect may benefit firms in the whole region, it also brings fiercer competition that raises the death rates of firms. In other words, evidences from the ecology literature provide important clues about the tension between cooperation and competition brought

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by a cluster (Kukalis, 2010; Pouder & St. John, 1996). In what follows, we demonstrate our strategy by the data of the yacht manufacturing industry data in Taiwan.

Rationale on Hypotheses

In this study, we focus on three paths through which a cluster evolves and impacts firms: founding of new firms, survival of existing firms, and firm size in the resurgence stage. One of the most important insights of organizational ecology is the need for long-term data for determining the causal mechanisms in the study. Because cross-sectional data can only show existing firms at the time of survey, they inevitably have the problem of selection bias and cannot help to solve the problem raised in this study. For example, if a cluster can reduce the death rates of firms located inside it, utilizing panel data can show the different survival rate between firms located inside and outside the cluster and thus untangle the coopetition impact over time.

Firms' founding rate and their locations in the early stage of cluster. Based on the above discussion, we establish the following hypotheses. The first hypothesis is about firms' founding rate and their locations in the early stage of cluster. Following this argument, this study argues that firms located inside a cluster can easily find the resources and cognitive legitimation in the early stage of cluster (Stuart & Sorenson, 2003). New firms can easily find partners or cooperators on value chain activities in agglomerated areas even though they also will confront the possible challenges from other firms (Folta et al., 2006; Galaskiewicz, Bielefeld, & Dowell, 2006). For example, the successful cluster of biotechnological industries results from the networks among large, extant firms and small, new firms (Whittington, Owen-Smith, & Powell, 2009). Galaskiewicz et al. (2006) also find that firms' inter-organizational ties within a cluster enhance organizational growth. When a new firm is established in a cluster, it can gain the cognitive legitimation as well as the financial or technological resources from other firms (Ruan & Zhang, 2009). In other words, industrial clusters may not directly benefit individual firms but rather create the coevolution process for firms and their embedded environment at the aggregate level (Audia, Freeman, & Reynolds, 2006; Galaskiewicz et al., 2006; McCann & Folta, 2008). In other words, locating in a cluster can also create value among firms during the cooperation and legitimacy creation stage (Ritala & Tidström, 2014), and has positive effects on the founding rates of firms located inside the cluster. Therefore, we posit the following hypothesis:

> *Hypothesis 1: The founding rate of new firms will more likely be higher inside the cluster. This effect will be positively associated with the size of a cluster.*

Survival rate of firms in a cluster during the competition stage. The second hypothesis is about the survival rate of firms in a cluster during the competition stage. When firms that

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choose to locate in a nearby industrial area increase, they inevitably have overlapping products and have to compete for customers with each other (Baum & Mezias, 1992; Wenting & Frenken, 2011). We argue that in this stage a cluster has dual effects on firms: they share common resources but also face more fierce competition in the stage of competition (Bigelow, Carroll, Seidel, & Tsai, 1997). In this situation, cooperation and competition happen at the same time at the industrial level (Gnyawali et al., 2008; Raza-Ullah et al., 2014). Even though each firm in the cluster may have a fiercer struggle for resources and competition (Shaver & Flyer, 2000), and search for the value appropriation for itself (Bengtsson & Kock, 1999), this focal firm still cooperates with others during the competition stage and obtains resources and information on innovation (Park et al., 2014; Tallman et al., 2004; Whittington et al., 2009). In the case of yacht manufacturers in the cluster, they usually outsource the wood making activity in the yacht manufacturing chain to those independent wood workers and those wood workers will share the knowledge and skill among each other and implement it among different yacht manufacturers (Cheng, 2011; Cheng & Chung, 2012). Thereby, even though the yacht manufacturers compete on customer orders, they share the knowledge and resources with each other in the manufacturing process. At the ecology level, for those survived firms, it is hardly to justify the value creation and value appropriation effect accordingly. As a result, we suggest that in the competition stage, locating in a cluster have no overall effect on firm survival because a cluster may bring two opposite impacts on firm survival rate (Kukalis, 2010; St. John & Pouder, 2006). Based on the fact that cluster advantages and disadvantages coexist, we argue that the coexistence of these two effects will cause the cluster impact to be irrelevant on firm surviving rate in the competition stage (Lomi, 1995; Wenting & Frenken, 2011).

Hypothesis 2: After a population enters the stage of competition in which the overall death rate will be higher than the birth rate of organizations, whether locating in a cluster has no impact on survival rate.

Firm's upgrading strategy after survival. After the competition stage, some firms survive while others fail and exit the market. Population ecology researches argue that organizational size is positively associated with survival rate (Baum, 1996; Baum & Mezias, 1992; Bigelow et al., 1997). Organizational size is closely related to firms' slack resources as well as on the base to compete (Bigelow et al., 1997). Larger firms usually have a better chance to find a cooperator as well as to compete. They have a stronger ability of innovation than the smaller ones in a cluster do (Carroll & Hannan, 2000; Cooper & Folta, 2000). Thus, if a firm can survive through the stage of competition, it can gain strong legitimacy and attract more resources to grow (Audia et al., 2006; Galaskiewicz et al., 2006). We argue that in the yacht industry, if the manufacturer's size grows over a threshold, it is an important indicator that this firm has the capability of making

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a mega-yacht (Cheng, 2011; Cheng & Chung, 2012). Since making a mega-yacht will take more time than a typical smaller yacht, a firm's size that is over a threshold is a critical indicator for the customers that this firm has the ability and resources to make the mega-yacht (Taiwan Yacht Industry Association, 2007). Therefore, for those firms that their size is over the size threshold in a cluster, those firms can gain more opportunities on upgrading, and get bigger and more competitive. Thus, we get hypothesis 3:

Hypothesis 3: For those surviving firms, locating in a cluster will help them to expand their size.

METHODS

Data and History

In this study we use panel data of the yacht industry in Taiwan. Taiwan is one of the world's 25 largest economies despite having a population of less than 25 million (IMD, 2006). The island also has well-established legal traditions that help to ensure that the public data reported by business groups is reliable (IMD, 2006). Taiwan is representative of a number of other newly industrialized economies with a history of newly international firms such as South Korea, Hong Kong, and Singapore (Lasserre & Schütte, 2006), and Taiwan is also recognized as a kind of mid-ranged emerging economy (Hoskission et al., 2013).

Although the value of the yacht manufacturing industry in Taiwan is relatively small in terms of market value (between 150 to 300 million USD), its characteristics make it a strategic site to answer the research question. First, it has already experienced all of the three stages of evolution of an organizational population, namely legitimation, competition, and resurgence. In other words, the data allow us to fully examine the organizational dynamics at different stages of population development (Cheng, 2011). Second, we are fortunately able to collect the complete data of the basic information of every firm in this industry since the beginning of this industry. The completeness of data allows us to overcome the major challenge for empirical studies of organizational ecology. Third, the yacht industry in Taiwan has experienced the process of shifting geographic location and obviously forms a cluster over time. Although yacht manufacturers originated from Taipei in the 1960s, after the 1990s yacht manufacturers were overwhelmingly concentrated in Kaohsiung, which is the second largest city in Taiwan and is a cluster of the yacht industry (Hsu, 2001; Taiwan Yacht Industry Association, 2007). This process of location shifting provides an important opportunity to examine the interaction between geographic location and organizational demography (Carroll & Hannan, 2000; Kukalis, 2010). Finally, Taiwan has almost no domestic yacht market and Taiwanese yacht manufacturers are overwhelmingly export oriented until now (Cheng & Chung, 2012; Taiwan Yacht Industry Association, 2007). The impact of the domestic market can be fully

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controlled and the disparate performance among firms can be fully attributed to the factor of production sites.

The first Taiwanese yacht maker was the Tachiao corporation, established in 1957 in Taipei. Originally, it provided small boats for US military officers for their entertainment and later exported to the US market. In the early period, yacht makers were overwhelmingly surrounding the Tamsui River, which is the major river of northern Taiwan. In the 1970s, the family who owned Tachiao Corporation and their business partners in Southern Taiwan built several new firms, including Tayana corporation and Tashin corporation (Taiwan Yacht Industry Association, 2007). The founding of these two firms opened the yacht manufacturing industry in Kaohsiung, which later became the place where yacht manufacturers concentrated. Since 1957, both the number of manufacturers and production value kept rising until 1988 when the overall production value reached 200 million USD. However, as NTD rapidly appreciated since the late 1980s, Taiwanese yacht manufacturers soon lost competitiveness and the total product value declined to 50 million USD. After 1995, yacht manufacturers in Kaohsiung gradually developed the new business model of customized production and shifted the products from small yachts to luxurious mega-yachts. These efforts of upgradation successfully raised the added value of the whole industry and generated a new period of growth until 2008 when the production value reached 340 million USD. Our early work has provided a detailed account and value-added on the characteristic of customized production in the yacht industry in Taiwan (Cheng, 2011; Cheng & Chung, 2012).

Data Source

Based on the methodology of organizational ecology (Carroll & Hannan, 2000; Hannan et al., 1995), in this study we treat yacht makers in Taiwan as a population and analyze their founding, dissolution, and growth. Our data is from the following sources. First, we use membership records the Taiwan Shipbuilding Industry Association and Taiwan Yacht Industry Association to record all yacht manufacturers since 1957, when the establishment of the first yacht manufacturer is recorded (Lu, Chung, & Tsai, 2010; Taiwan Yacht Industry Association, 2007). We further checked the registration data from the Ministry of Economic Affairs within the Taiwanese government. Because the export of yachts is highly regulated, we are confident that our data contains all yacht manufacturers that once existed in Taiwan. We use the registration date as the time point of the birth of a firm, and dissolution day declared to the government as the date of organizational death. We compare the data from the government and the two associations and also conducted some interviews among firms. Thus, we found 107 yacht manufacturers that ever existed in Taiwan.

In addition to birth and death of firms, we also use the data of '***registered capital***' from the Ministry of Economic Affairs in the Taiwanese government as

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the indicator of organizational size. Although in the literature there are better indicators, such as sales or number of employees; however, we face difficulty when obtaining this data, especially for those already disappeared. On the other hand, since firms have motives to expand registered capital when their revenue grows, we believe that it is still a proximate indicator for organizational size. The number of yacht manufacturers and their total registered capital is shown in Figures 1 and 2.

Figure 1 and Figure 2 above clearly show the trend and geographic distribution of yacht manufacturers. The number of existing firms in every year can clearly show the two stage of population evolution – legitimation based on cooperation in the early stage and the competition stage. Between 1957 and 1988 the birth rate of yacht makers is higher than the death rate and the total number continuously rose. After 1988 the number of firms began to decline, and this trend has not stopped yet. On the other hand, the total registered capitals of the whole industry also declined after 1988, which reflected the shock brought by the appreciation of NTD. However, it soon rebounded after 1996 and exceeded the previous peak in 2005. Additionally, from Figure 3, we can observe the shift of firm location from Northern to Southern Taiwan. Our data show clusters in Northern and Southern Taiwan began to have different dynamics after 1988; after 1988 the number of firms in Kaohsiung slowly rose but those in Taipei kept declining. On the other hand, the total registered capital in Kaohsiung exceeded that in Taipei since 1970, and we can find that the capital gap between manufacturers in Kaohsiung cluster and their counterpart outside this cluster was never narrowed. This process provides an important cue to analyze the relationship between the industrial cluster and a firm's survival rate.

Variables and Analysis

We follow the analytical model of population ecology, thus there will be specific dependent and independent variables based on the different hypotheses.

For the first hypothesis, we use locating outside Taipei and Kaohsiung as the baseline. Thus, the dependent variable (Y) in hypothesis 1 is the '*location of the yacht manufacturers*'. In this study, the yacht manufacturers agglomerate on the Kaohsiung location compared with the other location (Taipei). Thus, the Kaohsiung location is a cluster compared with the Taipei location. The independent variable (X) in hypothesis 1 is the '*number of yacht manufacturers in Taipei and Kaohsiung in the previous year*'. In hypothesis 1, we control the 'total registered capital of yacht manufacturers in Taipei and Kaohsiung' and the 'period effect' – this study divides the history of yacht industry into two periods: the legitimation period between 1957 and 1988, and the competition period between 1988 and 2012.

For the second and third hypothesis (H2 & H3), we are interested in examining the impact from the cluster evolution on the firm's survival rate. Thus, we choose the basic exponential model as the parameter. In hypothesis 2, the

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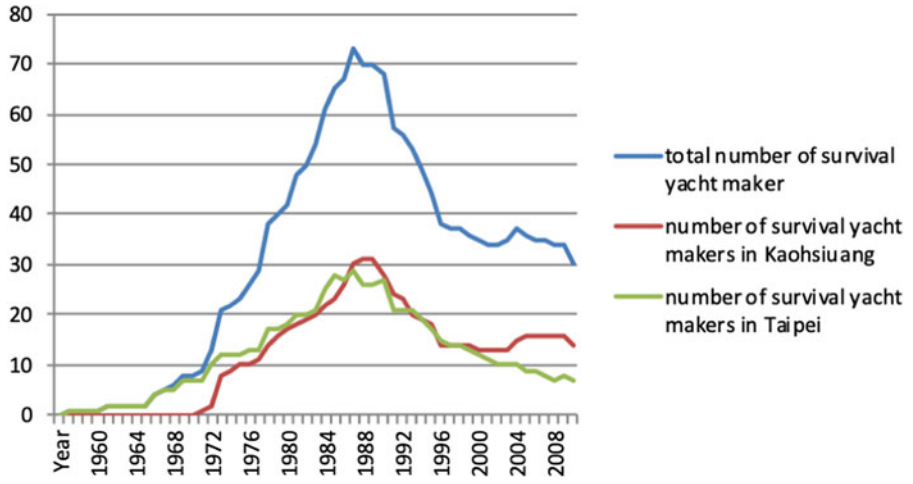

Figure 1. The survival number of yacht manufacturers inside and outside the cluster.

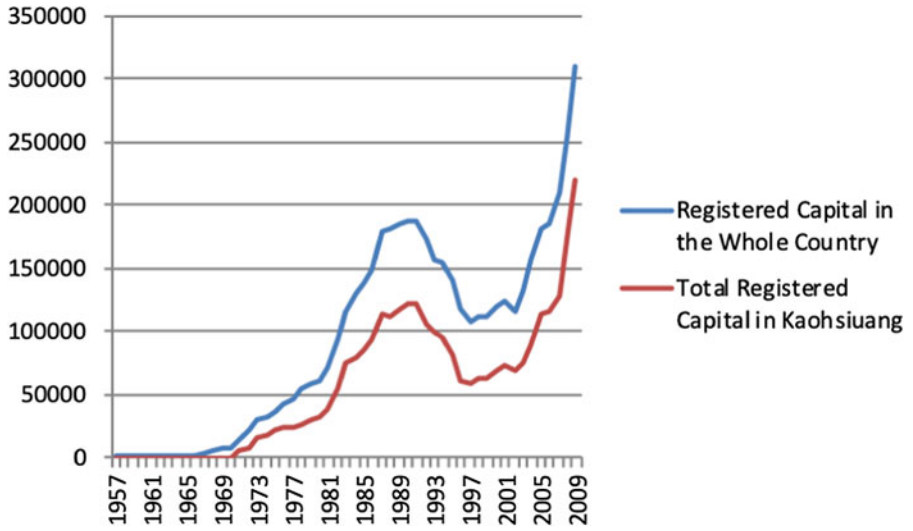

Figure 2. The asset (registered capital) change of those survival yacht manufacturers inside the cluster and the whole country over time (indicated in 10 thousand NT dollars).

dependent variable (Y) is the *'dissolution rate of yacht manufacturers'*. We use the registration date as the time point of the birth of a firm, and dissolution day declared to the government as the date of firm's death.

Furthermore, in hypothesis 3, the dependent variable (Y) is the *'yacht manufacturer's size over a threshold'* as the indicator that firm has the capability. In the yacht industry, the firm size over a threshold is an indicator that whether this firm has the capability to make mega-yacht (Cheng, 2011; Cheng & Chung, 2012). Thus, for those firms to achieve this size threshold is an important indicator that this firm is survival and has the competitive advantage. In this study, the data of *'registered*

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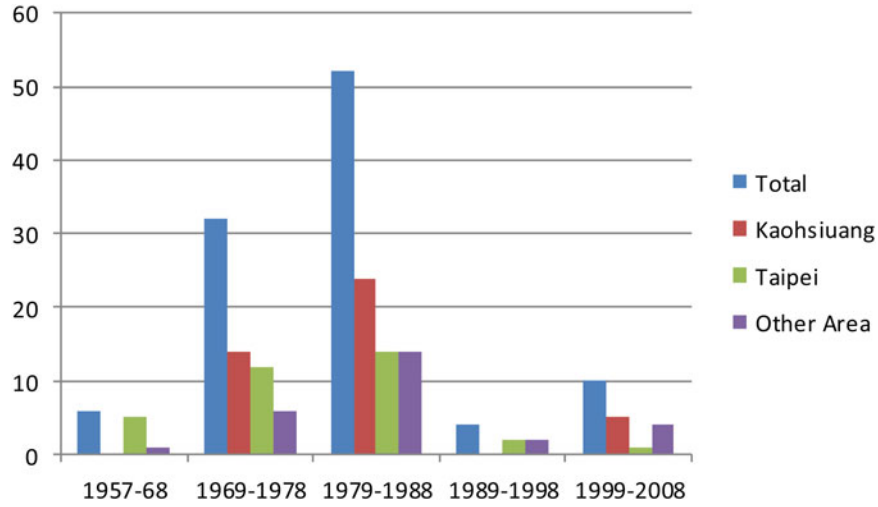

Figure 3. The founding time and number of yacht manufacturers.

capital over 26 Million N. T. dollars' from the Ministry of Economic Affairs as the threshold indicator of organizational size (Taiwan Yacht Industry Association, 2007) and the proxy of firm size over a threshold. The X is the dummy code of whether the firm locates inside a cluster (Kaohsiung) or outside the cluster (firm location (dummy variables of Taipei, Kaohsiung, outside these two locations as the baseline). The following variables are controlled in testing hypothesis 2 and hypothesis 3, including: 1) Firm age; 2) Firm size: measured by log of registered capital; 3) Period (between 1957 and 1988; between 1989 and 2012); 4) Interaction term of period and size; 5) Organizational density: measured by number of existing yacht manufacturers; 6) Square of organizational density/ 1000; and 7) log of total registered capital.

RESULTS

Table 1 shows a clear decline of founding rate of the yacht manufacturers since 1988. The results show that the overall size of manufacturers in a region is positively related to the location of new firms, and number of manufacturers has no impact or even negative impact. In other words, when total industry size in a location or a cluster is crucial for new firm's choice of location. The firm's founding rate is positively related with the cluster size and thus hypothesis 1 (H1) is supported.

In terms of the second hypothesis (H2), we follow the standard procedure to use *event history model* to examine the factors influencing the survival rate of yacht manufacturers. According to Figure 4, in terms of the distribution of birth and death of firms, an important pattern is the near separation of time between founding and dissolution. Although the first yacht maker was founded in 1957, not until 1983 did the first manufacturer dissolve.

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Table 1. Multi-nominal logistic regression on location of yacht makers (Baseline: Locating in area outside Taipei or Kaohsiung)

Dependent Variable	*Kaohsiung*	*Taipei*
Period	0.29	0.21
Number of Makers in Taipei (previous year)	0.31	−0.27
Total registered capital of yacht makers in Taipei(log; previous year)	−1.22	6.36**
Number of yacht makers in Kaohsiung (previous year)	−0.5**	−0.27
Total industry size in this location (registered capital of yacht makers in Kaohsiung)(log; previous year)	2.85**	−0.38

Notes: Observations: 107. $p < 0.10$; *$p < 0.05$; **$p < 0.01$.

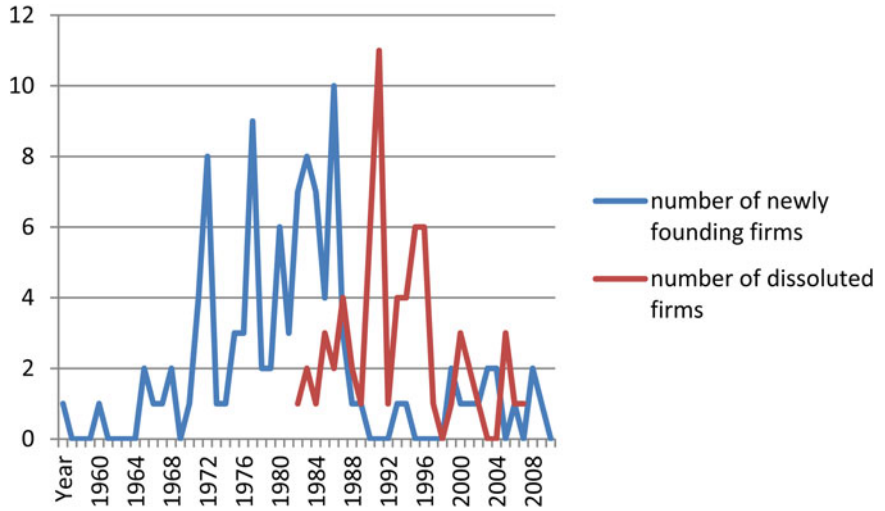

Figure 4. The founding and dearth of yacht manufacturers over time.

Furthermore, according to Table 2, the above result confirms the traditional wisdoms of organizational ecology about the impact of organizational age, density, and size on organizational survival. On the other hand, considering the transformation of the industrial environment, locating in clusters brings a higher mortality rate for yacht manufacturers. This pattern may result from the fiercer competition for resources for firms in the same cluster. It means that the disadvantages of competition may outweigh the advantages of cooperation among firms located inside the cluster in this stage. Thus, hypothesis 2 (*After a population enters the stage of competition, whether locating in a cluster has no impact on survival rate*) is not supported.

For the third hypothesis (H3), because firms' registered capital only changes after a certain period, we use the historical average 26 million N.T. dollars as a threshold and adopt event history analysis to test what kind of firms and when they will pass this threshold. The results are as follows in Table 3. In this model we find that organizational age and locating in Kaohsiung (the cluster) have a

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Table 2. Event history on the dissolution rate of yacht makers

Dependent Variable: Dissolution Rate of Yacht Makers (hazard ratio)		
Organizational Age	1.27**	1.2**
Number of Firms	1.05**	1.45**
Square of number of firms	0.98**	0.99**
Log of organizational size (by registered capital)	0.64**	0.63**
Kaohsiung location	1.24	0.52
Taipei location	0.51	0.21
After 1989		**4.69****
Taipei* after 1989		5.21
Kaohsiung* after 1989		**8.13****

Notes: N = 104; Number of obs = 1733; No. of failures = 65; Time at risk = 207780; LR chi2(9) = 408.88; Log likelihood = 108.75908; Prob > chi2 = 0.0000.

Table 3. Event history on registered capital exceeding 26 million

Dependent Variables (Y): Yacht Maker's Size over 26 Million NT Dollars (hazard ratio)		
Organizational Age	1.2**	1.2**
Number of Firms	0.89	0.90
Square of number of firms	1.00**	1.00**
Log of organizational size (by registered capital)	2.7	1.05
Kaohsiung location	2.6**	2.6*
Taipei location	0.13**	0.21
After 1989		2.85
Taipei* after 1989		0
Kaohsiung* After 1989		2

Notes: N = 103; Number of obs = 1240; No. of failures = 39; Time at risk = 205310; LR chi2(9) = 134.11; Log likelihood = −9.898251; Prob > chi2 = 0.0000.

significant effect on the chance of exceeding the threshold. In other words, not those firms located inside the cluster (Kaohsiung area in this case) can always get the bigger size. Those older firms that are located in the cluster can get bigger. It indirectly proves the cluster effect on organizational size. Thus, hypothesis 3 (*For those surviving firms locating in a cluster help them expand their sizes*) is partially supported.

DISCUSSION

In this study, we integrate the literature of cluster and coopetition and employ the perspective of organizational ecology (Carroll & Hannan, 2000; Hannan & Freeman, 1989) to analyze the impact of clusters on individual firms. The ecological perspective allows us to decompose the impact of clusters on firms into

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three possible paths: facilitating the founding of new firms, decreasing the death rate of existing firms in the competition stage, and enhancing the growth of surviving firms in the resurgence stage. By analyzing the dynamic dimension of cluster formation and evolution (Carroll & Hannan, 2000; Pouder & St. John, 1996), we argue this ecological perspective will provide insightful implications to address the coopetition issues in a cluster.

The results based in the analysis of over 30-years of data of the yacht industry in an emerging economy indicate that the impact on individual firms of locating in an industrial cluster is mainly enhancing organizational founding rather than reducing the death rate. While firms in an industrial cluster are more likely to fail due to fiercer competition, they also gain more resources and legitimacy once they can survive (Audia et al., 2006; Galaskiewicz et al., 2006). In the case of the yacht industry from this study, the shift of geographic location of yacht manufacturers from Taipei to Kaohsiung (the cluster) demonstrates this process. Although yacht manufacturers in Kaohsiung suffered from a higher chance of failure, more new firms were attracted to this cluster. The higher total size of yacht manufacturers since the 1970s kept attracting the entrance of new firms. Thus, and thereby, the yacht manufacturers who survive can obtain more resources (McCann & Folta, 2008). However, when more and more yacht manufacturers agglomerate together in cluster (the Kaohsiung area in this case), they also face fiercer competition if they cannot follow the new trend to upgrade (Cheng, 2011; Cheng & Chung, 2012). The non-supported hypothesis of H2 indicates the rigorous environment faced by firms in a cluster during the stage of competition (Folta et al., 2006). It also indicates during the competition stage, firms will search more on individual value appropriation rather than creating the common value among the firms located inside the cluster (Gnyawali et al., 2008; Ritala & Tidström, 2014).

Additionally, firms that have a longer history and locate in the cluster have a higher chance of upgrading themselves and maintaining growth (Audia et al., 2006; Galaskiewicz et al., 2006). The partial support of hypothesis 3 reveals the innovation consequence is not equal for all the firms located inside the cluster (Park et al., 2014). Older firms may have more experience to balance the cooperation and competition among firms located inside the cluster and can seize the chance to make bigger yachts and accordingly, can be bigger and therefore competitive (Baum, 1996; Carroll & Hannan, 2000). By introducing a dynamic model focusing on the evolutionary logic (Kukalis, 2010; Pouder & St. John, 1996), this study contributes to the debate on coopetition: whether and when coopetition is advantaged for firm outcomes (Brandenburger & Nalebuff, 1996; Czakon et al., 2014; Gnyawali et al., 2008).

This study also shows the pathway of development of firms in emerging economies. Yacht manufacturers in Taiwan who do not have a domestic market accumulate capabilities and find the markets globally (Cheng, 2011; Cheng & Chung, 2012). Examining whether those firms inside the cluster in the yacht industry can

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survive and accumulate assets and capabilities is critical to the firms from the emerging economics aiming towards global expansion (Hoskission, 2000, 2013; Ramamurti & Singh, 2009). Additionally, this study illustrates the importance of stages of population evolution in addressing the cluster impact issues (Kukalis, 2010). Studies overlooking the long-term evolution of organizational population may reach an incorrect conclusion if they fail to take different stages into account. Thus, it will be helpful to answer what kind of firms can survive during the temporal evolution of the cluster (McCann & Folta, 2008; Pouder & St. John, 1996).

As we emphasize in the data and history section in this study, the analysis is highly constrained by the relatively small population and only over 30 years of history in the yacht industry in Taiwan. However, under this limitation, we still can trace the dynamic pattern of the coopetition strategy among firms in a cluster. We believe the organizational ecology employed in this study provides a more novel framework than traditional firm centered studies based on cross sectional data addressing the cooperation issues in a cluster. Additionally, the unsupported hypothesis 2 on the coopetition impact on the firm survival in the competition stage reveals the limitation of this study: that we cannot observe and code exactly in what kind of activities during the value chain of the yacht manufacturing process that firms will cooperate or compete with each other (Bengtsson & Kock, 1999, 2000). This is absolutely a limitation on the ecological level. We hope more work can be done in the future to further investigate the imbalance from coopetition among firms in different industrial stages.

NOTES

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