# Key survival factors in the exhibition industry

Huiwen He [1], Zhibin Lin [2]*, Hui Li [1]

1. College of Tourism and Service Management, Nankai University, Tianjin, 300350, China

2. Durham University Business School, Durham, DH13LB, United Kingdom

* Corresponding Author: zhibin.lin@durham.ac.uk (Zhibin Lin)

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## Abstract

This study examines the key survival factors in the exhibition industry. Secondary data were collected from 656 exhibitions held in China from 1981 to 2019. The results of Kaplan-Meier analysis show that the probability of failure is significantly lower in large, first-tier cities such as Shanghai than in smaller cities. The survival probability of machinery exhibitions is significantly higher than that of automobile and motorcycle exhibitions. The results of semi-parametric regression with an extended Cox model reveal five key survival factors, namely, exhibition history, start-up size, trade association connection, relevant industry clusters, and public transportation. However, the influence of exhibition history diminishes with time. The findings provide important managerial implications for both the exhibition industry and hosting cities.



**Keywords:** Exhibition; Trade show; Survival analysis; Business failure; Networking capacity; Agglomeration.

## 1. Introduction

The exhibition industry, as part of the MICE (meetings, incentives, conventions, and exhibitions), is an important contributor to economic development, regional prosperity and global business (Hanly, 2012; He et al., 2019; Huang, 2016). A successful exhibition not only attracts business travelers (Getz, 2008; Getz & Page, 2016), but also leisure tourists (Yi et al., 2018). In China, 3793 trade fairs were held in 2018, with an increase of 56.54% from 2423 trade fairs in 2014, as reported by the China Council for the Promotion of International Trade. Unfortunately, the failure rate of exhibitions is high across the global market. While the venues and numbers of exhibitions have grown tremendously in recent years, nearly 40% of exhibitions cannot survive more than three years (Kirchgeorg, Jung, & Klante, 2010). In Spain, the number of trade shows in 2012 diminished to 50% of those held in 2009 (Albercaoliver, Rodríguezoromendía, & Parteesteban, 2015).

Previous studies examine the survival of various hospitality and tourism sectors, such as hotels (Falk & Hagsten, 2018; Gémar, Moniche, & Morales, 2016; Kaniovski, Peneder, & Smeral, 2008; Lado-Sestayo, Vivel-Búa, & Otero-González, 2016), ski lift operators (Falk, 2013), and micro-firms in tourism (Brouder & Eriksson, 2013). Gémar et al. (2016) reveal that the key survival factors include location, size, and management, as well as whether the hotel was launched at a time of economic prosperity. These factors are somewhat different from the earlier study of Kaniovski et al. (2008), which reveals that the determinants for a hotel's survival were fast market growth, the suitable location of the business, large initial size, high sunk costs, a large share of young firms, and high bed utilization rate. Falk (2013) shows that for ski operators, the important survival determining factors are the elevation of the ski areas, size, early adoption of snowmaking facilities, and local competition. In the field of exhibition research, previous studies examine the economic impact of the MICE industry (Jones & Li, 2015), the performance of convention bureaus (Aureli & Del Baldo, 2019), the attractive attributes of a hosting city (Crouch, Del Chiappa, & Perdue, 2019; Jin & Weber, 2016), convention site selection and others. However, we still know very little about the determining factors concerning the survival of exhibitions, particularly in one of the world's largest exhibition markets, China.

This study aims to narrow this gap in the literature by conducting a survival analysis of the exhibition sector in China. We first conducted a descriptive analysis based on a sample of 656 exhibitions and showed that the first three years were the peak period of exhibition death, with 37.2% of exhibitions among the sample terminating within three years. Furthermore, Kaplan-Meier analysis was conducted to compare the survival functions of different groups, and differences were uncovered among cities and industries. The results show that the exit of exhibitions is significantly lower in first-tier cities like Beijing, Shanghai and Guangzhou, and the survival probability of machinery exhibitions is significantly higher than automobile and motorcycle exhibitions. We then used an extended Cox proportional hazards model to simultaneously assess the significance of the eight explanatory variables. The results indicate five major influencing factors of exhibition survival, namely, exhibition history, start-up size, association connection, relevant industry clusters, and public transportation.

To the best of our knowledge, this is among the first studies to investigate the survival of the exhibition business. Although there is vast literature investigating firm survival, with a majority of the studies focusing on manufacturing firms, very little research attention has been paid to examine the survival of businesses such as exhibitions (Gémar et al., 2016). A firm may have several businesses or provide a variety of services, and the survival of a service business is not the same as that of the whole firm (Banbury & Mitchell, 1995). By focusing on the exhibition business, this study thus offers significant contributions to advancing the hospitality literature. The findings provide important implications for city administrators and destination marketers to create a friendly environment for business events to survive. Furthermore, knowledge of the survival factors is valuable for exhibition organizers to improve the long term success of their exhibitions.

## 2. Literature review and hypotheses

There is a large body of business literature examining firm survival. Various factors have been identified, which can be categorized from individual level to firm, industry and environmental factors (Audretsch & Mahmood, 1995). Some of these are a firm's internal factors, such as human resources (Coleman, Cotei, & Farhat, 2013; McGuirk, Lenihan, & Hart, 2015), innovation capability (Cefis & Marsili, 2006; Wagner & Cockburn, 2010), productivity (Shiferaw, 2009), and firm age and size (Dunne & Hughes, 1994) while others are external, such as competition intensity, collaboration network (Nieto & Santamaría, 2007), industry life cycle and economic growth (Box, 2008). This study focuses on factors related to exhibition organizers' internal resources and capabilities and the external factors surrounding the hosting cities' environment.

### *2.1. Internal resources and capabilities*

#### *2.1.1. Exhibition history*

The resource-based view of the firm suggests that internal resources and capabilities are critical for firm competitiveness (Barney, 2001). Lack of resources is a major cause of failure for new businesses. It has been suggested that nearly 78% of new businesses cannot survive in the first five years (Song et al., 2008). For survival and growth, a new business needs various resources. The parent company invests certain resources at the early stages but obtaining resources from external partners might be difficult because of the lack of legitimacy (Zimmerman & Zeitz, 2002). Legitimacy is a valuable but scarce resource for new businesses because they do not have sufficient reputation due to their short history.

Historical uniqueness endows the firm with resources that cannot be imitated by rivals (Barney, 2001). Exhibitions that have a long history are likely to acquire a strong reputation (Yi et al., 2018). Tafesse (2014) proposes the use of exhibition history as an indicator of the reputation of a trade show. Organizers can accumulate valuable experiences from the past, which are an important resource to achieving future success in exhibition organization (Tafesse & Korneliussen, 2012). Moreover, older exhibitions tend to be perceived as more credible than those existing only in recent years (Bathelt & Schuldt, 2008). Thus, exhibition history can be considered as a firm-specific intangible resource to some extent. We hypothesize that:

**H1a:** Exhibition history has a positive relationship with the chance of exhibition survival.

Previous empirical studies indicate a link between the age of an exhibition and survival probability; specifically, the risk of failure is the highest at the start-up stage and reduces over time (Strotmann, 2007). New exhibitions tend to encounter more risk factors such as cancellations and delays than those that are well established (Gopalakrishna, Roster, & Sridhar, 2010). However, as an exhibition matures, the incremental value of its history for survival decreases (Tafesse, 2014). Thus, we hypothesize:

**H1b.** As the survival time of an exhibition increases, the influence of history will be smaller.

### *2.1.2. Start-up size*

The size of a firm is associated with several important resources such as the number of well-trained managers, and its relationships with business partners and other stakeholders (Bruderl & Schussler, 1990). The size of the start-up has a positive effect on its survival, as revealed in earlier studies (Strotmann, 2007). It is generally agreed that small firms are vulnerable to changes in the business environment (Kim & Burnie, 2002). This is the so-called liability of smallness, which is prone to a higher risk of failure (Freeman, Carroll, & Hannan, 1983). Therefore, we hypothesize:

**H2:** The chance of exhibition survival increases when the start-up size of the exhibition is larger.

### *2.1.3. Connection with industry associations*

Networking capabilities, or the ability to create and maintain relationships with key stakeholders, is essential for a firm's competitive performance (Acquaah, 2012). We identify trade associations and governments as two major external stakeholders for exhibition survival. Exhibition organizers usually seek support from trade associations which have access to the actors within the industry cluster (Berne & García-Uceda, 2008). In addition, exhibition organizers often foster connections with government agencies to solicit their testimonials and include these groups in the official list of sponsors to further attract exhibitors and visitors (Lee & Lee, 2017). A connection with other organizations, particularly those well-established and powerful indicates to the customers and other stakeholders that the start-up has received evaluative approval (Rindova, Petkova, & Kotha, 2007). Through trade associations, start-up exhibition organizers could gain access to members within the trade association's network to recruit both exhibitors and visitors, and encourage their attendance (Tafesse, 2014). Therefore, we hypothesize:

**H3:** The chance of exhibition survival increases when there is a connection between an exhibition and the related industry associations.

Navigating through institutional constraints in emerging economies is an important capability for a firm to survive (Child & Tsai, 2005). As noted by Peng and Heath (1996), the governmental regulatory regime in China is regarded as one of the most influential factors for firms. Local governments can exert influence on the allocation of critical resources and set the tax rate or even tax exemption (Luo, 2001). He and Yang (2016) show that government support is positively related to firm survival. Similarly, Barbieri, Di Tommaso, and Bonnini (2012) show that support from the local government has helped to protect firms from the risk of failure. Government support is particularly helpful for exhibition organizers (Jin, Weber, & Bauer, 2012b). A close connection with the government helps the firm to access key resources and establish relationships with other stakeholders (Alcantara, Mitsuhashi, & Hoshino, 2006). Therefore, we hypothesize:

**H4:** The chance of exhibition survival increases when there is a connection between an exhibition and the government.

### *2.2. External environment*

Organizational ecology views firm survival as a selection process driven by environmental forces, i.e., the fit between a firm and its environment determines the chance of survival (Freeman & Hannan, 1983). For the exhibition industry, we identify the key environmental factors to include the hosting city's relevant industry clusters, hospitality capacity, public transportation, and local innovation capacity.

Location theory posits that the concentration of industry within a region creates externality and knowledge spillover, which stimulate regional growth and specialization and result in greater returns for firms (Porter, 1990; Romer, 1990). When selecting a location, exhibition organizers should consider the synergy and fit between the exhibition's themes and the local industry environment (Lee & Lee, 2017). In China, many specialized exhibitions are held at places with regional industrial clusters (Jin et al., 2012b). These industry clusters have a concentration of firms in interrelated industries (Porter, 1998), thus increasing the attractiveness of the destination to exhibitors (Jin, Weber, & Bauer, 2012a). We therefore hypothesize:

**H5**: The chance of exhibition survival increases when the relationship between the exhibition theme and the industry clusters of the host city is closer.

Quality hotel accommodation is one of the key elements evaluated by exhibitors and visitors in deciding their attendance (Whitfield et al., 2014). Hotels are an infrastructure that is critical to exhibitions, given that most exhibitors and visitors require local accommodation (Lee & Lee, 2017). The availability of a wide variety of quality hotels helps to attract exhibitors and visitors, thus contributing to the success of an exhibition (Lee & Lee, 2017). Other hospitality services such as food and beverage, catering and entertainment are also important factors to attract exhibitors and visitors. Therefore, we propose the following hypothesis:

**H6:** The chance of exhibition survival increases when hospitality capacity is greater.

Previous studies indicate that air and ground accessibility influences the performance of an exhibition (Lee & Lee, 2017). Exhibitors selecting the location of an exhibition will evaluate ground and air transportation for visitors as well as shipping materials to the exhibition (Lee & Lee, 2017). Thus, we hypothesize:

**H7:** The chance of exhibition survival increases when public transportation is better developed.

Exhibitions promote innovation and offer the opportunity for the exchange of new ideas (Hanly, 2012). The 2013 UFI survey shows that event organizers acknowledge innovation as one of the most significant factors for the industry's development (Ahmad & Daud, 2016). The development of the exhibition industry is closely linked to the innovation capacity of a city. Moreover, a well-developed local innovation industry and highly innovative products have the potential to attract greater media attention during the exhibition event, helping the organizers to gain greater publicity (Chiou, Hsieh, & Shen, 2007). Thus, we propose that:

**H8**: The chance of exhibition survival increases when local innovation capacity is greater.

## 3. Methodology

### *3.1. Analytical technique*

Survival analysis is widely applied in various disciplines (Liu, 2012) and involves a series of statistical procedures with the outcome variable being *"time until an event occurs"* (Liu, 2012). *"Time"* refers to the duration from the beginning of a follow-up until an event occurs. *"Event"* refers to the occurrence of a status change.

### *3.2. Main variables*

In this study, the "time-to-event" variable and the "status" variable are *Survt* and *Failure*. *Survt* is the survival years of an exhibition within the study period. Since our study period starts from the beginning of 2011 to the end of 2019, *Survt* has a maximum of nine years. *Failure* is a dummy variable, the value is 1 when the failure event occurs during the study period, and 0 otherwise.

For some exhibitions, failure event can be observed within the study period, the *Survt* is defined as the time elapsed between the 'entry-year' and the 'failure-year'. Therefore, the value of *Survt* is assigned by the following formula:

$$Survt = \text{failure-year} - \text{entry-year} + 1$$

However, as some exhibitions had existed before the beginning of the study period, we assign them using the following formula:

$$Survt = \text{failure-year} - 2011 + 1$$

In terms of the exhibitions that survive to the end of the study period, we assign them using the following formula:

$$Survt = 2019 - \text{entry-year(or 2011)} + 1$$

Information about ‘entry-year’ and ‘failure-year’ is collected from several sources, including the exhibition’s own website, the marketing materials about the exhibition in other websites such as Baidu (https://www.baidu.com/, the leading search engine in China), and websites that focus on reporting exhibition and meeting information such as eshow365 and China-show (http://www.china-show.net/). To judge the failure of an exhibition, the first evidence we use is the announcement issued by the organizers. Unfortunately, most of the failed organizers do not publish such an official “failure notice”. Consequently, we have to adopt an alternative way: if there is no evidence to show that the next exhibition was held or will be held, we decide that the exhibition is terminated.

**Table 1.** Major variables

| Variable | Label | Measurement | Mean | SD | Min | Max |
|---|---|---|---|---|---|---|
| Survt | | Survival years of an exhibition | 5.04 | 3.02 | 1 | 9 |
| Failure | | Dummy variable, the value is 1 when the failure event occurs during the study period, and 0 otherwise | 0.53 | - | 0 | 1 |
| **Internal factors** | | | | | | |
| Exhibition history | history | The history of an exhibition, measured in years | 7.56 | 7.61 | 0.00 | 38 |
| Start-up size | size | The launch scale of an exhibition, measured in square meters | 21613.1 | 21349.1 | 1588 | 184200 |
| Association connection | ass.connect | Dummy variable, the value is 1 if there is an industry association among the sponsor list, and 0 otherwise | 0.58 | - | 0 | 1 |
| Government connection | gov.connect | Dummy variable, the value is 1 if there is a government agency among the sponsor list, and 0 otherwise | 0.28 | - | 0 | 1 |
| **External factors** | | | | | | |
| Relevant industry clusters | cluster | Dummy variable, the value is 1 if the exhibition is related to the industrial clusters, and 0 otherwise | 0.51 | - | 0 | 1 |
| Hospitality capacity | hospitality | Measured by the total employment in the accommodation and catering sector (Unit: ten thousand people) | 8.25 | 7.92 | 0.04 | 27.44 |
| Public transportation | metro | Measured by Metro mileage per capita (Unit: kilometers) | 0.20 | 0.19 | 0.00 | 0.53 |
| Innovation capability | innovation | Measured by the number of leading universities within the host city | 5.07 | 6.20 | 0.00 | 20.00 |

Note: SD=standard deviation, Min=minimum, Max=maximum.

We use four internal variables to explain the survival of the exhibition. Following (Tafesse, 2014), we measure exhibition history by the number of years that exhibitions have been in existence before their last show. In the sample used in this study, the oldest exhibition is 38 years old, with an average age of 7.56 years. Following Gopalakrishna and Lilien (1995), we measure start-up size by the launch scale of the exhibition, i.e., the total floor space covered by the first show using square meters. If an exhibition had existed before the beginning of the study period, we use the exhibition area of 2011 as the launch area. In our sample, the maximum launch area is 184,200 square meters, and the smallest is 1,588 square meters. Association connection and government connection are two dummy variables, the value is 1 when there is an industry association or government agency among the sponsor list, and 0 otherwise. We obtained the sponsor list from the exhibition's own website or the industry web portals such as eshow365 or China-show.

We use four external variables to explain the survival of the exhibition. Relevant industry clusters refer to the relationship between the exhibition theme and the industry clusters of the host city. Its value is 1 if there is a close relationship between the exhibition theme and the major local industries. We collected information about a city's industry clusters from the National Economic and Social Development Statistical Bulletin, which is available on the website of each city's Statistics Bureau. Innovation capability is measured by the number of leading universities within the city, according to the Shanghai Ranking of Top Universities in Greater China (2011). The rationale for using the number of universities as an indicator of innovation capability is based on Anselin, Varga, and Acs (1997) who confirm the significant and positive effects of university research on innovative activity and private sector R & D. Hospitality capacity is measured by the total employment in the accommodation and catering sector in 2010. Public transportation is measured by kilometers per capita of the metro in 2010.

### *3.3. Sample*

Our work focused on the manufacturing industry. The research sample was constructed based on the data available at China's leading exhibition information web portal, eshow365 (http://www.eshow365.com/). According to this web portal, it has collected nearly 5000 exhibitions and provided comprehensive, timely and objective information for exhibitors and buyers. Eshow365 classifies the exhibitions into four groups, namely, manufactured products, raw material, consumer goods, and comprehensive exhibitions. We chose the first group, exhibitions about manufactured products, for the empirical test. This group consists of eight subgroups: machinery industry, electronics, photoelectric technology, transportation tools, automobile and motorcycle accessories, instruments and meters, heating, ventilating and air conditioning, and the logistics industry.

We initially collected 932 exhibitions from eshow365 and purified the sample in the following ways. Firstly, we censored 106 exhibitions that died before 2011. Secondly, we excluded 30 exhibitions that have been changed the host city during the observation period. Most of them are mobile exhibitions that are scheduled to show in different cities. The reason for abandoning them is that most variables in this study are location-related variables. If we keep an exhibition that has been held in two cities within the sample, we will have two values for one variable. Thirdly, we deleted 140 exhibitions that are open for more than four days. Although such an event is also named an exhibition or trade show in China, it is, in fact, more like a market for buying and selling.

After the purification, we collected a sample of 656 exhibitions. We took the year that the first exhibition was held as the entry-year. As shown in Table 1, 46.2% of the exhibitions were opened before 2010, and 39.9% of the exhibitions entered the market between 2011 and 2015. We took the year that the last exhibition was held as the failure-year. In total, 346 exhibitions were shut down and 310 were still alive until the end of the study.

**Table 2.** Sample characteristics (N = 656)

| | Characteristics | N | % |
|---|---|---|---|
| Entry-year | | | |
| | 1981-2010 | 303 | 46.2 |
| | 2011-2015 | 262 | 39.9 |
| | 2016-2019 | 91 | 13.9 |
| Failure-year | | | |
| | 2011 | 15 | 2.3 |
| | 2012 | 37 | 5.6 |
| | 2013 | 66 | 10.1 |
| | 2014 | 54 | 8.2 |
| | 2015 | 60 | 9.1 |
| | 2016 | 53 | 8.1 |
| | 2017 | 38 | 5.8 |
| | 2018 | 23 | 3.5 |
| | Total | 346 | 47.3 |
| Industry | | | |
| | Machinery | 253 | 38.57 |
| | Electronics | 79 | 12.04 |
| | Photoelectric technology | 61 | 9.30 |
| | Transportation vehicles | 24 | 3.66 |
| | Automobile and motorcycle accessories | 101 | 15.40 |
| | Instruments and meters | 28 | 4.27 |
| | Heating, ventilating and air conditioning | 43 | 6.55 |
| | Logistics | 67 | 10.21 |

## 4. Empirical results

The data analysis was run in three steps. First, we conducted Kaplan-Meier analysis to present the total survival status of exhibitions in China and compare the survival functions of different groups. Second, we ran the Cox proportional hazards model to examine the effects of the explanatory variables. Third, we demonstrated the robustness of our semi-parametric Cox model.

### *4.1. Descriptive statistics*

As Figure 1 shows, the survival function of China's exhibition presents a sharp drop at the beginning, then a slow decline and, finally, it tends to be stable. The first four years were the most dangerous period for a new-birth exhibition, over 40% of the exhibitions could not survive for more than four years. According to our statistical calculation, 11.4% of the 656 exhibitions in our sample disappeared from the market after their first show, 15.8% went bankrupt after their second show, another 16.2% shut down operation after their third show, and 13.1% failed after their fourth show. From the fifth year, the survival function curve began to flatten, indicating that the proportion of exhibitions fading out of the market was smaller and tended to be stable.

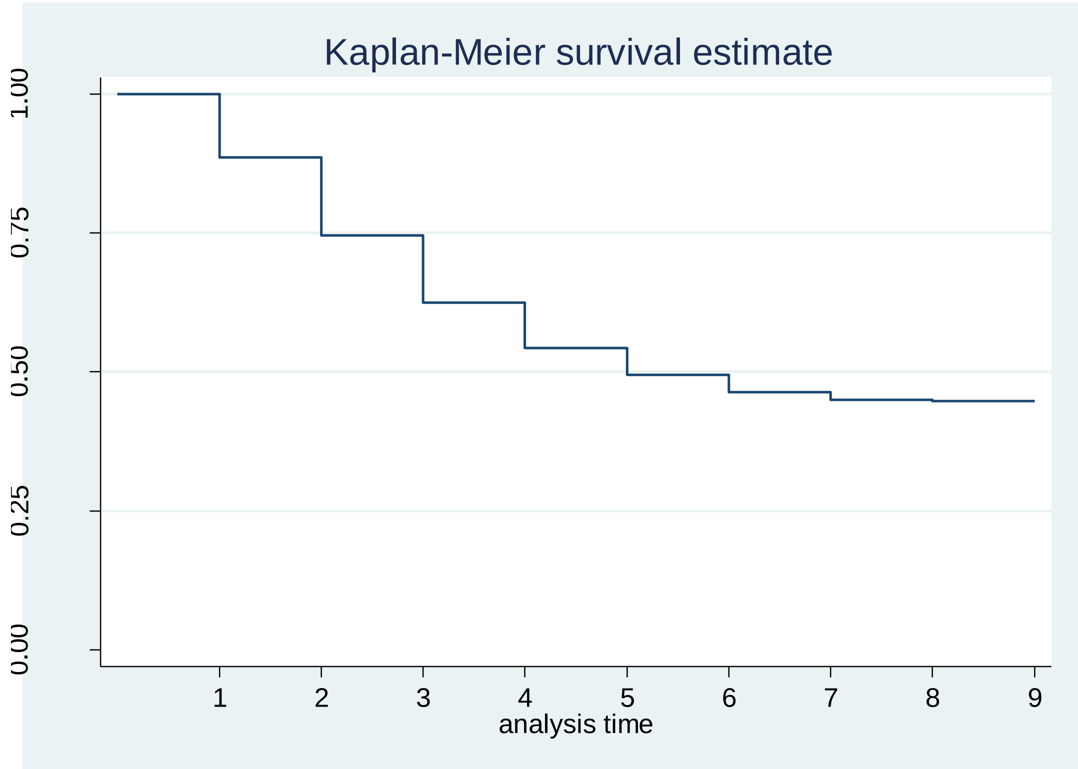


**Figure 1.** Survival function of exhibitions in China

### 4.1.1. *Difference between large and small cities*

Large and small cities have different advantages in attracting exhibitions. Large cities have good venue facilities, convenient transportation links, a wide range of quality accommodation, and a high level of industry diversity; thus, they tend to be suitable destinations for hosting exhibitions (Cuadrado-Roura & Rubalcaba-Bermejo, 1998). However, small cities also have advantages, for example, cheaper costs, friendly local residents and staff, unique local culture and food, the opportunity for shopping, and central location (Nelson & Rys, 2000).

The three cities of Shanghai, Beijing, and Guangzhou were classified as first-tier exhibition cities in China (Xin, Thomas, & Karin, 2010). A test of equality of survival functions suggests that there is a significant difference (Log-rank: $\chi^2$ =5.666; $p$=0.017) between first-tier cities and others. Kaplan-Meier curves are shown in Figure 2, the curve for the first-tier city is consistently higher than that of the other cities; this suggests that the exhibitions held in large cities have better survival possibility than those held in smaller cities.

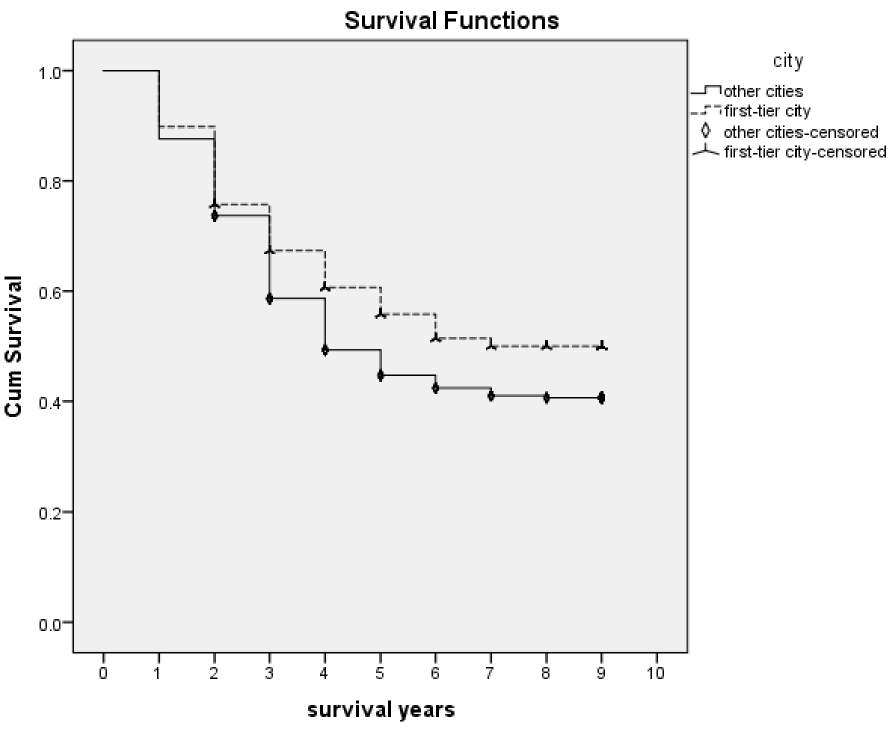


**Figure 2.** Difference between first-tier and other cities

### 4.1.2. *Difference between industries*

The development of an industry's exhibitions is associated with that of the industry, and an industry's major exhibitions are often seen as an economic barometer of the industry (Jin et al., 2012b). To examine the differences between industries, we compared the survival functions between the machinery industry and the automobile and motorcycle industry. The results suggest there is a significant difference between the two industries (Log-rank: $\chi^2$ =4.998; $p$=0.02). Figure 3 shows the Kaplan-Meier curves. The curve for the machinery industry is consistently higher than that of the automobile and motorcycle industry, indicating that machinery exhibitions have better survival possibilities than automobile and motorcycle exhibitions.

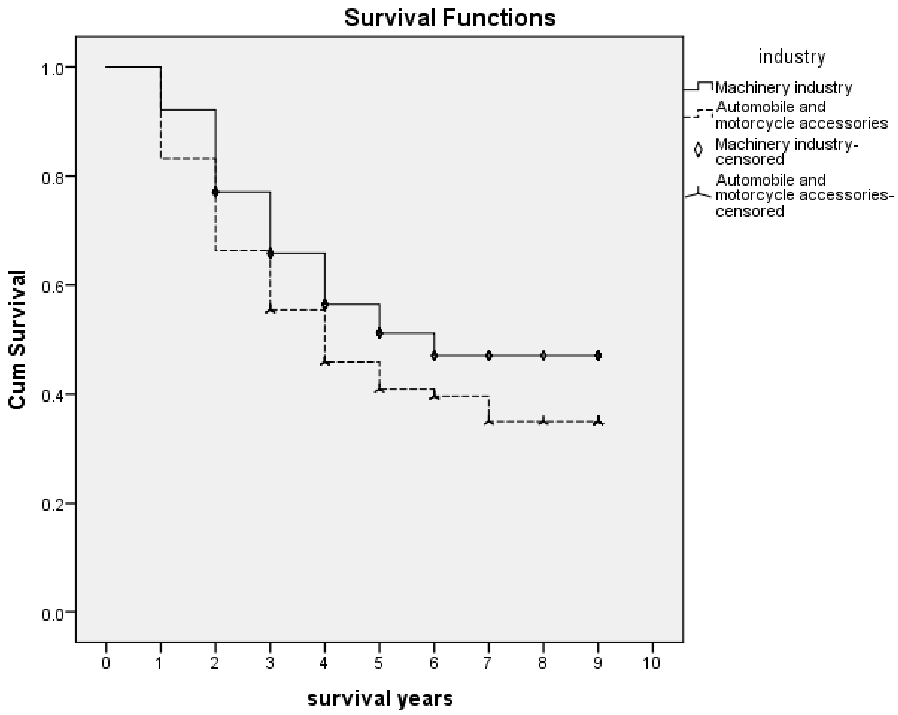


**Figure 3.** Difference between industries

### *4.2. Cox regression model*

We assessed the Cox model's assumption of proportional-hazards (PH) using the stphtest command of Stata. The results (see Table 3) suggest that the assumption is not violated for all but one variable, exhibition history, which has a p-value smaller than 0.001.

**Table 3.** Test of proportional-hazards assumption

| | rho | $\chi^2$ | df | p-value |
|---|---|---|---|---|
| history | 0.20621 | 32.25 | 1 | 0.000*** |
| size | -0.09512 | 2.80 | 1 | 0.095 |
| ass.connect | -0.01493 | 0.08 | 1 | 0.772 |
| gov.connect | 0.00690 | 0.02 | 1 | 0.894 |
| cluster | -0.07680 | 2.17 | 1 | 0.141 |
| hospitality | -0.02126 | 0.16 | 1 | 0.687 |
| metro | -0.02638 | 0.27 | 1 | 0.604 |
| innovation | 0.01165 | 0.05 | 1 | 0.825 |
| global test | | 37.56 | 8 | 0.000*** |

Note: ***$p < 0.001$

We therefore used an extended Cox model that includes a time-dependent variable defined as the product of the exhibition *history* variable with time (i.e., *history* × *t*), *t* is the survival years of an exhibition within the study period. The model contains eight covariates and one time-dependent variable.

$$\mathrm{h(t)} = h_0(t)\exp[\beta_1 * history + \beta_2 * \ln(size) + \beta_3 * \mathrm{ass.connect} + \beta_4 * \mathrm{gov.connect} + \beta_5 * \mathrm{cluster} + \beta_6 * \mathrm{hospitality} + \beta_7 * \mathrm{metro} + \beta_8 * \mathrm{innovation} + \delta * history * t]$$

**Table 4.** Extended Cox proportional hazards model

| | Coefficient | Hazard ratio | p-value |
|---|---|---|---|
| main | | | |
| history | -0.560 | 0.571 | 0.000*** |
| ln(size) | -0.238 | 0.788 | 0.006*** |
| ass.connect | -0.203 | 0.816 | 0.076* |
| gov.connect | 0.083 | 1.087 | 0.542 |
| cluster | -0.315 | 0.730 | 0.006*** |
| hospitality | 0.023 | 1.024 | 0.370 |
| metro | -0.933 | 0.393 | 0.043** |
| innovation | -0.006 | 0.994 | 0.846 |

| | | | |
|---|---|---|---|
| tvc | | | |
| *history* × *t* | 0.068 | 1.071 | 0.000*** |

Note: *t* is the survival years of an exhibition within the study period. ***$p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

As shown in Table 4, both *history* and *history* ×*t* are statistically significant with a Wald test p-value of 0.000. Therefore, the estimated hazard ratio for the *history* effect at any specified time t is calculated by using the following formula:

$$\mathrm{HR(t)} = \exp(-0.560 + 0.068 * t)$$

When we observe the effect of *history* on survival at t=1, the hazard ratio for *history* is 0.611 [exp(-0.560+0.068×*1*)]. A hazard ratio of less than one implies that the failure odds are lower when the value of *history* gets larger. When t=5, the hazard ratio for *history* is 0.803 [exp(-0.560+0.068×*5*)], which implies that the exhibition history still has a positive relationship with the chance of exhibition survival. However, when t=9, the hazard ratio for *history* is 1.053 [exp(-0.560+0.068×*9*)], which implies a one year rise in *history* is associated with a 5.3% higher hazard rate.

**Table 5.** Coefficients and hazard ratios at different times in history

| t | Coefficient | Hazard ratio |
|---|---|---|
| 1 | -0.492 | 0.611 |
| 2 | -0.424 | 0.654 |
| 3 | -0.356 | 0.700 |
| 4 | -0.288 | 0.750 |
| 5 | -0.220 | 0.803 |
| 6 | -0.152 | 0.859 |
| 7 | -0.084 | 0.919 |
| 8 | -0.016 | 0.984 |

| | | |
|---|---|---|
| 9 | 0.052 | 1.053 |

Note: *t* is the survival years of an exhibition within the study period; all values are significant at the p<0.01 level.

We assume that exhibition history has a positive influence on the chance of exhibition survival, however, the influence of history will diminish. Table 5 shows the hazard ratios of *history* at different times. For exhibitions with survival times between one and eight years, the hazard ratio for *history* is less than 1, indicating that *history* has a positive impact on reducing the risk of death. However, the hazard ratio shows a gradual increase, which implies that the positive effect of *history* decreases year by year. When the survival time of an exhibition reaches nine years, and the hazard ratio for *history* is greater than 1, *history* has changed from a positive factor into a negative factor. Therefore, H1a and H1b can be supported.

We hypothesized that start-up size positively influences the survival of exhibitions. The result of the Cox estimator suggests that *ln(size)* is statistically significant in the model, with a negative coefficient (-0.238, p<0.01) and less than one hazard ratio (0.788, p<0.01). This implies that exhibition survival probability increases when the value of *ln(size)* increases. Therefore, H2 is supported.

H3 concerns the positive relationship between exhibition survival and its social connections. The result indicates that a supportive industrial association has a positive effect on exhibition survival with a hazard ratio of less than one (0.816, p<0.01). H3 is therefore supported. Similarly, *cluster and metro* are both statistically significant in the Cox model, with negative coefficients (-0.315, -0.933, ps<0.01) and less than one hazard ratio (0.730, 0.393, ps<0.01). Subsequently, H5 and H7 are supported.

In addition to the five significant covariates in the model, three variables are insignificant, namely, *gov.connect, hospitality, and innovation.* This indicates we cannot derive sufficient evidence from empirical data to support H4, H6, and H8. The main reason for this result is that, among the 50 cities involved in this sample, 12 are mega-cities with a population of more than 5 million, 32 are mega-cities with a population of between 1 million and 5 million, and only six are small cities with a population of less than 1 million. Most of these cities have developed accommodation and catering industries and attach great importance to the development of the exhibition economy. Smaller cities may not match the larger cities in terms of hospitality supply or innovation environment, but the difference is not significant enough to threaten the exhibition's survival.

### *4.3. Robustness check*

To demonstrate the robustness of our semi-parametric Cox model, we first ran the same model with two subsamples, then ran the parametric Weibull distribution model with the same explanatory variables. Our total research period is from 2011 to 2019, of which 2011-2015 is China's twelfth five-year plan and 2016-2019 is China's thirteenth five-year plan. Therefore, we selected the exhibitions which took risks from 2011 to 2015 as the first subsample (n=552), and exhibitions taking risks from 2016 to 2019 as the second subsample (n=424). Since some exhibitions have been held in both periods, the sum of the two subsamples is greater than the total sample. The results as shown in Table 6 and those in our basic Cox model are highly consistent, confirming the robustness of our basic model.

**Table 6.** Robustness check

| | Basic model | Subsample one (2011-2015) | Subsample two (2016-2019) | Weibull |
|---|---|---|---|---|

| | | (n=552) | (n=424) | |
|---|---|---|---|---|
| main | | Hazard ratio | | |
| history | 0.571<br>(0.000***) | 0.691<br>(0.000***) | 0.048<br>(0.000***) | 0.634<br>(0.000***) |
| ln(size) | 0.788<br>(0.006***) | 0.652<br>(0.001***) | 0.697<br>(0.017**) | 0.766<br>(0.002***) |
| ass.connect | 0.816<br>(0.076*) | 0.746<br>(0.073*) | 0.665<br>(0.072*) | 0.765<br>(0.020**) |
| gov.connect | 1.087<br>(0.542) | 1.018<br>(0.924) | 1.271<br>(0.345) | 1.021<br>(0.880) |
| cluster | 0.730<br>(0.006***) | 0.752<br>(0.082*) | 0.662<br>(0.037**) | 0.694<br>(0.001***) |
| hospitality | 1.024<br>(0.370) | 1.048<br>(0.230) | 1.001<br>(0.920) | 1.030<br>(0.263) |
| metro | 0.393<br>(0.043**) | 0.249<br>(0.041**) | 1.588<br>(0.557) | 0.280<br>(0.006***) |
| innovation | 0.994<br>(0.846) | 0.965<br>(0.444) | 1.004<br>(0.889) | 0.991<br>(0.757) |
| tvc | | | | |
| *history × t* | 1.071<br>(0.000***) | 1.053<br>(0.077*) | 1.525<br>(0.000***) | |

Notes: ***$p < 0.01$; ** $p < 0.05$; * $p < 0.1$

## 5. Discussion and conclusions

Understanding the factors that influence the survival of exhibitions is critical to a destination's MICE investment and an exhibition organizer's business strategy. This research examines the key survival factors for an exhibition using a large longitudinal dataset collected in China. The study reveals that: a) the risk of failure is the highest in the first three years, with 37.2% of exhibitions among the sample terminated; b) five internal and external factors have significant positive effects on survival, i.e., exhibition history, start-up size, trade association connection, relevant industry clusters, and public transportation; c) the influence of exhibition history changes with time; d) the failure of exhibitions is significantly lower in first-tier cities such as Beijing, Shanghai, and Guangzhou than smaller cities; and, e) the survival probability of machinery exhibitions is significantly higher than automobile and motorcycle exhibitions. This is pioneering research to identify factors related to the survival of an exhibition, which is associated with the high failure rate of the industry. Although failure is pervasive in the exhibition sector, empirical research often reflects an anti-failure bias (McGrath, 1999). As a result, researchers usually over-sample success and under-sample failure; few studies have addressed the issue of exhibition failure (Albercaoliver et al., 2015).

### *5.1. Theoretical implications*

The findings of this study show that exhibition history and start-up size are two internal factors for survival, which are similar to firm age and size that are important for firm survival from a resource-based perspective (Dunne & Hughes, 1994). Exhibition history is a unique and inimitable resource, which signals various favorable characteristics such as legitimacy (Yi et al., 2018), reputation (Zimmerman & Zeitz, 2002), and credibility (Bathelt & Schuldt, 2008). The history of an exhibition implies that the organizer has gained the resources of experience (Tafesse & Korneliussen, 2012), forming an exhibition's historical uniqueness. The significance of the start-up size of an exhibition for survival supports the findings of earlier studies (Strotmann, 2007). Large start-up size implies that the organizer has ample resources, both tangible and intangible, such as highly qualified staff and an internal network (Bruderl & Schussler, 1990), whereas small exhibitions are subject to liabilities such as size (Freeman et al., 1983), and vulnerability to volatility in the environment (Kim & Burnie, 2002).

The study indicates that trade association connection is a significant survival factor, highlighting the importance of exhibition organizers' networking capabilities because exhibitions rely on both exhibitors and visitors to survive . Good connections with trade associations provide organizers with evaluative approval (Rindova et al., 2007) and access to member organizations of trade associations to participate in exhibitions as exhibitors or visitors (Berne & García-Uceda, 2008).

Two external factors, the hosting city's relevant industry clusters and public transportation facilities, are found to be significant factors for survival. This finding provides evidence to support the location theory (Porter, 1990; Romer, 1990), highlighting the benefits of agglomeration and public infrastructure (Eberts & McMillen, 1999; Giner, Santa-María, & Fuster, 2017). Relevant industry clusters help exhibitions to achieve synergy with local industry clusters (Lee & Lee, 2017), which helps to increase the attractiveness of such exhibitions to participants (Jin et al., 2012a). A good public transportation network, as part of the public infrastructure, provides easy access for exhibition attendees, contributing the exhibition performance.

Consistent with the theory of agglomeration economies (Eberts & McMillen, 1999; Giner et al., 2017), the study further shows that the failure of exhibitions is significantly lower in large cosmopolitan cities such as Beijing, Shanghai, and Guangzhou than smaller ones. Large cities benefit from agglomeration economies, as firms can share public good such as the proximity of professional services, technical expertise, human resources and public infrastructure such as transport, water, energy, and communication facilities, all of which directly influence the efficiency and productivity of the city (Eberts & McMillen, 1999).

The findings of this study further show that the survival probability varies depending on industry. Specifically, the survival rate for machinery exhibitions is significantly higher than automobile and motorcycle exhibitions. According to the industry life cycle theory, the survival rate for firms is higher in a growth industry than a mature industry (Lumpkin & Dess, 2001). However, it is difficult to judge the life cycle stage for the machinery vis-à-vis automobile and motorcycle industry, as both industries have been growing in China in the past few years. As such, further empirical observations are needed to explain the survival rate difference between the two industries.

### *5.2. Managerial implications*

The findings of this study have several important implications for exhibition organizers. First, managers should pay special attention to the first three years after opening because this is the peak period of exhibition death. To improve the survival probability of the exhibition, opening with a larger start-up size and establishing a connection with relevant industry associations are effective strategies. Second, before the exhibition matures, usually within eight years, exhibition history can be considered as a unique resource, symbolling experience and reputation; so, an organizer should make full use of it. However, after the exhibition has entered the mature stage, the negative influence of exhibition history could emerge. An organizer of a mature exhibition should be alert to the negative factors brought by the long history, for example, the low enthusiasm of employees, rigid work system, lack of innovation, and so on. Third, exhibition organizers should invest in developing their networking capabilities, fostering and maintaining relationships with several key stakeholders, particularly trade associations, as highlighted in the study's findings. Finally, because of the benefits of agglomeration and public infrastructure, choosing a city with relevant industry clusters and good public transportation help improve the exhibition’s chance of survival.

The findings of this study are also valuable for a hosting city as an exhibition destination to improve its competitiveness. First, destination managers should focus on several key industries to create several reputable exhibitions to improve agglomeration economies. Local governments could introduce a series of policies to support and reward those exhibitions with growth potential. Second, as exhibitions and related industrial clusters can promote and benefit each other, the destination can focus on exhibitions that are relevant to local industries. Third, the destination should provide public infrastructure, especially the transport network, which will help improve the operational efficiency of the city and attract exhibitors and visitors, as both are important for the survival of exhibitions.

### *5.3. Limitations and future research*

There are several limitations in the study and future research is needed. First, this study examines the survival of China's exhibitions, which are linked to industrial clusters (Jin et al., 2012a), the generalizability to other country contexts is limited, and future research could explore the survival factors of the exhibition industry in other countries. Second, the sample examined in this study is restricted to business-to-business exhibitions, not those of a business-to-consumer nature. Future studies could examine the survival factors of business-to-consumer exhibitions. Third, this study is limited to the eight important factors examined, hence future research could examine more factors. For example, the industry life cycle, the brand of the exhibition (Geigenmuller & Bettis-Outland, 2012), the size and relationship quality of the exhibition's business network (Lai, 2015), and the relationship among organizers, exhibitors, and visitors and the competence of the management team (Wang et al., 2014). Finally, the result of the study suggests that some influencing factors such as exhibition history are time-dependent covariates, suggesting that future survival analysis should consider time-variable factors.

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