SOCIAL NETWORKING WEB SITES: WHO SURVIVES?

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ABSTRACT. This paper studies the relationship between the characteristics of social network sites (SNSs) and their probability of survival. The data sample includes 224 SNSs launched throughout the world from 1995 to 2015 and that can be described by focus strategy, business financing methods and interactions with external companies, such as partnerships, mergers and acquisitions. Three factors are systematically associated with closure hazard rates. First, compared with SNSs that address a specialized audience, generalist SNSs have a three times higher probability of closing. Second, being the target of a merger or acquisition more than doubles the probability of closure. Third, new entrants have a higher probability to survive if compared with SNSs with experience in the industry.

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1. INTRODUCTION

Network effects usually raise antitrust issues, because the "winners take it all" rule can lead to highly concentrated markets. In reality, network effects have negative consequences even on market definition and on the feasibility of empirical analyses. In fact, few subjects achieve a mass of users large enough to trigger an automatic network expansion. Thus, researchers can only observe the characteristics and behavior of the winners. The losers leave evanescent traces, which are often inadequate for an empirical analysis.

This situation is typical of social networking sites (SNSs). Given the absence of strong barriers to entry and the apparent ease of implementing an online virtual community (Albarran, 2013), since the mid-1990s many entrepreneurs have attempted to achieve economic success by launching general or specialized SNSs. Today, we know a great deal about those who succeeded and little about those who failed: the digital traces of the losers rapidly disappear. This biased information complicates the empirical study of the industry and has scarce relevance for managerial and policy purposes.

To fill this gap, this paper builds a database of SNSs appearing from January 1995 to March 2015. The sample includes 224 SNSs, of which 181 are active and 43 are defunct. The empirical analysis focuses on the technological and structural antecedents that can affect the survival of an SNS. The economic studies on SNSs are mainly theoretical, although an increasing number of empirical applications are coming to light. For example, some scholars explored the behavior of SNS users (Kossinets and Watts, 2006; Lin, 2008; Shriver *et al.*, 2013; Wilcox and Stephen, 2013; Tucker, 2014), while others focused on the strength of network effects (Henkel and Block, 2013), on firms' strategies (Miller *et al.*, 2009) and on cross-border connectivity (Rohn, 2014). However, the bulk of

empirical work consisted of experiments on single networks or on the data analysis of major examples, such as Facebook or Twitter. No study has explored the issue of SNS success/failure in the aggregate. Hence, the next section reviews the "established" literature on firm survival and discusses the application of its major findings to the SNS industry. Section 3 describes the data, while Section 4 shows the results of the empirical analysis, which can be summarized as follows. From a static and dynamic perspective, only three circumstances are significantly correlated with survival: if an SNS addresses a specialized audience, the probability of survival is considerably higher. Secondly, when an external company purchases an SNS, the probability of the latter shutting down increases significantly. Finally, the age of SNSs is negatively correlated with the probability of survival. Section 5 concludes the paper, describes its limitations and suggests the policy implications of the empirical results.

2. FIRM SURVIVAL: THEORY, PREVIOUS EMPIRICAL WORK AND APPLICATION TO SNSs

The literature on firm survival is a recognized field of research that assesses the impact of firm and industry characteristics on the probability of failing or exiting the market. The most discussed "internal" factor related to entry, survival and exit is firm size. The empirical studies have generally found that larger firms that enter a market have a higher probability of survival (Aldrich and Auster, 1986; Mata and Portugal, 1994; Wagner, 1994; Geroski et al., 2002; Esteve-Perez and Mañez-Castillejo, 2008; Strotmann, 2007; Varum and Rocha, 2012). In the SNS industry, firm size is not easy to assess. In terms of revenues, market share or users, every SNS enters the market with a size equal to zero. In addition, the data regarding the number of SNSs employees are usually not available. Hence, Section 3 will explore how the following factors affect the probability of survival of SNSs: focus of the SNSs (generalist against specialized SNSs), restriction policies, methods of

financing the SNS, intensity of competition, special transactions (mergers and acquisitions) and firm experience.

Previous empirical studies have considered specific firm strategies and their impact on firm survival. For example, Audretsch (1995), Esteve-Perez and Mañez-Castillejo (2008) and Cefis and Marsili (2005) suggested that firms investing in R&D activities have a higher chance of survival. Similarly, differentiation strategies, for example the occupation of a narrow niche in the market, may affect the probability of survival. In their seminal contribution, Hannan and Freeman (1977) argued that a "generalist" company has the ability to tackle unexpected occurrences, while a specialized and niche oriented company faces a higher risk of failure. However, more recent investigations found that differentiation within-industries can increase the probability of staying in the market (Stern and Henderson, 2005; Zahavi and Lavie, 2013). In addition, although the demand of a specialist product is highly variable, a niche marketing strategy enables a faster growth of the firm (Cressy, 2006). Management studies also emphasize the tension between generalist and specialized (niche) services (see for example Deephouse, 1999). Regarding SNSs, targeting a general audience facilitates the achievement of a critical mass of users, which ensures direct monetization or advertising revenues (Canzer, 2006). "Big numbers" are important for SNSs in two ways. First, direct network externalities mean that the value of participating in the network is increasing in network size. Second, a large audience increases the willingness to pay of many advertisers. However, a generalist SNS must compete with many other platforms and continuously adjust its features to satisfy the preferences of heterogeneous users. Instead, a specialized SNS can focus on a more homogeneous target and occupy a niche in the industry with a low intensity of competition (Laudon and Traver, 2007).

Some sector-specific factors might affect the probability of staying on the market. First, an SNS can exclude some categories of users from registration. For example, users under thirteen years old

cannot access Facebook. The effect of this policy is not obvious. On the one hand, the potential

number of users is artificially reduced, as well as the potential advertising revenues. On the other,

restrictions can guarantee users a minimum intimacy and homogeneity, thus increasing the utility

of joining the network (Subrahmanyam et al., 2008).

Regarding the source of revenues, some SNSs offer additional services upon the payment of a fee.

As with restrictions, this practice can have contrasting effects. Premium services broaden the

variety of content and the SNS can offer multiple packages using different pricing schemes. With

market power, SNSs can price discriminate between users and boost profits (Wang et al., 2005;

Enders et al., 2008). On the other hand, some users may regard the premium fee as an attempt to

exploit their willingness to pay for additional services. SNSs might thus lose those users with a

"free mentality" about the provision of Internet contents (Dou, 2004).

Similar considerations apply to the selling of space and private information to advertisers.

Traditional advertising (e.g., banners) grant resources to improve the functionality of the SNS and

increase the probability of survival, but many users find display ads particularly annoying (Kelly et

al., 2010). On the other hand, the observation of users' behaviour in online communities allows

media and advertisers to personalize the ads. Consumers can perceive the ads aligned with their

personal interests and this can ultimately improve the advertising effectiveness (Anand and

Shachar, 2009; Lambrecht and Tucker, 2013). However, a prerequisite for matching users'

preferences and advertising content is to open personal information to advertisers' analyses and

many users are seriously concerned about privacy issues (Taylor et al., 2011; Lee, 2013).

Some SNSs act as an online vendor and sell goods and services directly to registered users. If the e-

commerce operations succeed, the SNS has an additional income to enhance the site and continue

its operations (Buhler et al., 2015)[1]. Furthermore, e-commerce increases the social interactions among SNS users, their trust in the SNS and the probability of future transactions (Hajli, 2014). However, the number of transactions has to be high in order to be profitable (Armstrong and Hagel, 2000; Zeng and Reinartz, 2003). In addition, some users might see e-commerce as a debasement of the main mission of the SNS, that is, the creation of a virtual community based on personal linkages without commercial involvement (Huang and Benyoucef, 2013).

Returning to the broad literature on firm survival, a recurrent result is the "liability of newness": controlling for firm size, the first years of operation present a higher risk of failure/exit (Stinchcombe and March, 1965; Mata and Portugal, 1994), although some studies suggested a non-linear relationship between firm age and probability of survival (Wagner, 1994; Fackler *et al.*, 2013). Firm age is a proxy for firm experience, which is needed to build business relations with suppliers and to convince consumers to try new products (Bruderl and Schussler, 1990). These considerations can apply to SNSs. Although the basic idea of a virtual community is often the main driver of its success, experience can be crucial for strengthening the relationship with users, improving the service and attracting greater numbers of individuals and advertisers. In fact, the users' trust in social networks is increasing in the experience of the platform (Dwyer et al., 2007; Fogel and Nehmad, 2009). However, some scholars suggest the possibility of liability of aging (Barnett, 1990; Barron et al., 1994; Ranger-Moore, 1997). In brief, firms may become progressively unable to generate innovations as they remain in the industry. As time goes by, older firms develop organizational rigidities that do not facilitate the acquisition of new knowledge and routines (Leonard-Barton, 1992). On the other hand, younger firms have learning advantages since they can explore innovative routines without the need to unlearn the old ones. The elements that

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[1] Media scholars distinguish endogenous transactions, when a platform provides physical or digital goods and services that users can buy, and exogenous transactions, when the SNS provider "sells third party (or user-generated) content to its users or enables transactions between users" (Enders et al., 2008, p. 208).

favor younger firms can be crucial in the SNS industry, because younger generations enter the social networks every year and express new preferences.

The empirical studies on firm survival also considered "external" factors such as the intensity of competition. When the number of firms in an industry is high relative to market demand, the chance of survival is lower (Hannan and Carroll, 1992). At the same time, the regional agglomeration of economic activities can generate external economies of scale, which compensate for the higher competition of those companies with a similar location (Audretsch and Feldman, 1996; Porter, 1998)[2]. Some scholars also claimed that the availability of human resources and qualified labor are linked to innovation and success on the market (Fritsch *et al.*, 2006). Intensity of competition and regional agglomeration are not easy to assess within the SNS industry. For the sake of simplicity, the next section assumes the number of SNSs active in each country as a proxy of competition intensity. Regarding geographical issues, the development of an SNS essentially takes place in front of a PC, whose location is somewhat insignificant. However, more than half of the SNSs in the sample were launched in the U.S., where the West Coast and the Silicon Valley present the highest number of SNS experiments in the world, thanks to a huge concentration of specialized human resources (Cha, 2013). Therefore, the empirical application of the next section will explore whether localization in the U.S. has an impact on firm survival.

The previous studies did not explore whether participating in a merger or acquisition has an effect on the probability to survive in the industry. This issue may appear unimportant from the perspective of a target company, which is destined to dissolve in the new legal entity. However, a company becomes a target if it generates revenues or profits, has an established brand or count on a large customer base. Once the merger is completed, closing the activities of the target or changing its brand can be dangerous (Basu, 2006; Clark et al., 2010), especially in the SNS industry,

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[2] Broadly speaking, knowledge spillovers associated with spatial proximity can help survival in the market (Krugman, 1991) even with multiple and aggressive competitors.

where the success depends on multiple loyal users who might suspect that the SNS is changing its identity (Boyd and Ellison, 2007). Given the interdependence of users' actions, an initial and slight drop in users can quickly develop into a rapid decline and lead to the collapse of the SNS. Of course, the objective of the acquisition may be the simple suppression of a dangerous competitor (Kwoka and Elhauge, 2012). Should this be the case, the closing of the target company would be the natural outcome of the predator's strategy. On the other hand, vertical or conglomerate mergers do not necessarily entail the end of the target company (e.g., the acquisition of MySpace by News Corporation completed in 2005 – the takeover was a failure, but MySpace did not disappear). An SNS can also act as the buyer in an M&A process. Given the long debated unpredictable impact of mergers on profitability (see, for a review, Ismail *et al.*, 2011; Das and Kapil, 2012), the next section will include this variable as a control. For the very same reason, the empirical analysis will include the partnerships with external entities among the covariates[3]. Broadly speaking, the theoretical and empirical literature on firm survival has discussed in detail the factors that can affect the probability of shutting down. Most of these factors are linked to market entry/exit conditions. However, the empirical studies did not find any structural antecedent that is systematically associated with firm survival.

3. DATA DESCRIPTION

Social network sites (SNSs) are "web-based services that allow individuals to construct a public or semi-public profile within a bounded system, articulate a list of other users with whom they share a connection, and view and traverse their list of connections and those made by others within the

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[3] There are several examples of partnership in the industry. For example, Twitter and Yandex (the largest Russian search engine) announced a partnership on February 21, 2012, consisting of Yandex showing new tweets in its search results almost immediately (Prodhan, 2012).

system" (Boyd and Ellison, 2008, p.211). Using this definition, this paper considers the SNSs "mentioned" in the academic literature. In particular, in March 2015 we launched the query "social networking websites" in EBSCOhost and collected 407 SNSs mentioned in the first 1000 results (the list of SNSs and publications is available upon request). Then we discarded the SNSs without information about the characteristics needed for the empirical analysis (see below)[4]. We distributed the list of the remaining 273 SNSs to 10 paid students who were asked to confirm that each website was actually a SNS (students were free to verify the information provided with all the available channels). For each SNS, we needed at least 8 students out of 10 to accept confirmation. We ended with a sample of 224 SNSs.

Each SNS of the sample is defined by the following characteristics: launch date; closure date if the SNS is no longer active; audience type (general against specialist[5]); possible restrictions (based, for example, on the age of users); whether or not the SNS offers premium services; whether or not the SNS sells advertising space; whether or not the SNS is active in e-commerce; country of origin (in particular, whether or not the SNS is an American company); whether or not the SNS acquired other companies; whether or not the SNS was the target of an acquisition[6]; whether or not the SNS became involved in a partnership.

In order to take into partial account the "size" of SNSs, the data include the maximum number of accounts registered (*accounts*), available for only 153 SNSs. The number of users/subscribers is a time-variant covariate and is not available for all the years and SNSs. Here, the idea is to assess if a sufficient mass of users can ensure the survival and growth of an SNS.

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[4] The data on structural characteristics of the SNSs were collected within the publications retrieved in EBSCOhost. The data collected were integrated with other information gathered on the websites of the SNSs that were still active.

[5] We asked another ten students to establish if the SNS is generalist or specialist. The classifications of students were highly congruent with each other.

[6] The data regarding mergers and acquisitions were cross-checked with the Zephyr database.

Table 1 shows the descriptive statistics of the qualitative variables. Seventy percent of SNSs use advertising to finance their activities, while a few act as an online vendor. Most SNSs have the headquarters in the U.S. (59.8%), while the sample is split evenly between specialized and general SNSs. The SNSs have rarely acted as a predator in mergers and acquisitions, while 61 SNSs have been the target of an acquisition.

Table 1. Descriptive statistics

	active	defunct	total
specialized	98	14	112
restrictions	45	11	56
premium	34	7	41
advertising	120	30	150
e-commerce	14	2	16
us	105	29	134
partnership	55	7	62
M&A	19	2	21
target	42	19	61
Obs.	**181**	**43**	**224**

4. EMPIRICAL ANALYSIS

Before introducing the duration analysis, the data can shed some light on the *static* relationship between the explanatory variables and the probability of survival as an SNS. Table two shows the results of a *probit* analysis where the dependent variable is equal to 1 if the SNS is still active, 0 otherwise. The explanatory variables in Table 2 are: *specialized*, equal to one if the SNS explicitly addresses a specialized audience, zero otherwise; *restrictions*, equal to one if the SNS imposes access limitations, zero otherwise; *premium*, equal to one if the SNS offers additional content upon the payment of a fee, zero otherwise; *advertising*, equal to one if the SNS sells advertising space to advertisers, zero otherwise; *e-commerce*, equal to one if the SNS sells goods and services directly to users on the website, zero otherwise; *competition*, the number of SNSs active in the

same country in each period (month); *us*, equal to one if the SNS has its base in the U.S., zero

otherwise; partnership, equal to one if the SNS has been involved in a collaboration, joint venture,

partnership, etc., zero otherwise; *M&A*, equal to one if the SNS has purchased external companies,

zero otherwise; *target*, equal to one if the SNS has been acquired by an external company, zero

otherwise.

Table 2. Probit analysis: marginal effects on the probability of survival.

	I	II	III	IV
specialized	0.747**	0.768**		
	(0.299)	(0.300)		
restrictions	0.094		0.080	0.074
	(0.238)		(0.233)	(0.236)
premium	0.069			0.044
	(0.265)			(0.265)
advertising	-0.086	-0.074	10.116	
	(0.220)	(0.221)	(0.217)	
e-commerce	0.269	0.229	0.173	0.242
	(0.449)	(0.453)	(0.417)	(0.428)
competition	0.019	0.019	-0.012	-0.003
	(0.019)	(0.019)	(0.140)	(0.210)
us	-0.310	-0.333	-0.258	-0.264
	(0.215)	(0.217)	(0.209)	(0.211)
partnership	0.150	0.146	0.205	0.124
	(0.249)	(0.248)	(0.245)	(0.245)
M&A	0.419	0.459	0.308	0.313
	(0.419)	(0.424)	(0.401)	(0.409)
target	-0.500**	-0.505**	-0.521**	-0.552***
	(0.214)	(0.215)	(0.212)	(0.213)
*premium*restrictions*		0.797		
		(548)		
*specialized*premium*			0.213	
			(0.372)	
*specialized*advertising*				0.512*
				(0.274)
constant	0.490	0.494	1.351***	0.980***
	(0.496)	(0.498)	(0.348)	(0.358)
LL	-100.155	-98.968	-103.443	-101.827
Pseudo R2	0.086	0.096	0.056	0.071
Obs.	224	224	224	224

Notes. Reported coefficients are marginal effects. Level of significance: ***0.01, **0.05,
*0.10. Standard errors in parenthesis.

Table 2 shows that only two variables are associated with the probability of survival. First, if the

SNS is devoted to a specific audience, it has a higher chance of survival. Second, if the SNS has

been the target of an acquisition, the probability of survival is systematically lower. The impact of

the other variables is not significant. Regressions II, III and IV include interaction terms, which

however do not change the main results, although advertising seems to be more important for

survival within SNSs devoted to a specialized audience[7].

However, these results completely ignore the fact that the duration of the SNSs is censored.

The variable of interest in the duration analysis is the length of time that elapses from the

beginning of an event until either its end or the end of analysis. Hence, the observation consists of

a cross section of durations t_1, t_2, …, $t_n \in T$, where T is a discrete or continuous random variable.

The analysis of duration estimates the probability that the event "failure" will occur in the next

period. In this paper, the dependent variable is the span of SNS survival, calculated as the

difference between time t and the launch of the SNS, while the failure event coincides with the

closure of the website. Therefore, the variable T is by necessity censored. The cumulative

probability of the random variable T is

$$F(t) = \int_0^t f(s)ds = Pr(T \leq t)$$

Where $f(s)$ is the continuous probability distribution. The probability that the period is at least of

length t is given by the survival function

$$S(t) = 1 - F(t) = Pr(T \geq t)$$

and the probability that the "phenomenon" will end in the next interval of time (Δ) is

$$I(t, \Delta) = Pr(t \leq T \leq t + \Delta \mid T \geq t)$$

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[7] The following considerations suggested the interaction terms of Table 2: 1) the combination of restrictions and participation fees can effectively shape the audience of the SNS (*premium*restrictions*); 2) on the other hand, the payment of a participation fee can guarantee the provision of really specialized content and services (*specialized*premium*); 3) advertising can be effective and ensure relevant revenues if it targets a specific audience who access specialized content (*specialized*advertising*). The regressions in Table 2 have been replicated with further interaction terms and the results do not change.

The hazard rate is the rate at which intervals are completed after duration t (given that they last at least until t):

$$\lambda(t) = \lim_{\Delta \to 0} \frac{Pr(t \leq T \leq t + \Delta \mid T \geq t)}{\Delta} =$$

$$= \lim_{\Delta \to 0} \frac{F(t + \Delta) - F(t)}{\Delta S(t)} = \frac{f(t)}{S(t)}$$

To assess the impact of explanatory variables on the probability of survival, the Cox Proportional Hazard Regression estimates the parameter λ. In particular, the hazard function $h_i(t)$ of SNS i is

$$h_i(t) = h(t, x_i) = h_0(t)exp(x_i'\beta)$$

where $h_0(t)$ is an arbitrary and unspecified baseline hazard function, x_i is a vector of measured explanatory variables of the i-th SNS and β is the vector of unknown parameters to be estimated. A negative sign of the coefficient or a hazard ratio lower than one means that the hazard rate decreases, that is, the corresponding variable is associated with a higher probability of survival. Table 3 shows the results of a Cox regression, where the covariates are those defined for the static probit analysis. In addition, the variable *age* measures the months passed since the SNS launch, while *gdp* is the variation in domestic GDP on a monthly basis.

Table 3. Cox regressions. SNSs, 1995-2015.

	HR(1)	HR(2)	HR(3)	HR(4)	HR(5)	HR(6)
specialized	0.383**	0.361**			0.181***	0.158***
	(0.181)	(0.171)			(0.117)	(0.108)
restrictions	0.980		0.933	0.966	0.739	0.714
	(0.354)		(0.330)	(0.346)	(0.369)	(0.394)
premium	0.731			0.703	0.893	1.603
	(0.479)			(0.306)	(0.517)	(0.896)
advertising	1.245	1.199	1.273		1.630	0.902
	(0.531)	(0.420)	(0.445)		(0.802)	(0.407)
e-commerce	0.482	0.504	0.554	0.502	0.530	1.111
	(0.333)	(0.380)	(0.408)	(0.373)	(0.448)	(0.929)
competition	0.986	0.984	1.025	1.013	0.995	0.938
	(0.031)	(0.030)	(0.223)	(0.024)	(0.043)	(0.043)

us	1.661	1.660	1.575	1.557	1.366	1.382
	(0.570)	(0.564)	(0.538)	(0.528)	(0.572)	(0.619)
partnership	0.811	0.816	0.704	0.801	0.903	0.902
	(0.320)	(0.319)	(0.276)	(0.314)	(0.458)	(0.477)
M&A	0.429	0.419	0.477	0.502	0.301	0.623
	(0.320)	(0.311)	(0.353)	(0.372)	(0.314)	(0.498)
target	2.245**	2.216**	2.376***	2.416***	2.081**	
	(0.723)	(0.705)	(0.756)	(0.779)	(0.854)	
age	1.284***	1.279***	1.287***	1.268***	1.349***	1.329***
	(0.083)	(0.083)	(0.084)	(0.083)	(0.118)	(0.120)
gdp	0.783	0.581	0.479	0.985	0.628	0.672
	(0.527)	(0.271)	(0.385)	(0.783)	(0.611)	(0.601)
accounts					0.998	
					(0.006)	
premium*restrictions		0.240				
		(0.245)				
specialized*premium			0.632			
			(0.398)			
specialized*advertising				0.507		
				(0.222)		
LL	-191.915	-190.648	-194.336	-193.059	-106.200	-95.399
Prob>chi	0.000	0.000	0.000	0.000	0.001	0.000
Obs.	224	224	224	224	153	163

Notes. HR=hazard ratio. A hazard ratio lower than one means that the corresponding variable is associated with a higher probability of survival, and vice versa. All variables are dummies, apart from *competition* (number of competitors in the same country), *age* (in months), *gdp* (in billion dollars) and accounts (in thousands).

Table 3 shows that the SNSs addressing a specific public have a much higher probability of survival. Therefore, the advantage of tailoring an online network for a particular public more than compensates for the disadvantage of renouncing to a larger audience. Indeed, half of SNSs are devoted to a general audience, which makes competition quite intense in that segment. Advertisers, the main source of revenue for most SNSs, certainly look at the big numbers, but at the same time pay attention to the registered users' homogeneity, which is expected to be higher in a specialized virtual community.

A second result regards the age of the SNSs. "Old" SNSs have a higher probability to shut down. The traditional literature on firm survival explains that the age of a firm is a proxy of its experience, which can be crucial for maintaining a market share higher than zero. In the SNS industry, network effects are pervasive, and users must sustain high switching costs if they move

from one community to another. However, SNSs must adapt their features to waves of new users, whose preferences are largely unknown. Digital natives enter the "industry" and express their preferences simply joining one or more networks without costs. Within this turbulent environment, younger SNSs showed a superior ability to survive, at least in the period under review.

The SNSs that are target of an acquisition have a double probability of closing the website compared to SNSs that remain independent. The significance of the *age* and *target* variables can have a "dynamic" explanation. Some companies enter the SNS industry through an acquisition and immediately obtain a mass of users that increases the probability of survival. In other words, a target SNS might continue to do social networking under a different name and thus raise the survival rates of "apparently new" social networks[8]. Casual observations within the sample show a mixed picture: some acquirers do not carry on doing social networking, while others incorporate the target companies into a proprietary website, as it is, maintaining the original brand name[9]. To control for this possible bias, column H6 of Table 3 does not consider acquisitions. The previous results are confirmed: specialization and age continue to affect the probability of closure.

When the motivation of the takeover is the suppression of a dangerous competitor, the closure of the target company can be considered a natural outcome. However, the end of the target company is not the obvious consequence of vertical and conglomerate mergers.[10] To control for the type of acquisition, the takeovers are classified as horizontal and non-horizontal. An acquisition is horizontal if the acquirer was already in control of another SNS at the date of the

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[8] An anonymous referee pointed out this possibility.

[9] Sometimes the acquisition process presents a different outcome: the target company is closed and the users' accounts are transferred towards different services, along with some functionalities of the target SNS. For example, Amazon purchased PlanetAll in 1998 and shut down it after two years, announcing that PlanetAll members would be able to continue their social experience within the Amazon e-commerce services (https://www.cnet.com/news/amazon-to-shut-planetall-absorb-features/).

[10] An anonymous referee raised this issue.

deal (hence, the same company can conduct horizontal as well of non-horizontal acquisitions; for example, Yahoo took over Flickr in 2005 and Tumblr in 2013; the second acquisition is horizontal, the first is not). Table 4 shows that 25% of SNSs shut down after a horizontal acquisition, while non-horizontal takeovers lead to closure in nearly half of the cases.

Table 4. Targeted firms: type of acquisition and survival

	active	defunct
Horizontal	27	9
Non horizontal	13	12

However, a more rigorous analysis (probit analysis; dependent variable: closure/non-closure of the SNS; explanatory variables: all the variables of Table 3; n=61), shows that the probability of shutting down is not affected by the type of acquisition. In conclusion, horizontal acquisitions that suppress and then rebrand the target SNS are not a common practice. The fact remains that takeovers are significantly associated with a lower number of SNSs in the market.

The different methods of financing virtual communities (advertising, e-commerce, premium content) do not have any effect on the probability of survival, and neither do the registration restrictions. Nor does the search for external contacts through partnerships or mergers, geographical location and economic trend have an impact on failure probability. Regressions II, III and IV include the interaction terms described in footnote 8. Interaction terms are not significant and do not change the results of regression I. Regression V includes the maximum number of accounts registered (*accounts*), available for only 153 SNSs. The hazard ratio is close to one and not significant.

Figures 1 and 2 show the log-log plots regarding the *specialized* and *target* variables. In fact, the Cox regression model assumes that the hazard ratio is proportional over time. The proportional-hazards assumption has not been violated, since the plotted lines are reasonably parallel. In

addition, a Schoenfeld test shows that there is no evidence that the proportional hazards

assumption is globally violated.

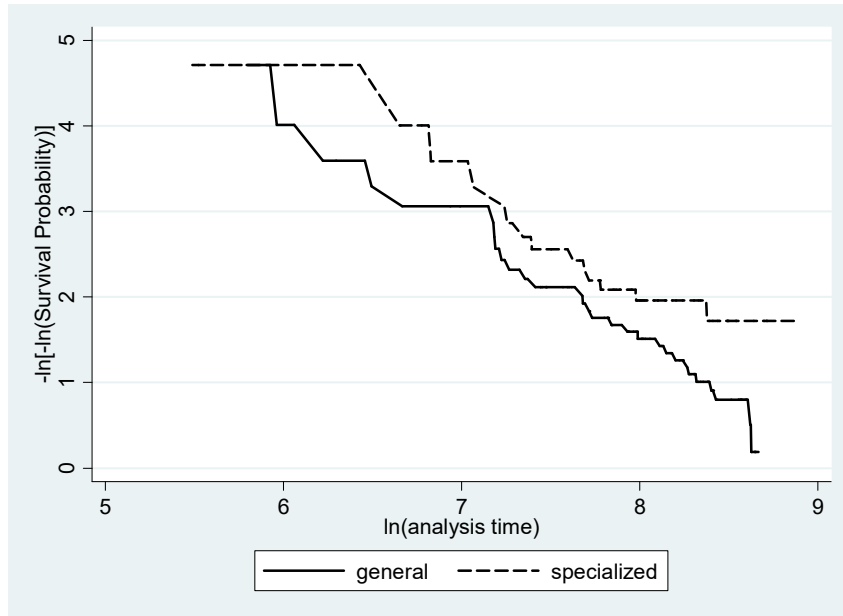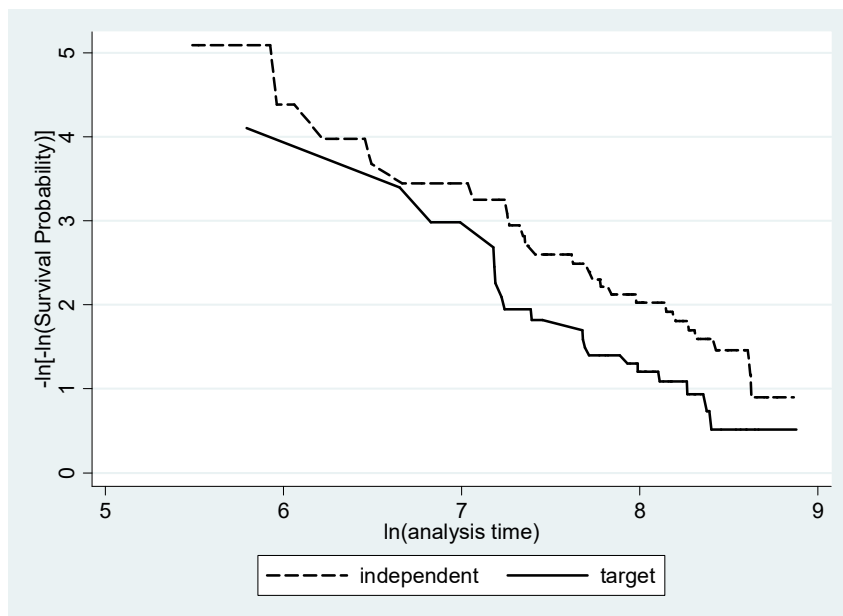**Figure 1. Log-log functions: specialized versus general SNSs**

Figure 2. Log-log functions: independent versus target SNSs

5. CONCLUSIONS

It is quite common to find advice and suggestions regarding the successful features of an SNS or the creation of a social network that makes money. Typically, such ideas draw upon exemplary stories, familiar to the public because they regard a handful of successful virtual communities. These "stories" lay on the fact that technical and financial barriers to enter the SNS industry are rather low (Beuscart and Mellett, 2008). However, the network effects mean that few competitors emerge: the information on the winners abound, while the losers leave vanishing digital traces. Unfortunately, knowing a lot about the leaders does not necessarily facilitate the entry of successful followers in the new media environment. From the perspective of empirical analysis and industry studies, the digitization of activities and the lack of a "register" of social media experiments make the data collection problematic.

This paper had two main objectives. First, to build a database of the social networking sites that have appeared from 1995 onwards. To do so, the name of the social network had to be associated with the basic service characteristics, the methods of financing and the relationships with external companies. The construction of the database is not an easy task, because the data sources are heterogeneous and the very same definition of social networking sites raises several issues. Secondly, the aim of the paper was to ascertain which characteristics of SNSs are associated with the probability of survival in the "industry". The empirical analysis shows that SNSs devoted to a particular audience and that remain independent have a higher probability of continuing their operations. In addition, older SNSs face a higher risk of shutting down, all else equal.

Of course, it would be ambitious to consider these results as general and conclusive. The sample includes only the SNSs which, for various reasons, are "popular", because only popularity enables an SNS and its characteristics to be identified. Therefore, the sample is unavoidably biased and

much caution is needed in interpreting the empirical results. In addition, the sample includes

relatively few companies[11].

Future research will thus regard the enhancement of data collection, the certification of basic

information and an increase in the SNSs under review. In addition, this paper assumes that some

variables are one-dimensional, although SNSs adopt similar but not identical strategies to increase

registered users and advertising revenues. For example, the advertising model of Twitter is

different from the models of online advertising implemented by other SNSs, because goods and

services are promoted through publicity, which means moving information in order to increase the

awareness of products (Cha, 2013). Likewise, "user monetization" can be direct (e-commerce or

paid subscriptions) or indirect (generating revenues from users with byproducts created by the

SNS users themselves). In particular, many SNSs use syndications with advertising to generate

revenues. For example, the public status of Facebook users may be linked to their other search

results[12]. Of course, the definition of SNS strategies through many qualitative/dummy variables

entails a tradeoff between descriptive ability and relevance of the econometric analysis. This issue

merits attention given the small size of the data samples.

From the antitrust perspective, direct and indirect network externalities of social networks allow

few firms to dominate the market and favor the formation of monopolies or quasi-monopolies

(Haucap and Heimeshoff, 2014). An excessive market concentration can harm users and

consumers, and information markets are not an exception. In fact, although information markets

are unquestionably different from "traditional" markets such as the auto or pharmaceutical

industries, still they must respect competition law. The European Commission has clarified that

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[11] Of course, the lack of information on the number of *attempts* to launch an SNS makes the terms "few" and "many" rather ambiguous.

[12] According to media analysts (Clarke, 2008; Cong and Du, 2008; Hmedeh *et al.*, 2011), syndication has great potential in the near future as a source of revenues. For a recent survey on social\ media business models, see Rohn (2015).

information markets are subject to the basic rules of articles 101 and 102 of the Treaty on the Functioning of the European Union[13] (Fietkiewicz and Lins, 2016).

The time span during which a firm maintains its dominant position is a crucial issue to assess if the exercise of market power is detrimental to consumers. Users, consumers and advertisers are not harmed if an online social network is dominant for a short period. Rather, users can benefit from network effects and service complementarities that arise within social networks. This paper has shown that "young" SNSs have a higher probability of survival with respect to "old" and experienced competitors. This result resembles a Schumpeterian competition where entrant firms, in order to gain market share and achieve a monopolistic position, invest in innovations that benefit users, convincing them to bear switching costs and abandon the old network for a new one. In addition, the high survival rates of specialized SNSs can alleviate the pervasiveness of dominant and generalist platforms (e.g., Facebook) and favor market fragmentation, in view of the multi-homing behavior of many consumers. Hence, the empirical results of this paper seem to lessen the antitrust concerns regarding the SNS industry, at least with regard to abuses of dominant position (Messina, 2006).

However, Schumpeter himself (1994 [1954]: 897 f.) warned that "there are means available to the successful entrepreneur - patents, 'strategy', and so on-for prolonging the life of his monopolistic or quasi-monopolistic position and for rendering it more difficult for competitors to close up on him...". Mergers and acquisitions certainly belong to the "strategies" adopted by some companies to maintain their dominance in the SNS industry. The sample of this paper includes acquisitions operated by Google, Amazon, Microsoft, Telefonica and Yahoo[14]. The majority of these giants have

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[13] A recent example is the merger of Facebook and WhatsApp, notified to the European Commission in 2014. The Commission did not oppose the transaction, in spite of the dominant position of each company in adjacent markets and some complementarities between the services provided (Fietkiewicz and Lins, 2016).

[14] Facebook completed about 60 acquisitions between 2005 and 2016.

attempted to launch a proprietary virtual community. Acquiring an SNS with a certain popularity is a quick way to get essential technology, intangible assets and consumer goodwill. An acquisition permits to maintain both the successful functionalities of an SNS and the mass of its users/subscribers. The complete and instantaneous "transfer" of clients and customers from one company to another is not observable in "traditional" markets, although consumer's trust and loyalty can facilitate the post-merger integration process. In addition, many mergers in the SNS industry can be anti-competitive: in addition to horizontal acquisitions aimed at eliminating a competitor, some takeovers prevent that a social network fall in the hands of rivals (Waller and Sag, 2015). These strategies are not easy to detect, especially when the size of the target company is small. In fact, antitrust authorities must focus on mergers that reach a certain turnover threshold, because the main concern regards the structural effect of the planned mergers and the consequences on market power and collusive practices. However, the SNS industry is peculiar also in this respect. First, mergers involve a limited amount of tangible resources, whose re-organization would increase, in traditional industries, the costs of the whole transaction. In other words, acquiring an SNS does not entail excessive "material" efforts for the acquirer company. Second, the acquirer company has direct access to a mass of users that facilitates the generation of direct and cross network externalities. Hence, although the impact on market structure is negligible, mergers can increase the future chances to conserve a dominant position. These circumstances, along with the high probability of closure of the target companies, induce a thorough analysis of the anti-competitive nature of acquisitions in the SNS industry. Such analysis is a crucial point of a broader debate regarding the compatibility of current competition law with the rapid developments of information markets.

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