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Standing and "Survival" in the Adult Film Industry*

Jochen Lüdering†

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It is said that knowing the right people is essential for one's career, which is supported in the literature on *social capital*. However, the empirical evidence in this field remains ambiguous, while the literature recognizes that "connections" certainly help finding any job at all, it remains unclear if there is a long-term benefit.

While it is difficult to record a network structure in most industries, in the adult film industry collaboration between performers is easily observed. Consequently, a collaborative network can be constructed for which centrality measures can be calculated in order to estimate the effect on success. Unfortunately, success is not easily observed either. Hence, in this manuscript, the survival in the industry is used as a proxy for professional success. This assumption is justified by the economic argument that, in the absence of lock-in effects, performers will remain in the industry as long as it remains profitable. The profitability will not only depend on monetary aspects, but, in addition to economic costs, it takes potential costs from loss of reputation and personal well-being into account.

The research at hand stands stands out by pioneering the use of centrality measures in duration models which, to the best of my knowledge, is a novel approach in the field. The

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results indicate that there is a strong correlation between network centrality and industry survival for the adult film industry.

JEL classification: C41, D80, C55

Keywords: Duration Analysis, Professional Success, Network Analysis, Centrality, Social Capital

1. Introduction

It is widely accepted that networking is an important aspect to get ahead within ones career. This reasoning justifies the existence of events to connect students and alumni, as well as network meetings over lunch for professionals. There appears to be a whole industry forming around the idea of facilitating networking. Online Social Networks, in particular career oriented ones like Xing and Linkedin, are the most visible intermediaries in this industry. While some firms in the industry claim that "NETWORKING is the single most powerful marketing tactic to accelerate and sustain success for any individual or organization!"[1]. The importance of a social network (in the sociological sense)for success is an important part of social capital theory (Lin 1999a). In the context of recruitment Gorman and Marsden (2001) documents that the empirical evidence to be inconclusive whether networking leads to any long lasting advantages. However, it appears that in the short run networking is beneficial as it helps to find any job at all (See Granovetter (1995) for a discussion and recent evidence by Brady (2015)). Moreover, it appears to be problematic that a majority of studies work on cross-sectional data and make inference about dynamic developments. Wolff and Moser (2009) who study the benefit of networking based on longitudinal data are a noteworthy exception to this.

Addressing this question empirically, it appears to be a central issue that personal interactions are hard to track in most industries. An exemption to this is the film industry, where joint movie appearances are easily observed. Examples of descriptive studies based on social network analysis of the film industry include Ahmed et al. (2007) and Herr et al. (2007). Further, the collaborative network of the film industry has been used to illustrate the *small-world experiment*, which became part of popular culture with the advent of "Six Degrees of Kevin Bacon" [2] in 1994. An actors Bacon number is the collaborative distance from Kevin Bacon. Older and more relevant for economists is the Erdös Number, a similar

[1] `http://www.strategicbusinessnetwork.com/about/importance` accessed 2015-04-22.
[2] `https://en.wikipedia.org/wiki/Six_Degrees_of_Kevin_Bacon` accessed 2015-08-03.

measure for scientific publications. The first record of the Erdös number dates back to Goffman (1969). A persons Erdös number measures the collaborative distance between himself and the Hungarian mathematician Paul Erdös. My own Erdös number is four, which I obtained through my recent collaboration with Peter Winker (3). Winker had previously collaborated with Dennis K. J. Lin (2), who in turn has a joint publication with Erdös coauthor Gutti Jogesh Babu (1).[3] Despite the popularity of these measures, the selection of Erdös and Bacon as a reference points in the collaborative networks is rather *ad hoc*. At least in the case of Bacon we know that he is far from being the most central person in the actor network.[4] More "sensible", classical centrality measures of prominence in the collaborative network in economics are provided by RePEc (`http://collec.repec.org`). To my knowledge these data are still waiting to be used in an economic publication.

In order to address the question whether knowing the "right" people will lead to "professional success", I combine measures derived from social network analysis with methods of survival analysis. To the best of my knowledge, this combination of methods is a novel approach and has not been used in economics so far.

As a first step I construct a network of the adult film industry, where personal interactions are easily observed. From this rather descriptive exercise, we obtain the position of each performer in the industry. In a second step these centrality measures are used as a proxy for connectedness in an empirical analysis to address the central question whether being connected is beneficial for professional success. Contrary to the movie industry, where statistics about box office revenues are published, there are no information on the revenues from adult films. Hence, this paper relies on *survival* in the industry as a measure of economic *success* and argues that one person stays in the industry as long as (economic) benefits exceed costs, which include stigmatization and marginalization resulting from the involvement in the industry. The particularities of duration data require the use of spe-

[3] Determined using `http://www.ams.org/mathscinet/collaborationDistance.html`

[4] `http://www.randalolson.com/2015/03/04/revisiting-the-six-degrees-of-kevin-bacon/` accessed 2015-08-03.

cialized econometric methods: survival analysis. The application of this method has some tradition in economics (Kiefer 1988) and is widely used in the field of industrial dynamics (Mata and Portugal 1994; Disney, Haskel, and Heden 2003; Buenstorf 2007), employment (Hunt 1995; Card, Chetty, and Weber 2007; Kuhlenkasper and Kauermann 2010) and education (Edwards and Ureta 2003; Gury 2011). Regarding the relationship between networking and professional success in academia, there is a strand of literature (Abbasi, Altmann, and Hossain 2011; Bordons et al. 2015; Cimenler, Reeves, and Skvoretz 2014) on the impact of co-authorship networks on "citation performance", showing that centrality is correlated with the authors publication performance measured by their g-index (Egghe 2006). However, in the light of the existence of so called "citation clubs" (Kostoff 1998), where the same authors regularly cite members of their clubs due to sympathy, friendship or strategic career considerations, problems of endogeneity become likely in these type of settings.

The remainder of the paper is organized as follows: Section 2 covers the theoretical background. The industry and the dataset used in the analysis are portrayed in more detail in Section 3. Section 4.1 and 4.2 are concerned with the definition of the two concepts *success* and *being connected*. In Section 5 the survival model is employed to analyze the effect of centrality for success. The results are discussed and put into perspective in Section 6 before Section 7 closes with a conclusion.

2. Social Networks in the Theory of Social Capital

The term social capital has ambiguous meanings encompassing several means or services which a society provides for its members, including institutions as well as social networks. Lin (1999a) is one attempt to structure these different concepts along several dimensions.

One strain of the theoretical debate is concerned with the value of social network, which is the basis for the research at hand. It is relevant to the economic debate as social networks

are a mean to facilitate the flow of information. An early application in labor economics is Montgomery (1991), who shows that in a labor market with adverse selection, well-connected workers are better off than those without large social networks, because firms rely on referrals for hiring to overcome adverse selection. Hence, an individual without contacts to a company would need to exercise substantial effort for signaling and self-marketing.

The theoretical body on social networks can be split into two parts. One strain of the literature, dating back to Granovetter (1973) and Granovetter (1983), analyses the structure of a social network arguing that it is important to have a large social network to derive the largest benefit. This kind of thinking gives rise to the "Strength of weak ties" argument (Granovetter 1973). It says that it is the weak ties between people that are of importance for individuals. Weak ties exist between colleagues, teachers and students, and acquaintances. In contrast, close friends and family members are connected through strong ties. The argument is that individuals connected through a strong link are to a large extent connected to the same people. However, an individual i to whom a person j is connected through weak links only, likely has strong links to persons outside of the immediate neighborhood of j. Hence, a single weak link between i and j increases the size of the social network of i, and hence access to information, by a larger extent, than a single strong link to a close friend f whose network largely overlaps.

The social resource theory, developed by Lin (e.g. described in Lin 1999b), argues that resources are contained inside a social network, which enables an individual to access the resources through the network. Consequently, it is not only important how the network is structured but also with whom a person is connected.

Whether it is link strength or its destination, there is an agreement that social capital is as a resource on which an individual can draw upon through the usage of a social network. This research takes up both theoretical concepts in the empirical estimation, considering not only own centrality (Granovetter) but also the centrality of the persons in the neighborhood

(Lin), as sources for potential success.

3. The Adult Film Industry

The adult film industry is geographically centered in San Fernando Valley, located 30km from Los Angeles. Danta (2009) estimates that in 2009 about 71% of the adult film industry was located in "the valley", with an additional 12% in other parts of the US and only 2% of the industry located abroad. The location provided excellent conditions for the industry, due to the proximity to Hollywood (and thus access to fortune seeking young actors) and the 1988 ruling of the California Supreme Court[5] that the production of adult films is protected as *free speech* under the First Amendment.

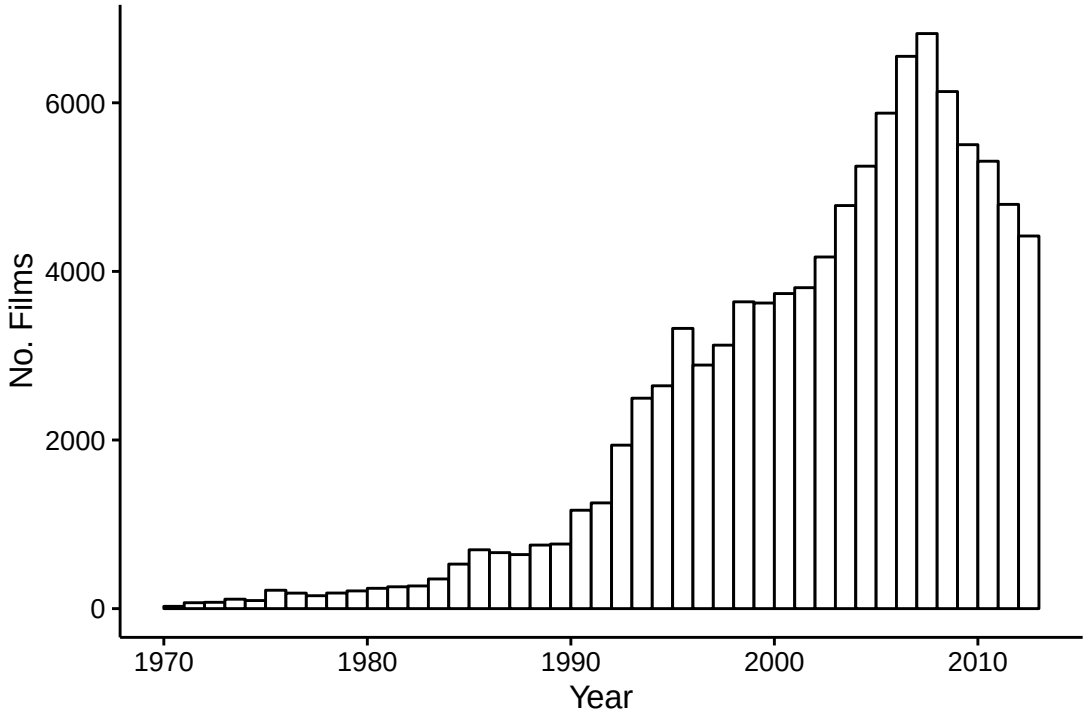
Statistics on adult entertainment are scarce and accuracy of the available data is highly debated. The industry's trade journal, Adult Video News (AVN), estimated 12.8 billion US$ of retail sale in the *Adult Entertainment Subsector* (as cited in Edelman 2009) for the year 2006.[6] The largest part of the proceeds is accounted for by "Video sales and rentals". Still, the revenue from video sales were 15% less than in the previous year, which is in line with the data used in this paper, where the number of films released per year have been declining since 2008 (see Figure 1).

The analysis at hand uses a dataset obtained from the Internet Adult Film Database (`iafd.com`). It consists of 7001 female and 2886 male performers who appeared in 102,871 films (which excludes compilations and web scenes). A comprehensive overview on the wealth of the data on `IAFD.com` can be found in Millward (2013), who goes in great detail about the distribution of places of birth, measurements and hair color. The data used here was downloaded in the last quarter of 2013. Despite the extraction date in 2013 there were already three films included which were to be released in 2014. Although the first film in

[5] The People v. Harald Freeman: see `https://en.wikipedia.org/wiki/People_v._Freeman` accessed February 1st 2016.

[6] For the debate on the validity of this number see Rich (2001), Ackman (2001) and Silverstein (2006).

Figure 1: Number of Films per Year



the database was published in 1951, the analysis focuses on the period between 1970 and 2013, when a sufficient number of films appeared every year. The number of films per year are shown in Figure 1. One observes that the number of films released was growing from the beginning up until 2007, when 6821 films were published. The successive demise can likely be explained by the substitution of DVD-style releases with Internet pornography (for the history of the interplay between pornography and technology see Coopersmith 1998), which is not (to the same extent) captured in the database. To avoid issues of selection bias all web content is excluded from the analysis.

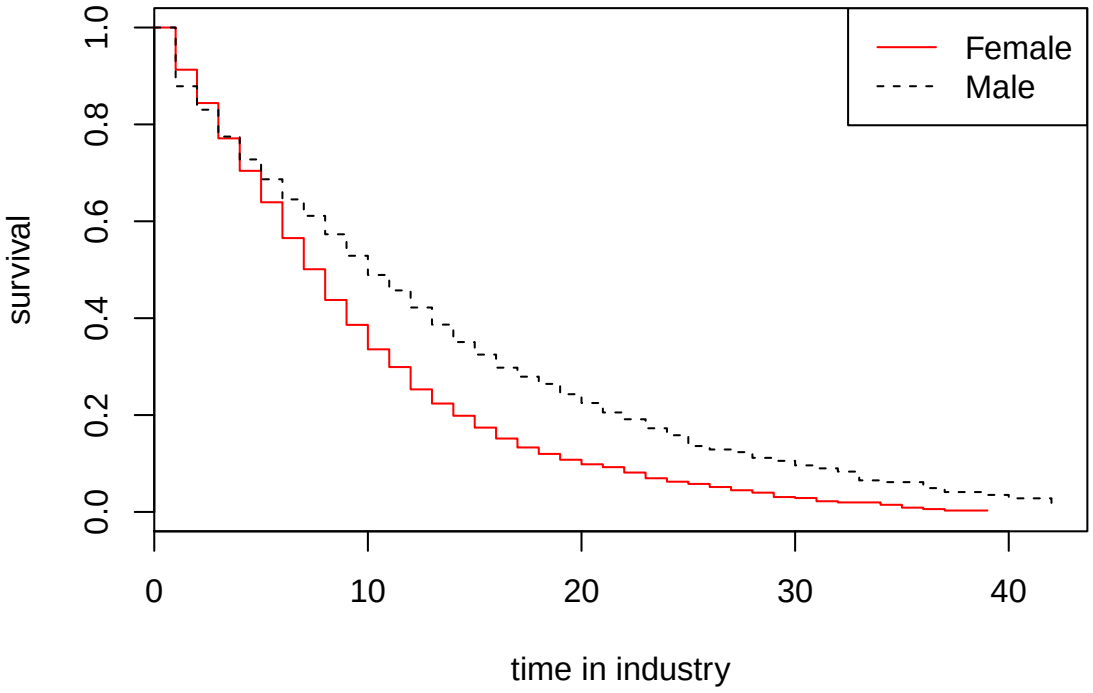
Figure 7 (page 27) shows the network structure in 2013. In the graph nodes represent individual performers which were active in that year. Two performers are connected by an undirected link if they appeared together in at least one film in 2013. While the largest share of female (red) and performers are centered in the middle, there are a few com-

munities of performers completely disconnected from the main network. Moreover, it is interesting to see that there are also groups consisting largely of men (blue) constituting the gay pornography industry sector. There are only very few individuals who connect the homosexual and heterosexual markets.

The question of data quality is a delicate one. In particular information provided by the actors and studios on performer characteristics are potentially flawed. It is not unlikely that the year of birth is misreported for marketing purposes, as it remains questionable if performer *Rose Agree* really joint the porn industry at the age of 87. In total there are 11 performers who joined the industry above the age of 65 and 50 who were below the age of 18. The latter cases can roughly be split in three groups. There are at least two cases were performers were added to a film later when it was re-released on DVD, e.g. resulting in the calculated age of 8, even though the scenes were filmed when the actress was in her twenties. There are also the cases of Tracy Lords (born 1967) and Alexandra Quinn (born 1973) who were later confirmed to be underage at the time of making their first films, which prompted legal action. The recent cases mostly are young Brazilian men, who state to be younger than 18. Compared to the age, the information on which actor appeared in which film is likely much more reliable.

Figure 2 shows the Kaplan-Meier (Kaplan and Meier 1958) estimates of the survival function for male and female performers, the lines indicate the share of performers remaining in the industry after a given number of years. The graph shows that more male than female performers drop out within the first three years. Afterwards, the "survival" of men is higher than that of their female counterparts. A large gap arises after ten years, when only about 30% of women and 50% of men remain in the industry. There are no observations of women who have been in the industry for more than 40 years.

Figure 2: Kaplan-Meier estimate for survival of male and female performers



4. Concepts of Success and Connectedness

This section will further elaborate on the two central concepts and their operationalization in this paper. It starts out with the discussion of *success* and afterwards elaborates on the metric of *network centrality* used in this analysis.

4.1. Survival as Success

Due to absence of direct measures of economic success, like sales, box-office revenues and actors salaries, I adopt the notion that remaining in the business is a success by itself. Based on economic intuition one would argue that a performer leaves the industry, if an activity is no longer worthwhile economically. These changes could result from increases in costs, reduced revenues or arising outside options. Hence, survival in the industry may serve as a proxy for economic success.

For this argument to hold, an actor needs to be, at least to a certain extent, rational and has to have a good understanding of the costs associated with his involvement in the adult film industry. These are not necessarily limited to financial costs, but also include induced societal costs resulting from social stigma or adverse effects on personal health.

Further, the absence of lock-in effects must be assumed. These exists in industries with high fixed costs, which — at least financially — is not the case in the adult film industry. Given an imperfect labor market, lock-in effects could also stem from the lack of outside-options due to high search costs.

4.2. Network metrics

As outlined in the discussion on the theoretical nature of social networks, the career effects of centrality is likely twofold. On the one hand a person can be central in the network herself and thus be well connected. On the other hand it may also be beneficial to be linked to a central person, without necessarily having a very prominent role on the network oneself. Both effects are included in the analysis and measured by betweenness centrality of the performer herself and the centrality in her neighborhood.

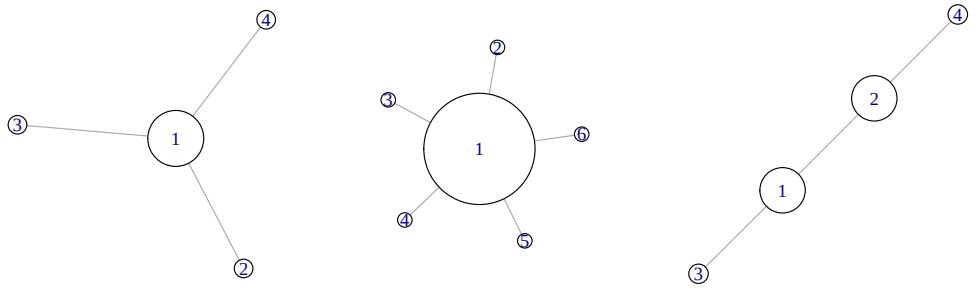
Betweenness centrality

The position of a performer within the network is measured by *betweennes* centrality. It has a meaningful finite value for vertices being outside the network (0), as it is a measure of the ratio of "shortest pathes" leading through a given vertex. The alternative "closeness", measuring the number of steps to every other vertex, would imply a value of infinity for vertices outside the network, which would pose difficulties, when using the data in a subsequent regression analysis.

According to Freeman (1978) the betweeness centrality (C_B) of node i is given by

$$C_B(i) = \sum_{k \neq j; i \notin \{k,j\}} \frac{P_i(kj)}{P(kj)} \tag{1}$$

$P(kj)$ is the total number of shortest paths between the nodes k and j. $P_i(kj)$ indicates the number of shortest paths between k and j leading through node i. Hence the sum over P_i/P for all k and j gives the share of shortest paths leading through node i.



(a) Betweenness of (1): 3 (b) Betweenness of (1): 10 (c) Betweenness of (1): 2

Figure 3: Visualization of Betweenness Centrality

Figure 3 (a and b) shows that betweenness centrality (C_B), indicated by the size of the vertices, for identical shaped networks is influenced by network size. Hence, betweenness (C_B) must be normalized according to

$$C_B^{\text{norm}}(i) = \frac{C_B(i)}{(n^2 - 3 \cdot n + 2)/2}. \tag{2}$$

The denominator is the maximum possible value for C_b, which is the betweeness value in a star-shaped network (Freeman 1977) as a function of the number of nodes (n) in the graph. As shown in Figure (3) the vertex at center of a star-shaped network (a and d) has the maximum betweenness score, given a constant number of nodes, compared to other shapes. This is rather obvious if one compares (a) and (c) in Figure 3, which consists of four nodes each. In the first case all shortest paths between vertex 2, 3 and 4 lead through

the central vertex 1. In (c) only two shortest paths lead through vertex 1 (3–2, 4–3).

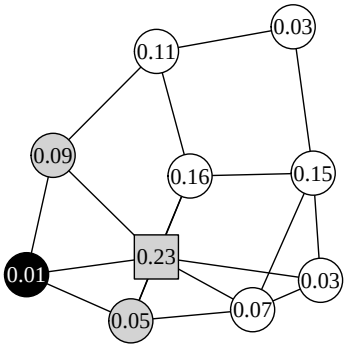
Neighborhood

The neighborhood of a vertex *i* consists of all the other vertices *h* it has a direct connection with. Henceforth, the *maximum neighbor centrality* of a vertex i (MNC_i) is given by

$$\text{MNC}_i = \max_{h \in N(i)} C_B^{\text{norm}}(h) \tag{3}$$

Figure 4 visualizes an example of this measure in a graph. The vertices are labeled with their normalized betweenness scores. For example, the *MaxNeighborCentrality* is to be determined for the black vertex. Among the direct neighbors (grey) the square shaped vertex has the highest value for betweenness ($0.23 > 0.09 > 0.05$). Hence, the MNC for the black node is 0.23, the betweenness value of the square neighbor.

Figure 4: Network showing MaxNeighborCentrality



5. The Relationship between Networking and Success

The empirical analysis in this section analyzes the relationship between the hazard rate, a number of variables indicating the position of an individual in the social network and control variables for gender and age. The Table 1 provides the descriptive statistics for the dataset.

Table 1: Summary Statistics

	mean	sd	median	min	max
event	0.571	0.495	1.000	0.000	1.000
birthyear	1977.180	10.978	1980.000	1900.000	1995.000
startage	24.488	6.671	23.000	*	87.000
StartYear	2001.668	7.983	2004.000	1951.000	2013.000
EndYear	2007.405	6.736	2010.000	1969.000	2013.000
male	0.265	0.441	0.000	0.000	1.000
Centrality	0.001	0.005	0.000	0.000	0.187
MNC	0.018	0.020	0.012	0.000	0.187
disconnected	0.033	0.179	0.000	0.000	1.000

Note: Variables in the top panel are constant across time, whereas the variables in the bottom panel are time varying. For the latter ones descriptive statistics are calculated over all observations in individual and time dimension.

*: Calculated minimal starting age is 8 (Person was added to the film years later). Confirmed minimum age when joining the porn industry is 16 (Traci Lords, Alexandra Quinn).

Cox regression models are the garden-variety model of survival analysis, being widely used in medicine, economics and other fields. The Cox regression model appeals to many applied researchers, because the semi parametric nature does not require any assumptions about the functional form of the (unknown) baseline hazard.

The hazard function in a Cox model is given by:

$$h(t, x) = h_0(t)e^{\beta \cdot x} \tag{4}$$

The unobservable baseline hazard $h_0(t)$ is the risk to experience an event in the absence of any effects of the covariates. As usual x is a vector of explanatory variables, and β is a

vector of the associated coefficients. A common approach is to interpret $e^{\hat{\beta}_x}$ is the ratio of hazards of two individuals differing by one unit in x.

The model makes a proportionality assumption for the hazards, which means that the *effect* of a covariate can not change over time. One should note that time-varying covariates and non-proportional hazards are two different extensions of the Cox model, even though both are deemed "extended" Cox models. However, both extensions, allowing for time varying *values* and/or time varying *effects* of covariates, can be incorporated in the Cox model. While it is straightforward to introduce a duration dependence for the Xs through episode splitting, it may sometimes be difficult to come up with the "correct" functional form for the duration dependence of the βs if one cannot come up with a theoretical explanation for the duration dependence. However, if the functional form is found the duration dependence is simply introduced as an interaction effect with the function of time.

However, according to Allison (2010, p. 422) the effects of violating the proportional hazard assumption are, depending on the research question, often not as grave. The violation of the assumption for a specific covariate would mean that the coefficient represents "some sort of average effect" over the period of observation.

An alternative approach, popular in applied work, to circumvent the problem of non-proportional hazards is the use of parametric survival models. On the downside the fully parametric survival models come with their own assumptions which are at least as restrictive as the proportional hazard assumption of the Cox regression model. They assume that the distribution of survival times is known, e.g. from previous research. The simplest form of hazard function is obtained for the so called exponential model, which only depends on the coefficients and covariate values. The more general Weibull model, allows for a parameter σ different from 1 on the log-exponential distribution of the error terms. Hence, the hazard

function becomes:

$$h(t, x, \boldsymbol{\beta}, \lambda) = \lambda\gamma t^{\lambda-1} e^{e-\lambda\beta_1 x} \tag{5}$$

$$\text{with} \qquad \gamma = e^{-\beta_0/\sigma} \tag{6}$$

$$\text{and} \qquad \lambda = 1/\sigma \tag{7}$$

The shape of the hazard function is usually reported by providing the *shape* (λ) and *scale* (γ) parameters, which are functions of σ, "the variance-like parameter on the log-time scale" (Hosmer, Lemeshow, and May 2008, p 261). The fully parametric nature has the advantage that the model can be estimated by full maximum likelihood, in contrast to the partial likelihood estimation of Cox models. Additionally, one can obtain fitted values to predict survival times.

In Table 2 coefficients for five differently specified survival models are presented. The risk to experience an event in the following period is explained by being *male*, *startage* (age at the time of joining the industry), *MNC* (the maximum centrality value among the neighbors), a dummy to account for *disconnected*ness from the network, and own *centrality*. Column (1) to (3) are semi-parametric Cox regression models. Model (1) is the base specification, which is altered in Model (2) by stratification based on gender (i.e. allowing for men and women to differ in their baseline hazard), justified by the fact that the Kaplan-Meier graph (Figure 2) showed that the two groups (male and female) were affected differently. In (3) interaction terms with time (indicated by ·t) are introduced in order to reflect the issue of non-proportionality. The multiplication of the MNC value with the time (observation time lies in the interval [1,42]) causes the smaller size of the coefficients. Column (4) and (5) are fully parametric hazard models, where the functional form of survival times is assumed to follow a Weibull and exponential distribution respectively. In order to preserve comparability with the Cox models the parametric models are also presented in their proportional hazard notation, thus the signs of the coefficients retain

Table 2: Results (Survival Models)

	Cox			*parametric*	
	prop. hazards			*prop. hazards*	
		strat.	strat. & TT	Weibull	exponential
	(1)	(2)	(3)	(4)	(5)
male	−0.307***			−0.337***	−0.229***
	(0.034)			(0.034)	(0.034)
startage	0.014***	0.014***	0.025***	0.014***	0.013***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
MNC	−20.906***	−20.834***	−15.238***	−18.751***	−20.194***
	(1.458)	(1.459)	(2.153)	(1.427)	(1.442)
centrality	−1,730.909***	−1,728.950***	−2,117.128***	−1,646.382***	−1,608.111***
	(78.680)	(78.723)	(114.598)	(76.170)	(76.170)
disconnected	0.174***	0.162***	0.167***	0.203***	0.123**
	(0.063)	(0.063)	(0.063)	(0.062)	(0.062)
startage·t			−0.002***		
			(0.0005)		
MNC·t			−0.896***		
			(0.285)		
centrality·t			55.260***		
			(10.062)		
log(scale)				2.253***	
				(0.040)	
log(shape)				0.306***	
				(0.010)	
Observations	51,686	51,686	51,686	51,686	51,686
R^2	0.058	0.054	0.055		
Max. Possible R^2	0.789	0.764	0.764		
Log Likelihood	−38,610.690	−35,852.540	−35,829.740	−14,829.660	−15,227.250
LR Test	3,085.291***	2,857.632***	2,903.237***	2,965.14***	2,767.36***
	(df = 5)	(df = 4)	(df = 7)	(df = 5)	(df = 5)

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors in parenthesis

strat: model uses straticiation, allowing for the baseline hazard to differ for male female performers.
TT: interaction with time is included

their interpretation. Using a likelihood ratio test it can be shown that the Weibull model provides the better fit to the data than the exponential model.

The coefficients in a survival model represent the conditional change in the risk to experience an *event* (e.g. leaving the industry) in the following year. Both variables representing the network (centrality and MNC) are both significant and lower the probability to experience an event (i.e. drop out of the industry) in the following period. While the centrality of the neighbor has a rather small effect, there is a large effect of own centrality on the survival. Being disconnected from the network increases the risk to experience an event. These results are consistent across the different specifications of the survival model, which gives strong support to the hypothesis that having worked with well-connected people and being central in the network helps ones own success. As expected from the descriptive work the risk is reduced for male performers and is increasing in *startage*. While the results appear robust across all specifications, the model explains only a fraction of the variation in the hazard rate. Potential further factors influencing entry an exit in the adult film industry include a the social background including heritage, upbringing and outside options, for which information are scarce.

As the size of the effects appear to be similar across model specifications, the effect sizes are discussed exemplary for model 1. Figure 5 shows the relative a hazards for the variables of interest. The top panel shows the relative hazard in comparison to a person with median centrality. To aid readability in the light of the skewed distribution only the interval between minimum and mean is shown. For a person being twice as central as the median performer the relative hazard is reduced by about 10%. This increase in centrality is rather small. Instead of 4×10^{-5} of all connections in the network running through the node, 8×10^{-5} of all connections would run through the node. Due to the skewed distribution the median and the mean lie rather far apart in distribution. Hence, the relative hazard at mean (0.0022) centrality is reduced by over 90%, compared to the median.

Considering the effect of MNC in the middle panel (showing the whole interval minimum

to maximum), the effects are not strong. Increasing ones own MNC by about 3 percentage points will reduce the hazard relative to the median to half. This is a substantial change considering that the maximum lies at 18,7%.

The bottom panel shows the effect of the age at which the performer joins the industry. The risk to leave the industry in the following year increases by 25% when the performer starts at 33 instead of 18.

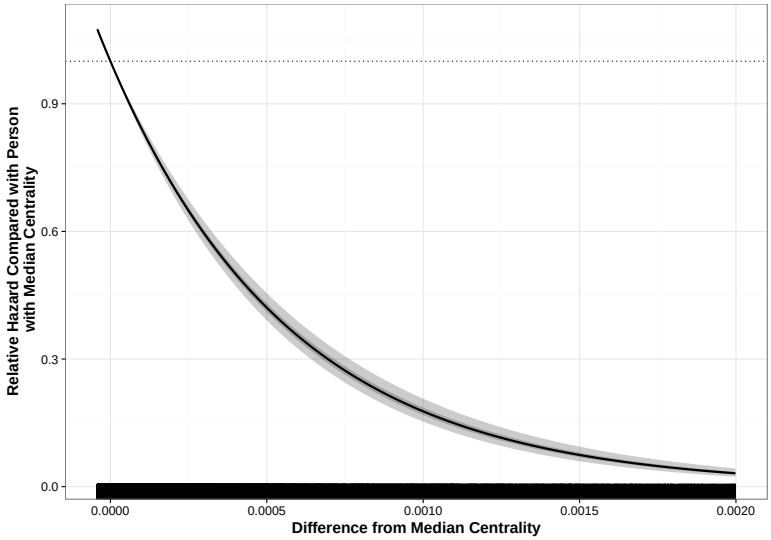
A potential critique concerns the question of endogeneity in the survival models employed. It is no guaranteed that the causality runs from centrality to the size of the network. Unfortunately, there is little one can do in terms of refined estimation techniques as there is a lack of established methods for using instrumental variables in duration models. Otherwise the position in the network could be instrumented by the film studios. However, the problem might not be as severe as it appears on first sight. Taking a closer look at the construction of the network one realizes that the network is not accumulated over time. The network at any given time consists of the collaboration in that year only. Additionally, there is a small time lag of one year between the possible event (in t+1) and the value of the covariate value (in t).

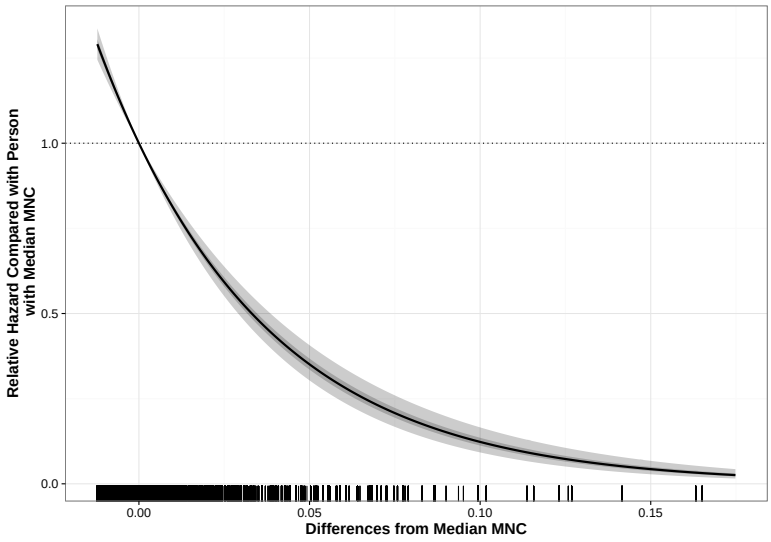
6. Discussion

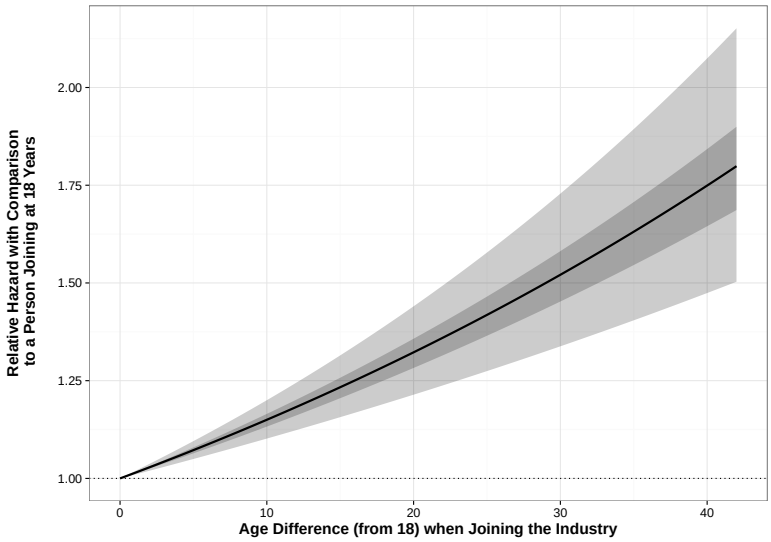
The results found in the empirical analysis are rather strong compared to the empirical literature (see review by Gorman and Marsden 2001), where the evidence on returns on "networking" is often vague and ambiguous. However, several studies show that while networking does not necessarily lead to good jobs, it generally helps to find any job at all (Gorman and Marsden 2001, p. 485). Whether the eventual returns are positive or negative may depend on the specific characteristics and the "quality" of the job in question.

The evidence at hand supports the argument that network social capital is indeed important for individual, professional success. Both measures, own centrality and the centrality

Figure 5: Effects of Coefficients







of the collaborators, have a significant negative impact on the probability to leave the industry. The effect of own centrality is larger by several magnitudes than the effect of position of the collaborator in the network. Hinting at the effect that it is easier to utilize resources from ones own social network rather than the contact through a person one is only loosely connected to through joint work.

Obviously, the measure of success used in the paper at hand differs from those used in the literature, where the measures are usually very direct, e.g. pay rises and promotions. An argument brought up in defense of the empirical literature in Granovetter (1995, pp. 153–154) is that a good initial social network yields an even larger number of ties in the long-term. Thus, the use of social ties today yields even more long-term benefits rather than the immediate outcome. This argument is a strong point in favor of survival analysis, which looks at the lifespan of activity rather than immediate pay-offs.

The adult film industry might be different from other industries. Long contracts are rather unlikely and the data shows that performers appear in films produced by different studios over their career. Hence, one should ask the question whether the results hold any external validity. I argue that similar conditions also exists in other industries which are characterized by short term collaboration like the "ordinary" film industry, scientific collaborations and (to some degree) the music industry.

From a purely econometric perspective, there is no strong argument in favor of a causal relationship. It may well be that one's own centrality, is influenced by survival in the industry. The argument becomes less plausible when considering the centrality of the most prominent "partner" a performer appeared with in a movie: Does someone appear in films with more prominent people the longer he is in the industry? I would argue that in pornography this is not necessarily the case, as there is always a demand for new "faces". (Slattery 2001, p. 243)

7. Conclusion

In this paper I have presented empirical evidence on the relationship between networking and professional success. The study is based on a novel dataset on the adult film industry. To the best of my knowledge, it also the first work to combine survival analysis with methods from social network analysis. It is a drawback of survival analysis that it is difficult to deal with endogeneity, as no established IV-method exists for survival models. Hence, conventional panel models were used to assess the robustness of the results. Therefore, the effect of centrality on an alternative success measure was estimated.

There is consistent evidence, robust over all specifications, that adult performers remain longer in the industry, thus are more successful if they are well connected by collaboration with central actors in the industry and/or are very central themselves. As expected the effect age at joining the industry has a negative effect of prevalence in the industry.

While there is strong support in favor of a positive relationship of networking and success in the analysis at hand, one might expect the adult film industry to be substantially different from other industries. Consequently, one should exercise caution when discussing the external validity of the results. While there is a large body of literature with ambiguous results on various industries and obtained with different methods. It might be wise to consider applying the same method to other industries (e.g. academia), to confirm the findings or determine how the adult film industry differs from other fields.

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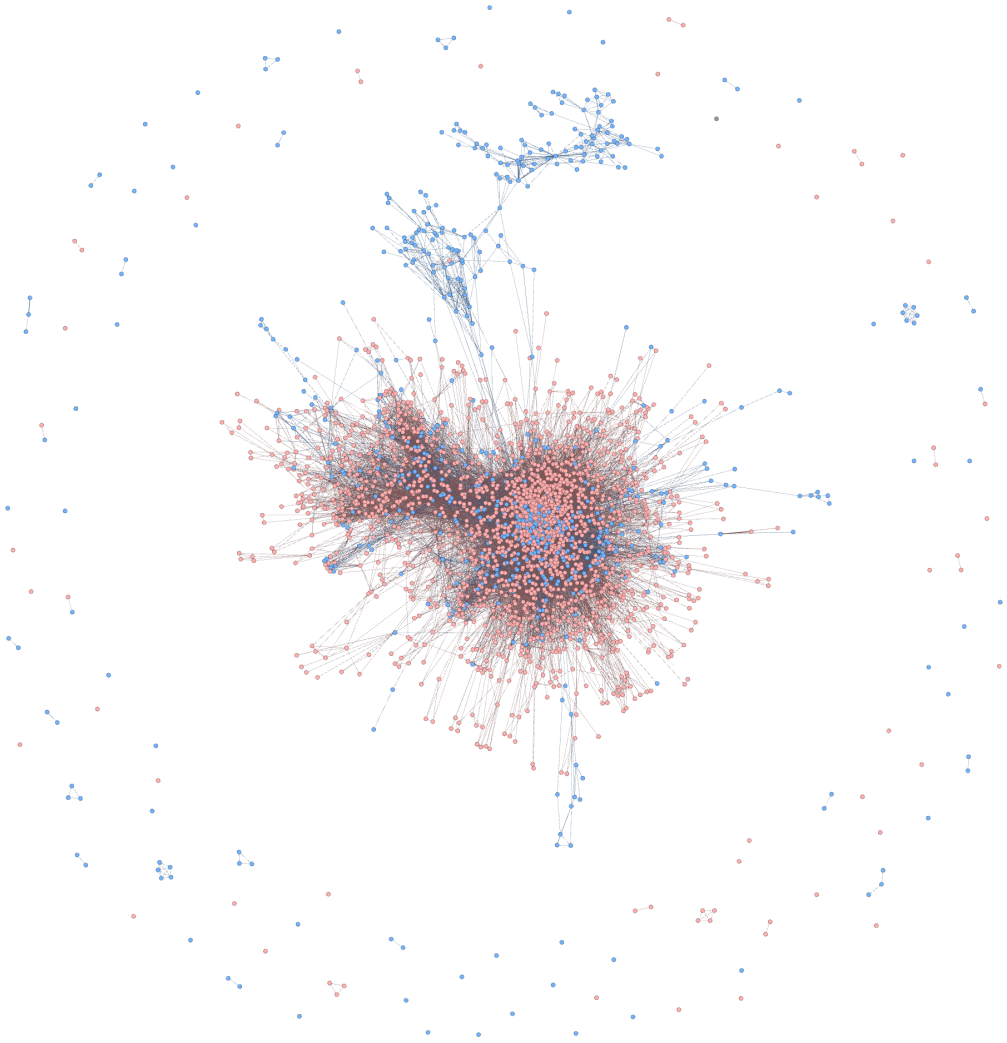
A. Network in 2013

Figure 7: Visualization of the performer network in 2013



Note: Red indicates a female performer, blue indicates a male performer. A link between two dots indicates a joint film appearance.

Technical Note

The computations in the document where conducted using R. The social network analysis was conducted using the package *igraph*[7]. The survival analysis relies on the packages *survival*[8] and *eha*[9]. The pretty tables were created using *stargazer*[10] and *xtable*. The relative hazards are illustrated using simPH[11]

[7] igraph Team (2015), Network Analysis and Visualization. R package version 1.0.1 `http://irgraph.org`.
[8] Therneau,Terry M (2015), survival: Survival Analysis. R package Version 2.38-1.
[9] Broström,Göran (2015). eha: Event History Analysis. R package version 2.4-3.
[10] Hlavac, Marek (2014). stargazer: LaTeX code and ASCII text for well-formatted regression and summary statistics tables. R package version 5.1. `http://CRAN.R-project.org/package=stargazer`.
[11] Gandrud, Christopher. 2015. simPH: An R Package for Illustrating Estimates from Cox Proportional Hazard Models Including for Interactive and Nonlinear Effects. Journal of Statistical Software. 65(3)1-20.