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Creative Success and Network Embeddedness
Explaining Critical Recognition of Film Directors in Hollywood, 1900–2010

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Abstract

This article analyzes how social network structures affect career success in a project-based labor market. The literature on team success has shown that teams perform well if they integrate both weak and strong ties simultaneously. Applying the literature to careers in the creative industries, the study suggests that creative artists are more likely to receive critical recognition if they build their careers in both familiar project networks and heterogeneous sets of creative conventions. It is argued that familiarity and diversity operate as complementary elements in the development of innovative ideas. While diversity is important to maximize the flow of new ideas, it needs to be embedded within trustworthy and familiar network structures in order to fully develop its creative potential. The suggested mechanism is tested by means of full career data of 55,097 film directors, covering 478,859 directing jobs in 330,142 film productions during the years 1900–2010. It is shown that familiarity and diversity explain a considerable part of a director's critical success. Results from interaction effects show that diversity has greater effects on critical success if it is socially embedded within familiar social structures. The article contributes to the emerging understanding of the role of group processes and network structures in explaining individual career success.

Zusammenfassung

Dieser Artikel untersucht, wie soziale Netzwerkstrukturen Karriereerfolg auf einem projektbasierten Arbeitsmarkt bestimmen. Auf der Grundlage von Forschung zu Teamerfolg argumentiert der Beitrag, dass Karriereerfolg in Kreativberufen wahrscheinlicher wird, wenn Karrieren sich sowohl in vertrauten als auch in diversen, mit heterogenen Konventionen ausgestatteten Projektnetzwerken bewegen. Vertrautheit und Diversität wirken als komplementäre Elemente in der Entwicklung innovativer Ideen. Zwar fördert das Element der Diversität den optimalen Austausch neuer Ideen, allerdings muss es, damit sich sein kreatives Potenzial vollständig entfalten kann, zugleich in vertrauensvollen Netzwerkstrukturen eingebettet sein. Anhand eines vollständigen Karrieredatensatzes, der Karriereprofile von 55.097 Filmregisseuren in 478.859 Engagements und 330.142 Filmproduktionen in den Jahren 1900 bis 2010 einbezieht, wird dieser Mechanismus getestet. Es zeigt sich, dass sowohl Vertrautheit als auch Diversität einen Großteil des Kritiker- und Karriereerfolgs der Regisseure erklären. Interaktionseffekte zeigen zudem, dass Diversität einen stärkeren Effekt auf künstlerischen Erfolg ausübt, wenn sie in vertrauten Strukturen eingebettet ist. Insgesamt erweitert die Studie unser Verständnis davon, wie Gruppen- und Netzwerkstrukturen individuellen Karriereerfolg beeinflussen.

Contents

Creative Success and Network Embeddedness: Explaining Critical Recognition of Film Directors in Hollywood, 1900–2010

1 Introduction

In recent years, the "winner-take-all" phenomenon has gained increased attention in the social sciences (Frank/Cook 1995; Rosen 1981; Adler 1985). The phenomenon describes a structure in a labor market in which most actors face precarious and uncertain career situations, while a handful obtain extreme success. Hollywood is an example: A few survive this volatile business and make a very good living; many drop out early. Faulkner and Anderson (1987) show that most directors and producers in Hollywood make only one or two movies. The same holds true for the critical recognition directors receive, as Figure 1 illustrates.[1] A very small fraction of directors accounts for the majority of critical attention in the film business. As can be seen from the figure, about 5 percent of Hollywood directors receive more than 90 percent of all film awards.

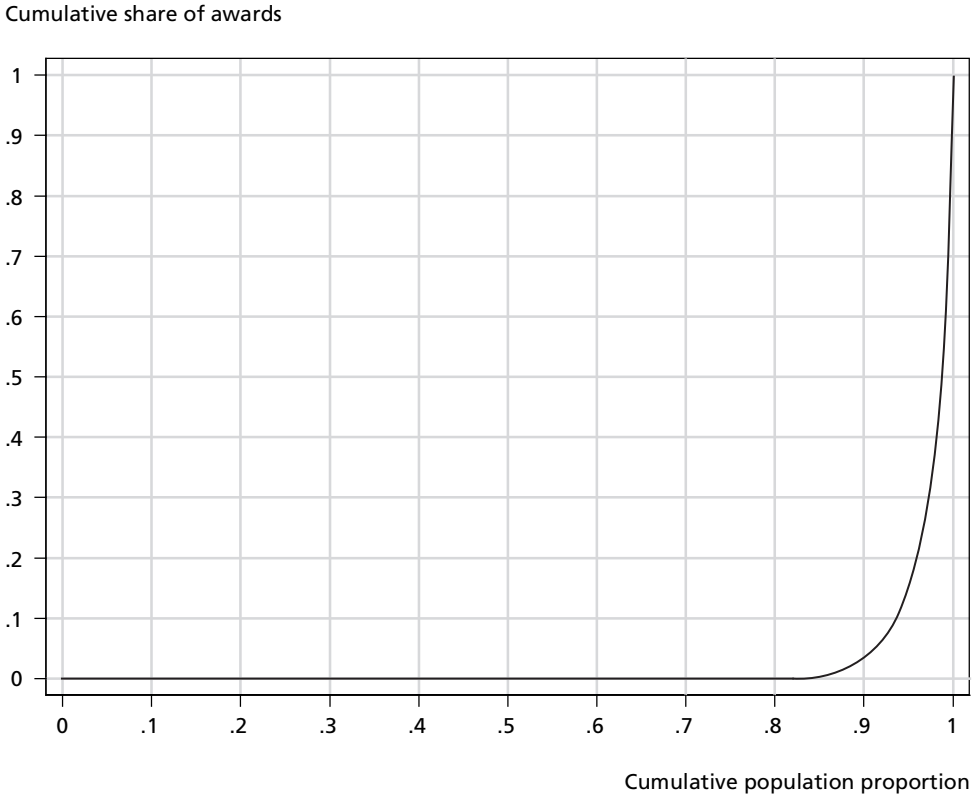
This structure can be found in nearly all professions within the creative industries. Rewards in the art world are heavily skewed toward a minority of superstars who earn the highest share of rewards, while most artists face unemployment, underemployment, and severe income instabilities (Menger 1999: 545). The heavy skewness in the reward distribution among artists has been explained by Rosen (1981) and Adler (1985) as a demand-driven process in which, once the technical level allows a worldwide distribution of the artistic product or service at a constant cost, small differences in talent may yield large differences in reward. According to Rosen (1981), rational consumers have clear preferences for the best talent in the market. The best talent, however, is usually not substitutable with the second-best: listening to second-tier musicians does not substitute the top performer. Reading several bad novels does not add up to the same enjoyment of a page-turner. Consumers instead vote for the best product, which creates large differences in reward between the best and the second-best performer, although "real" differences in talent or quality may be small.

If the talent of a creative artist or the quality of the artistic product is not directly observable, or if talent is uncertain, disputable, or costly to determine – a common feature in many markets (Beckert/Musselin 2013) – rational consumers reduce this uncertainty

The paper greatly benefited from presentations at several workshops, seminars, and meetings. I thank all participants of these events who provided helpful feedback. Specifically, I thank Jens Beckert, Uwe Gotzes, Wilhelm Hofmann, Greta Hsu, Philipp Korom, Olivier Pilmis, and Marcin Serafin for helpful and constructive comments.

1 For more details on the data see below.

Figure 1 Lorenz curve of the total number of awards per director



by looking at the preferences of others (Adler 1985). This rewards artists who are popular already. Once a certain threshold of popularity is achieved (Granovetter 1978), information cascades yield the extreme concentration of demand on a very few actors, products, or services (Bikhchandani/Hirshleifer/Welch 1992; Banerjee 1992). Herds of consumers develop an appetite for the same products, and adapt their decisions accordingly. What follows is a market in which a few superstars receive great rewards, whereas performers with slightly less talent or reputation fail, struggle, or drop out of the market.

These approaches make clear that talent or quality *per se* is not the most important factor in success. Talent is certainly important, but not necessarily a sufficient condition for the accumulation of success. What matters in the art world are *signals for talent*. For this reason, it makes sense to speak of reputation rather than talent as the driver of success (Menger 1999: 557; Becker 1982; White 1993). Reputation indicates a social process in the valuation of the artistic product. Artists with good reputations move ahead in the business, while "those with only moderate reputations do not, and those with poor reputations experience employment difficulties and fail in the market" (Faulkner/Anderson 1987: 881). Reputation is gained either through commercially successful projects, or critically successful projects, or both. If artists accumulate successful projects over their career, "Matthew effects" (Merton 1968), or cumulative advantages (DiPrete/

Eirich 2006) greatly increase chances for future successful projects. But what explains why some are able to gain reputation while others do not? What factors increase the likelihood of building a good reputation over a career?

While the accounts mentioned above explain a large part of the dynamics in the emergence of superstars, the explanation is focused on the demand side of a market, and disregards the specific contexts on the supply side, in other words, the social context and structures of the potential superstars themselves (see also Lutter 2013b). Both Rosen (1981) and Adler (1985) assume talent, or signals of talent, as exogenously given, but do not explain where critical recognition and reputation in the market come from in the first place. The same holds true for models of diffusion and information cascades; the initial signals that trigger diffusion processes remain largely exogenous.

In this paper, I focus on the social structures and contexts of the careers of creative artists in order to explain why some are able to gain critical attention, while others are not. I argue that specific social structures enable the innovativeness and creativity artists need to receive critical recognition from their peers and, ultimately, to build up a significant reputation. Specifically, I draw on social network theory (especially Uzzi 1997, 1999; Uzzi/Spiro 2005; Burt 2004, 2005) and cognitive dissonance theory (Stark 2009; de Vaan/Stark/Vedres 2013, 2011) in order to explain critical success in the US feature-film industry.

To date, most studies have been focused on the performance of creative teams and explain team-level success (Reagans/McEvily 2003; Reagans/Zuckerman 2001; Uzzi 1997, 1999; Uzzi/Spiro 2005; Perretti/Negro 2006, 2007; Vedres/Stark 2010; Girard/Stark 2002; de Vaan/Stark/Vedres 2013). But how networks and cognitive dissonance affect individual career success has rarely been studied (on artistic careers generally, however, see Cattani/Ferriani 2008; Giuffre 1999; Accominotti 2009; Menger 2009). The literature on teams suggests that familiar network structures and exposure to heterogeneous, diverse creative conventions work as complementary elements in the creation of innovative ideas (Uzzi/Spiro 2005). While diversity is important to maximize the flow of ideas, it needs to be embedded within trustworthy familiar social structures in order to fully develop its creative potential (Stark 2009; de Vaan/Stark/Vedres 2013). I argue that being embedded in these creativity-enhancing network structures positively affects individual career success. Using individual-level career data of 55,097 film directors, I test this argument. Controlling for human capital measures, I find that familiarity and diversity explain a considerable part of a director's individual critical success. Interaction effects show that diversity has greater effects on critical success if it is socially embedded within familiar social structures.

2 Theory

The social embeddedness of economic action (Granovetter 1985) has been a landmark concept in the study of markets, organizations, and economic life. However, the demonstration that market processes are structured by social networks is still an ongoing empirical and theoretical challenge. We still do not know what specific types of social structures affect market outcomes, nor exactly when and how they do so.

In order to explain success among creative artists, the literature on team success, social networks, and social capital is of particular importance (Portes 1998; Adler/Kwon 2002; Burt 2005; Coleman 1988, 1990; Lin 2001; Granovetter 1973). Within this literature, there are two basic views on how social structures affect success (Burt 2001). One goes back to Coleman's thoughts on social capital; the other is rooted in Granovetter's weak-ties theory and Burt's structural-holes approach. From these viewpoints, "success" is a function of either network density or network diversity.

The first approach views dense networks as a creator of social capital and a facilitator of performance (Coleman 1988). Dense networks are social structures in which each network member is familiar to all or most other members in the network. For instance, within a film production team, members form a dense network if many in the team know each other from past collaborations. The more members know each other, the more familiar the team will be.

This form of social embeddedness affects individual performance in two ways (Burt 2001: 37). First, familiar networks ease the exchange of information and the transfer of knowledge. This is especially true with regard to reliable or important information, knowledge of high complexity or quality (Reagans/McEvily 2003; Reagans/Zuckerman 2001; Rost 2011; Podolny/Baron 1997; Hansen 1999; Moran 2005: 1147; Smith/Collins/Clark 2005). The exchange of knowledge is fostered because members in dense networks develop trust through their repeated interaction. They establish reciprocal group norms that impose a set of obligations and expectations on the individual group member (Coleman 1988: 107). This makes cooperative behavior more likely, which positively affects performance.

Second, familiar networks enhance the coordination capacity of the team (Reagans/Zuckerman 2001; O'Reilly/Caldwell/Barnett 1989). Especially in environments with high market uncertainty, market actors stabilize coordination processes by relying on those with whom they have collaborated in the past (Podolny 1994; Geertz 1978: 30; Beckert 1996). Project-based labor markets such as the film industry are characterized by high uncertainty in several ways (Faulkner/Anderson 1987: 884): work is innovative, non-routine, flexible, and creative. At the same time, investments in capital are high, but market outcomes are economically risky, uncertain, and hard to predict, largely due to unstable demand patterns. Reliance on prior collaborators in team construction is a way to reduce uncertainties in the market.

It is easier to coordinate and to adjust action and to perform complex tasks if actors know and trust each other (Podolny/Baron 1997: 676). Familiar networks convey distinct frames of action within which their members can concentrate on their tasks and improve their performance. By contrast, unfamiliar, low-density networks create unclear, contradictory, or multiple frames of action within which coordination and communication become much more demanding.

Research shows that the positive effect of familiarity on performance is reversed when network density becomes too strong (Uzzi/Spiro 2005; Uzzi 1997, 1999; Giuffre 1999), which speaks against Coleman's positive view on dense networks. For instance, in their study of Broadway musicals, Uzzi and Spiro (2005) demonstrate a nonlinear, inverse u-shaped relationship between the artistic success of musicals and the network density of musical team members. Performance and success increase with network density up to a certain level. After this threshold, performance decreases with higher levels of embeddedness (for further examples, see Uzzi 1997, 1999; Giuffre 1999). In the case of high density, both coordination capacity and information flow are maximized, but this comes at the expense of reduced ability to come up with innovative ideas. The reason is that within high-density networks, the ideas that are shared become repetitive and redundant. They originate from the same people, who share similar demographic backgrounds, and have potentially been exposed to related experiences. High-density teams hold identical standards of knowledge. They agree on the same artistic or creative conventions. While these resources can be well coordinated because team members trust and know each other, the creative output is far from being novel, groundbreaking, or innovative. Hence, overly high-density teams gain less critical attention and success, which, if associated with these teams, becomes a liability for an artist's career success.

While overly dense teams might be beneficial in some contexts,[2] they are especially harmful in the context of creative work. The creative industries are forced to create permanent novelty. A movie earns critical recognition if it delivers a constant flow of novel experiences; this is what Hutter (2011) terms "infinite surprises" as a generator of "praise value." While a successful creative product undoubtedly uses and builds on conventions, it twists or combines these in an innovative way into new forms (Becker 1982: 63). Generating newness, however, becomes difficult in a context of high-density networks in which redundant information constrains innovative ideas.

2 In his classic paper, Coleman mentions the case of high school dropouts, the likelihood of which is much lower within dense family networks (Coleman 1988: 109–116). Still, as Burt (2001: 46) notes, it is debatable whether or not mere prevention from dropping out of school forms a good criterion for success.

In sum, this discussion suggests that while familiarity among team members increases creative performance and potential success in an art world, high levels of density and cohesion can potentially undermine the innovative flow of ideas. This should have direct effects on the career paths of creative artists, depending on whether they are more often associated with familiar teams, or with cohesive, overly familiar teams:

H1: Directors who build their career within familiar collaboration networks achieve higher rates of critical success.

H2: Directors who build their career within cohesive collaboration networks show lower rates of critical success.

The second view argues that success and performance are positively affected by exposure to heterogeneous, diverse sets of people, information, ideas, and cultures. This viewpoint goes back to Burt's concept of structural holes (Burt 1992; Burt 2001; Burt 2005), which itself starts with Granovetter's (1973) strength of weak ties hypothesis. In addition, it has origins in concepts such as Lévi-Strauss' notion of "*bricolage*" (Lévi-Strauss 1966) as well as March and Olson's organizational theory of exploration, ambiguity, and choice (March 1991; March/Olsen 1966).

The basic argument is that actors in a brokerage position who bridge two or more otherwise unconnected and diverse networks gain important competitive advantages over those located within rather than between groups (Burt 1992). Moreover, brokers enrich both worlds by bringing new ideas into a core group. Brokers are hence in a better position to create new ideas and to produce innovative outcomes (Burt 2004).

The positive effect of brokerage has been demonstrated in empirical research. For instance, Giuffre (1999) shows in her study of New York fine art photographers that those who are embedded in a loosely connected network of ties between artists and galleries obtain more critical success than those who are either not connected at all – and struggling to survive – or those who have a few strong connections to galleries.

Being embedded in a diverse set of network relations also serves as a protection against career failure. This is especially true for freelancers or project workers who have to rely on a large net of customers who might call for their services on future occasions (Becker 1982: 86), for job seekers who extend their search routes through the non-redundant information of weak-tie connections (Granovetter 1974; Godechot/Mariot 2004), or for disadvantaged labor market groups such as women, who benefit from a diverse set of job-relevant relationships (Lutter 2013a).

The approach also applies at the team level: If a team is designed in such a way that it recruits members from different disciplines, or with different creative or cultural backgrounds, this increases the chances that different ideas will be explored and combined in innovative directions (March 1991; Perretti/Negro 2006, 2007). For instance, most

scientific knowledge production happens in teams nowadays, and scholarly papers published by more than one author are more likely to be successful (Wuchty/Jones/Uzzi 2007), especially if co-authorship consists of cross-institutional (Abramo/D'Angelo/Solazzi 2011: 630) or cross-national (He/Geng/Campbell-Hunt 2009) collaboration. A team's productivity and success are enhanced when authors are included who are likely to bring in diverse ideas.

Hence, a career that moves through diverse cultural structures is more likely to be creatively successful. Artists exposed to larger sets of different genre conventions are likely to create new, innovative ideas by combining these conventions. In addition, Stark (2009: 17) emphasizes in his research that creativity requires both diverse informational structures *and* familiar settings within which people trust and know each other. Building on Burt's notion of structural holes, this is what Vedres and Stark (Vedres/Stark 2010) call "structural folds" – the simultaneous organization of familiar and diverse structures that increase innovativeness (also see: Girard/Stark 2002; Beunza/Stark 2003, 2004; de Vaan/Vedres/Stark 2011).

Putting diversity into familiar structures enhances creativity because taken-for-granted knowledge must be re-evaluated. In a diverse team context, different conventions engage in competition with each other, collide, and grind against one another. This leads to the redefinition of standards and to new combinations. What follows are creative mutations that are the source of newness (Stark 2009: 18–19). This is what Uzzi and Spiro (2005) describe in their paper on Broadway musicals (see also Uzzi 1999), but do not directly test. In their example of the collaboration of two musical producers drawing on different conventions, Uzzi and Spiro note:

> Together they creatively combined the musical and lyrical conventions of the whimsical lovers with those of the doomed lovers […]. This risky creative gamble was supported by their close personal relationship, which had formed two years earlier during *Oklahoma* (1943), their first musical together. In this way, the distribution of different conventions and personal relations around an art can inspire creativity either by revealing previously unseen connections in material or by necessitating that an innovative solution be found that enables a synthesis of different material. (Uzzi/Spiro 2005: 461–462)

In sum, exposure to a diverse set of conventions increases the likelihood that creative artists will produce creative, innovative products which gain critical recognition. In addition, the effect of diversity on critical success is increased if diversity is organized within familiar social structures.

H3: Directors who build their career within diverse and heterogeneous network structures show higher rates of critical success.

H4: The diversity effect increases with familiarity: Directors achieve highest rates of critical success if they build their career within both diverse and familiar network structures.

3 Data and method

I test the proposed hypotheses using full career path data from 55,097 film directors who at least once during their careers directed a US feature film. I focus on film directors because directors are the main figures responsible for the creative and artistic outlet of a production, as opposed to the producers who are mainly in charge of its financial aspects (Baker/Faulkner 1991). Specifically, a director is responsible for the artistic and creative vision of a production. Movies are identified with their director; he or she defines a movie's specific "signature." At the same time, directors draw reputation and critical acclaim from their production. The director is also important in bringing together and managing the film crew, and "plays a critical role in coordinating the efforts of other crewmembers, solving possible conflicts, and facilitating internal cohesion and communication" (Cattani et al. 2013: 9).

The data come from the IMDB, an internet encyclopedia that lists almost every feature film production ever released, including credit information on all actors and staff members (actors and actresses, producers, directors, cinematographers, editors, and so on). Currently, the database contains data on about two million productions and four million individuals.[3]

Each director's career path starts with his/her first movie production and ends with the last entry. This creates an unbalanced panel dataset in which the number of observations per director equals the total number of productions over a whole career. I include a director's full career profile if the director at least once directed a US feature-film production. This ensures that I capture the US labor market of film directors in its entirety.[4] Feature films are movies that were shown in a movie theater, and usually released at a film festival. I do not include TV productions, TV series, and video-only movies, such as pornographic films. The final sample includes a total of 478,859 directing jobs by 55,097 directors in 330,142 films between 1900 and 2010.

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3 The IMBD data are managed by editors who update the data regularly and ensure their validity. Film fans support them by reporting errors. Even actors themselves, or other members of a film crew, are allowed to provide information to the IMDB editors. Its good data validity is also known to social science research; several influential studies obtained important sociological insights using these data (Hsu 2006; Hsu/Hannan/Koçak 2009; Rossman/Esparza/Bonacich 2010; Zuckerman et al. 2003; Zuckerman/Kim 2003).

4 The aim of this procedure is to cover the full US labor market of film directors. This represents the best solution of constructing the sample. Other inclusion criteria produce a biased sample. For instance, if I just include directors "born in the US," an attribute in the IMDB, the sample will be biased by success. The reason is that there is missing data on this criterion for many of the unknown directors. Hence, this procedure produces a sample in which only famous directors are included. Since our dependent variable is a measure of success, estimates would be biased.

Dependent variable

I use the cumulative number of awards as a measure of critical success. I include all nominations and awards a director received at an important festival, either personally (for example, in a category such as "best director") or for the movie (that is, if the film as a whole was nominated or won an award in a category such as "best film"). I record the data from the 44 US-wide and internationally most acknowledged festivals (Gebert 1996; O'Neil 2001; Gemser/Leenders/Wijnberg 2008). This includes the fourteen high-ranking US film awards (such as the Academy Awards or the Directors Guild of America Awards), the fourteen top international film festivals (such as Berlin, Cannes, or Venice), plus sixteen second-ranked "B" festivals (such as European Film Awards, London Film Festival, or Toronto International Film Festival), as shown in Table A1 in the appendix. Each award enters the equation with an equal weight, for which there is a reason: First, there is no theory justification on how to appropriately weight each single award. Second, the film industry creates a "natural" weight: Those directors who receive the most prestigious awards (like the Oscar) are likely to receive many of the second-tier awards. In that sense, prestigious awards do not need to be weighted higher, because directors will receive more awards anyway.

Predictors

Table 1 lists descriptive statistics of all variables used for the analysis. Hypotheses 1 and 2 relate critical success to the type of embeddedness in the social structure of the labor market. To test H1, I use the variable *familiarity* in order to estimate the extent to which a director works in teams consisting of people knowing (and possibly trusting) each other, based on the intensity of past collaborations. Familiarity is a way to measure network density among team members. The measure goes back to Newman (2001), and has been used in a similar fashion by Reagans et al. (2005), de Vaan et al. (2011), Cattani et al. (2013) and Lutter (2013a). I adopt this measure from de Vaan et al. (2011: 13), but modify it for the individual career level. The variable is a cumulated standardized average of dyadic past collaborations for each film team over a director's career. It is zero if there is no repeated collaboration among any of the team members in any team the director has been working with, and it takes on positive values if there is prior collaboration. The higher its values, the higher the degree to which a director works in teams in which team members know each other and share experience from past productions. The appendix provides information on the technical details of this measure as well as on the predictors discussed below.

Table 1 Descriptive statistics of all variables

Variable	Mean	Std. dev.	Min	Max
Cumulative number of awards	5.31	21.68	0	659
Familiarity	77.71	810.08	0	22842.56
Cohesion	318.16	1866.80	0	51772.24
Vertical strong ties	194.63	1300.15	0	21134.05
Horizontal strong ties	98.21	598.92	0	11290.53
Degree of exploration	4.67	6.66	0	99.26
Genre spanning	115.47	288.17	0	4312
New genre	12.03	14.87	0	186
Genre diversity	12.63	24.96	0	359.55
Age	41.91	10.80	3	86
Female	0.09	0.29	0	1
Origin USA	0.40	0.49	0	1
Origin UK	0.03	0.17	0	1
Origin Germany	0.02	0.13	0	1
Origin France	0.02	0.15	0	1
Origin Italy	0.02	0.14	0	1
Prior success	2.71	17.33	0	659
Years in business	11.26	11.45	0	85
Job experience	56.92	137.07	1	2268
Has been producer	18.01	115.13	0	2209
Has been actor	24.17	54.60	0	595
Has been writer	6.21	19.12	0	337
International visibility	3.39	9.53	0	199
Major titles	54.75	135.35	0	2209
Sequels	1.32	8.32	0	287
Novels	3.35	6.78	0	88
Titles in English	38.26	99.50	0	1476
Titles in Spanish	1.49	9.29	0	231
Titles in German	0.99	6.56	0	210
Titles in French	1.32	6.58	0	171
Titles in Italian	0.90	6.23	0	181
Production country USA	49.38	136.20	0	2209
Production country Germany	0.74	6.12	0	174
Production country France	1.53	9.40	0	359
Production country Italy	1.06	7.10	0	191
Crew size	27.78	31.11	1	1311
Team human capital	35.16	67.16	0	2266
Team star power	2.79	5.94	0	432
Hierarchical layer structure	3.21	3.37	0	58
Time	43.04	35.67	1	111

While familiarity represents the strength of past collaboration within a team, it does not measure any sort of density that goes beyond an average quantity of prior relationships between pairs of team members. In order to measure the degree to which a team consists not only of familiar ties, but also of stronger, cohesive ties, I use three different approaches.

First, I use a modified version of a team-based cohesion variable that was developed by de Vaan et al. (2011: 13–14). Specifically, I apply their team-based measure to the individual level by accumulating over all entries of a director's career. At the team level, the quantity captures the degree of cohesion of a present team, derived from past col-

laborations of interconnected subgroups of at least three persons. For instance, if three crew members collaborated in a prior production and reassemble in a later movie, this production is more cohesive because a full clique rather than a dyadic tie collaborates again. The variable takes on positive values, and the higher the values, the more recurring cohesive structures from the past constitute a present team. If instead no clique of former collaboration exists within a team, the measure takes the value 0. I use the cumulative over a director's career path in order to capture past associations in cohesive teams.

Second, I create two measures of cohesion that refer directly to the position of the director (taken from: Delmestri/Montanari/Usai 2005: 990). The first is the cumulative of a director's *horizontal strong ties*. For each time point *t* in a career of director, I accumulate the number of times he or she directed a film with the same producer. In the same way, the variable *vertical strong ties* accumulates the number of times a director has been collaborating with the same actor or actress in present team. While the first variable measures strong-tie relationships on the managerial side of a production, taking horizontal ties between the director and the producers into account, the second quantifies strong ties vertically, between directors and actors, and hence relates to the artistic level of a production. Higher values of both variables indicate that a director tends to build a career within closer tie structures.

In order to test H3 and H4, I construct a total of four measures that capture different aspects of diversity. The first variable is the *degree of exploration* within each production, counted as the proportion of newcomers per team, and accumulated over a director's career. In line with March (1991) as well as Perretti and Negro (2006), I suppose that the more newcomers enter a team, the higher the extent to which fresh, uncommon, or progressive perspectives and ideas are being explored within a production. The more a director has been exposed to newcomer exploration within teams, the more likely a director's critical success.

The next three variables consider the director's individual experience with different artistic categories. Every film in the database is classified by a combination of up to 28 genre categories, such as drama, comedy, sci-fi, or crime. For instance, Kubrick's "Spartacus" (1960) carries the genre codes action, adventure, and biography, whereas "A Clockwork Orange" (1971) has the labels crime, drama, and sci-fi.

The variable *genre spanning* counts and accumulates at each point in time the absolute number of different genre categories a director has been exposed to over his/her career (see Hsu 2006). The more a director manages to cover different artistic categories, the broader his/her experience is with diverse artistic conventions, standards, and cultures (Zuckerman et al. 2003; Hsu 2006; Hsu/Hannan/Koçak 2009).

The variable *new genre* accumulates over time the number of a director's movies in which the attached genre categories constitute a completely new combination of genres for the respective director; in other words, the combination did not previously occur

in the director's career path. This variable measures a director's propensity to engage in new categories, which displays personal tendencies to leave familiar paths and to move to unknown artistic territory. While *genre spanning* measures the extent to which a director has been exposed to diverse genre categories, cultures, and conventions, *new genre* takes into account the extent to which a director actively pursues this exposure.

Finally, the variable *genre diversity* measures the average genre distance between all members of a film crew. Again, I adopt this measure from de Vaan et al. (2011: 11–12) and adapt it to the individual level by accumulating it over a director's full career path. Genre diversity at the team level is based on the individual genre histories each team member brings in from all prior productions. The measure is based on Jaffe's renowned dissimilarity index (Jaffe 1986) and has been used in a similar way by Rodan and Galunic (2004), Lutter (2013a), Phelps (2010), and de Vaan et al. (2011). In the technical appendix, I describe the construction in detail. At the team level, the measure is 0 if all members in a team share exactly the same genre history. It takes on positive values if members in a team differ in their genre histories. The cumulative of this variable quantifies the extent to which a director compiles, directs, and works within teams that are either more homogenous or more heterogeneous with regard to genre experiences. The higher the value of this measure, the more diverse the director's career path is with regard to genre diversity of prior teams.

Covariates

In order to rule out possible effects on the dependent variable, I use several controls at the individual and team level. First, I use a set of director-specific socio-demographic controls. This comprises *age*, measured in years, *female*,[5] and *country of origin* (five dummies for USA, UK, France, Germany, and Italy).

Second, I include a number of human capital measures to control for talent, experience, and seniority, as well as the human capital qualities of the team. *Prior success.* This variable counts the number of awards a director received prior to the current production. *Years in business.* This is the number of years the director has remained, or "survived," in the film business, counted from the director's first to last production at time point *t*. *General job experience.* This is the total number of movies the director has made by time *t*. *Specific experience: Has been producer/actor/writer*. These three variables count at each time point *t* the number of times the director has worked as producer, actor, or writer. Changing role types is a signal for a broader range of accumulated skills. This displays

5 The IMDB only provides the gender of actors and actresses. For directors, I had to compute this variable by automatically imputing gender information based on lists of female and male first names. This worked for about 73 percent of individuals in the data. For the remaining 27 percent, about 15,000 individuals, the gender information was coded manually.

more stable and successful careers (Baker/Faulkner 1991), and is likely to affect critical success. *International visibility.* This variable measures the international visibility and experience level of the director, which I assume should affect critical success. For each of a director's film productions, the measure counts and accumulates over time the number of production countries involved in the film and the number of languages in which the title was released. The home country or language is excluded from this count. *Major titles.* The accumulated number of a director's titles either produced or distributed by a major company. As opposed to independent productions, majors have substantial budgets and attract larger audiences through wider distribution channels and effective marketing. *Sequels.* This is the director's cumulative number of sequel productions. Sequels build on the popularity of their forerunner. Sequels often receive substantial box-office returns. *Novels.* Accordingly, this is the cumulative number of productions that were based on a novel. On average, titles based on a novel are more successful than movies based on previously unknown scripts. *Titles in English/ Spanish/ German/ French/ Italian.* These five variables count the number of English-language productions (Spanish-, German-, French-, Italian-language, respectively) the director has been involved in. *Production country USA/Germany/France/Italy.* Similarly, these four variables count the number of titles that were produced in the USA (UK, Germany, France, Italy, respectively). Both sets of variables account for possible heterogeneity due to language or country of production, which might differently affect the likelihood of receiving awards. *Crew size.* Since I do not have a direct measure for budget or box-office returns, I control for the number of members in a production. According to Rossman et al. (2010), this can be seen as an approximation of budget and, eventually, box-office returns. Productions with larger teams generally have higher production costs; at the same time, costly movies usually do well at the box office (though the correlation is not perfect). *Team human capital.* This variable measures the extent to which a team consists of experienced members. It accumulates the average experience level of the team for each film production, based on the total number of each team member's movie productions up to time point *t*, divided by crew size. The higher the value of this variable, the more experienced the team is. *Team star power.* This measure calculates the average number of awards each team member had received until the current production. Hence, it measures the extent to which the team consists of stars. *Hierarchical layer structure.* This variable counts the total number of producers and directors for each production. Previous research shows that the more co-directors or co-producers are involved, the higher the constraints on the creative vision of a director, which might have a negative effect on critical success (Perretti/Negro 2006: 767).

Analytical strategy

The dependent variable is a count variable, so I use count modeling to take advantage of the data effectively. Specifically, I employ random- and fixed-effects negative binomial regression models to account for overdispersion and to fully exploit the panel structure

in the data.[6] Since the dependent variable has a large amount of zeros, this might suggest the use of zero-inflated models. However, it should be noted that the zeros are completely "true" in the sense that each individual has a positive chance to receive an award. There are no "excess zeros," which would occur if some individuals have no chance of receiving an award (in which case, a zero-inflated model would be the appropriate tool) (Cameron/Trivedi 1998: 123).

Count data are sometimes modeled through OLS regression using log transformation of the dependent variable. Such an approach, however, is also not appropriate in this case since the log transformation would reduce the dispersion in the dependent count variable and it is precisely this dispersion in which this study is interested. That success across individuals is highly scattered is a natural feature of this labor market, and logging the dependent variable would lessen the ability to estimate this winner-take-all characteristic.

This is also the reason why I mainly focus on a random-effects approach rather than fixed-effects because fixed-effects models would drop all time-invariant variables as well as all directors who appeared in just one production, in addition to those without variation on the dependent variable (applies in total to about 75 percent of all directors). However, since a fixed-effects model allows stricter tests on causality due to its "within logic" in the interpretation of coefficients, and since fixed-effects estimations are generally better at ruling out possible endogeneity problems, I additionally run and present the results of a fixed-effects regression on the full model (see results section below, Table 2, Model 6).

Since the timeframe of the study covers more than a century, there might be general time trends affecting both the dependent as well as the independent variables. To account for such an unobserved heterogeneity due to time, the full model includes the logged number of years from 1900. Controlling for time is also important because many awards are relatively new and were established after 1970.[7] Thus, chances of receiving an award might increase with time, though probably at a marginally diminishing rate. In addition to time, all models control for possible heterogeneity due to genre. Some film genres might impart a greater chance of receiving awards. Therefore, I include dummies for all of the 28 genres. To control for skewness and diminishing marginal effects, most predictors enter the regression log-transformed.

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6 Likelihood ratio test strongly suggest that the usage of negative binomial models is superior to the Poisson model. All test results can be made available upon request.

7 I tested several dummies for certain time periods (silent era, studio-system era). Results do not change if I include these other specifications of time. However, since I have no theoretical justification for how to define the timeframes, it seems to be a better solution to use the logged time counter.

4 Results

Table 2 displays the regression results. Model 1 is a baseline model that starts with the first set of control variables, the socio-demographic background variables, and the individual-level human capital measures. Model 2 enters the main predictors. Model 3 adds the regional controls such as language and country of production. Model 4 includes the remaining team-level controls, and Model 5 controls for the time trend. Model 6 replicates the full model using a fixed-effects rather than random-effects regression. All six models include the 28 genre dummies.

The control variables, to begin with, show that critical success is associated with higher age, being female, prior success, years in the business, being experienced as a producer (but not as an actor or writer), having international visibility, having produced titles in the English language and produced in the United States, with a larger budget, with less team seniority, but with higher team star power. Producing more major titles or sequels reduces critical success, whereas scripts based on novels increase critical attention. The fact that women have higher chances of receiving awards is an interesting ancillary finding, which, as it is not the focus here, might be of interest for future studies (but see Lutter 2012).

The main predictors largely confirm the proposed hypotheses. As can be seen from the familiarity variable, H1 is supported. The more a director builds a career within familiar affiliation networks, the more likely it is that he or she will achieve higher rates of critical success. In contrast, if the affiliation becomes too strong, this is detrimental for creativity and innovativeness. Cohesive structures impart strong negative effects on critical success. This is shown by the negative coefficients of cohesion and vertical strong ties. It seems that especially the density among the "creative" members negatively affects critical success, because the coefficient of horizontal strong ties – that is, strong ties between director and producer – positively affects critical success. Relationships between the main "heads" of a production are crucial for the trust that is needed for creativity and innovativeness in output. Hence, H2 is supported for the "creative" domain, but not necessarily with regard to the business side of a production – which makes sense in light of the theory assumptions on the relation between information sharing and the generation of creative ideas.

The diversity measures, too, point in the expected direction: The more a career is built within diverse and heterogeneous structures, the better this is for creative success. This is true for the individual attachment to different genre cultures, as shown by the genre-spanning variable, as well as for the individual tendency to explore new creative fields, as shown by the new-genre variable. The association is also supported for genre diversity. These coefficients show that the diverse environments in which directors build their careers have strong effects on a director's likelihood of receiving critical attention and success. The only exception is the degree of exploration, which is positive in the first

Table 2 Random and fixed-effects negative binomial regression on cumulative number of awards

	(1)	(2)	(3)	(4)	(5)	(6)
Age (ln)	0.563*	0.408*	0.377*	0.188*	0.205*	0.296*
	(47.971)	(33.210)	(31.775)	(16.789)	(18.175)	(25.942)
Female	0.471*	0.556*	0.491*	0.429*	0.453*	(n.i.)
	(21.693)	(24.842)	(21.709)	(18.239)	(19.120)	
Origin USA	0.068*	–0.073*	–0.217*	–0.197*	–0.224*	(n.i.)
	(4.579)	(–4.881)	(–13.256)	(–11.819)	(–13.324)	
Origin UK	–0.217*	–0.304*	–0.251*	–0.176*	–0.173*	(n.i.)
	(–5.373)	(–7.574)	(–5.782)	(–3.912)	(–3.808)	
Origin Germany	–0.320*	0.297*	0.525*	0.512*	0.478*	(n.i.)
	(–6.382)	(5.716)	(10.368)	(9.548)	(8.731)	
Origin France	–0.365*	–0.038	0.238*	0.089	0.043	(n.i.)
	(–8.409)	(–0.862)	(5.188)	(1.936)	(0.936)	
Origin Italy	0.296*	0.873*	1.332*	1.139*	1.130*	(n.i.)
	(4.985)	(13.276)	(18.008)	(15.785)	(15.362)	
Prior success (ln)	0.037*	0.033*	0.033*	0.026*	0.025*	0.025*
	(48.349)	(44.991)	(46.313)	(40.086)	(38.423)	(38.506)
Years in business (ln)	0.273*	0.312*	0.297*	0.235*	0.248*	0.202*
	(82.778)	(89.599)	(87.517)	(73.381)	(75.531)	(62.220)
Job experience (ln)	0.020	–1.300*	–1.420*	–0.964*	–1.058*	–0.983*
	(1.974)	(–59.646)	(–63.665)	(–43.635)	(–47.061)	(–43.835)
Has been producer (ln)	0.076*	0.029*	0.013*	–0.006	0.001	–0.003
	(23.108)	(8.272)	(3.762)	(–1.808)	(0.197)	(–0.935)
Has been actor (ln)	–0.124*	–0.073*	–0.036*	–0.048*	–0.036*	–0.067*
	(–28.744)	(–14.001)	(–6.890)	(–9.427)	(–7.045)	(–13.067)
Has been writer (ln)	–0.039*	–0.037*	–0.022*	–0.006	0.001	0.010
	(–9.007)	(–8.549)	(–5.034)	(–1.382)	(0.334)	(2.353)
International visibility (ln)	0.435*	0.336*	0.496*	0.392*	0.394*	0.391*
	(99.252)	(73.572)	(85.049)	(71.006)	(71.536)	(70.573)
Major titles (ln)	–0.085*	–0.170*	–0.015	0.041*	0.085*	0.134*
	(–10.603)	(–20.558)	(–1.718)	(4.782)	(9.549)	(14.743)
Sequels (ln)	0.130*	0.012	–0.008	–0.007	–0.008	–0.008
	(32.831)	(2.853)	(–1.974)	(–1.706)	(–2.069)	(–1.967)
Novels (ln)	0.508*	0.376*	0.393*	0.290*	0.273*	0.282*
	(86.949)	(62.027)	(65.883)	(51.532)	(48.162)	(49.516)
Familiarity (ln)		0.132*	0.157*	0.078*	0.076*	0.108*
		(13.823)	(15.867)	(8.136)	(7.881)	(11.126)
Cohesion (ln)		–0.036*	–0.049*	–0.049*	–0.053*	–0.060*
		(–5.102)	(–6.842)	(–6.892)	(–7.452)	(–8.297)
Vertical strong ties (ln)		–0.111*	–0.084*	–0.053*	–0.060*	–0.050*
		(–21.382)	(–15.723)	(–10.431)	(–11.867)	(–9.780)
Horizontal strong ties (ln)		0.060*	0.077*	0.071*	0.065*	0.062*
		(15.063)	(18.853)	(17.896)	(16.257)	(15.630)
Degree of exploration (ln)		0.010	0.124*	–0.126*	–0.079*	–0.025
		(0.750)	(9.177)	(–9.630)	(–5.933)	(–1.851)
Genre spanning (ln)		0.787*	0.626*	0.542*	0.536*	0.428*
		(45.916)	(34.925)	(31.318)	(31.007)	(24.633)
New genre (ln)		0.603*	0.449*	0.317*	0.322*	0.340*
		(39.884)	(29.774)	(21.831)	(22.200)	(23.226)
Genre diversity (ln)		0.473*	0.525*	0.659*	0.699*	0.628*
		(20.242)	(21.178)	(27.021)	(28.521)	(25.517)
Titles in English (ln)			0.093*	0.050*	0.057*	0.043*
			(9.333)	(4.988)	(5.751)	(4.291)
Titles in Spanish (ln)			–0.044*	–0.050*	–0.043*	–0.049*
			(–9.350)	(–11.096)	(–9.536)	(–10.768)
Titles in German (ln)			–0.053*	–0.058*	–0.063*	–0.058*
			(–10.770)	(–12.291)	(–13.470)	(–12.430)
Titles in French (ln)			0.074*	0.064*	0.065*	0.063*
			(13.735)	(12.632)	(12.876)	(12.385)
Titles in Italian (ln)			–0.034*	–0.029*	–0.028*	–0.013
			(–6.239)	(–5.468)	(–5.278)	(–2.437)

(continued on next page)

Table 2 (continued)

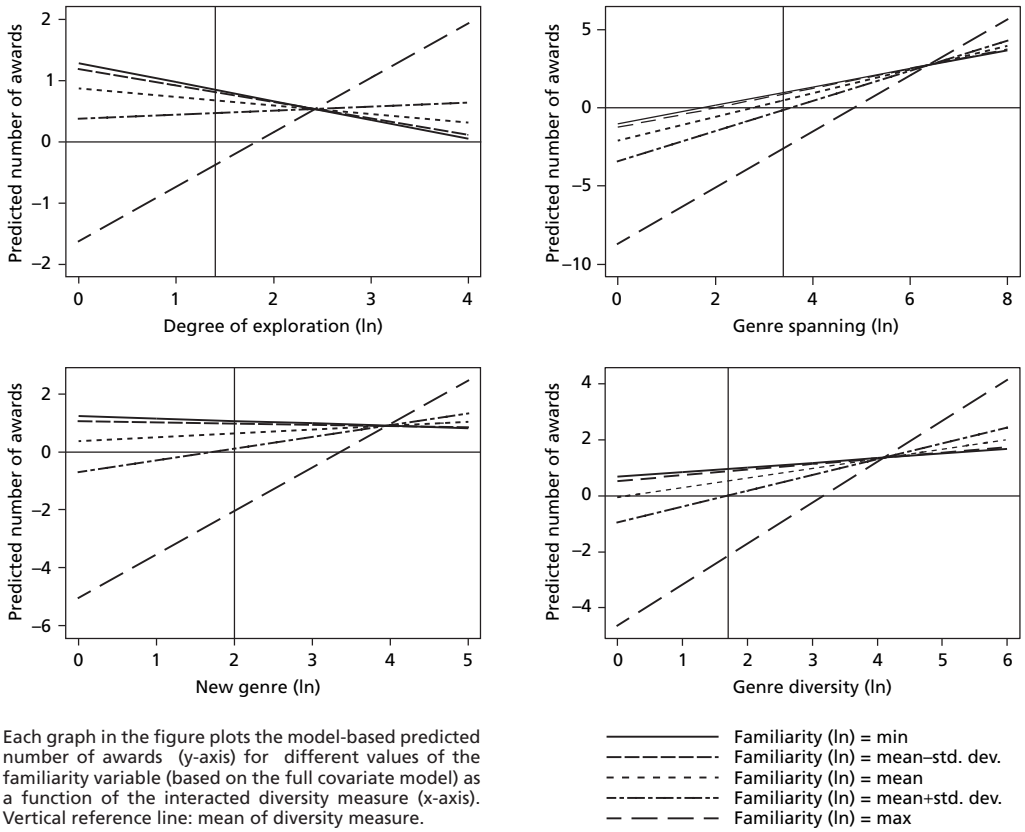
Production country USA (ln)			0.081* (11.055)	0.074* (10.037)	0.083* (11.337)	0.070* (9.604)
Production country Germany (ln)			–0.211* (–57.623)	–0.160* (–45.191)	–0.132* (–35.469)	–0.151* (–40.252)
Production country France (ln)			–0.203* (–38.237)	–0.148* (–29.243)	–0.142* (–28.146)	–0.139* (–27.624)
Production country Italy (ln)			–0.067* (–12.315)	–0.070* (–13.419)	–0.077* (–14.840)	–0.071* (–13.795)
Crew size (ln)				0.037* (18.458)	0.035* (17.396)	0.032* (15.653)
Team human capital (ln)				–0.265* (–92.039)	–0.260* (–91.011)	–0.264* (–91.888)
Team star power (ln)				0.335* (146.472)	0.333* (146.609)	0.329* (144.125)
Hierarchical layer structure (ln)				–0.032* (–13.542)	–0.032* (–13.736)	–0.030* (–12.409)
Time (ln)					0.058* (23.063)	0.037* (14.291)
Constant	–2.332* (–55.640)	–2.623* (–55.259)	–2.294* (–48.743)	–1.459* (–31.901)	–1.714* (–36.213)	–1.776* (–38.010)
Ln(r)	–0.141* (–10.844)	–0.092* (–6.972)	–0.052* (–3.896)	0.065* (4.804)	0.061* (4.475)	
Ln(s)	–2.136* (–141.192)	–2.116* (–138.973)	–2.160* (–141.559)	–2.088* (–135.730)	–2.067* (–134.260)	
Genre dummies	yes	yes	yes	yes	yes	yes
Log likelihood	–464141.963	–459412.467	–455512.965	–444636.205	–444369.087	–380763.899
Chi^2	332506.514	345351.941	355175.429	407514.604	411221.269	409884.367
AIC	928379.927	918936.934	911155.930	889410.411	888878.174	761651.798
BIC	928911.726	919557.367	911876.076	890174.873	889653.715	762291.844
N (directors)	55097	55097	55097	55097	55097	8503
N (engagements)	478859	478859	478859	478859	478859	224880

Note: Random-effects (Models 1–5) and fixed-effects (Model 6) negative binomial regressions; t statistics in parentheses; * $p < 0.001$ (two-sided tests); n.i. = not identifiable within fixed-effects regression; ln = logged variables.

models, but becomes negative after I control for team human capital and star power (and is insignificant in the fixed-effects model). Despite this ambiguity, H3 is well supported by three out of four diversity measures.

Regarding the robustness of the findings, the results remain absolutely stable within the fixed-effects estimation in Model 6. This model is only capable of estimating time-variant variables, and therefore drops all data with no time-variation as well as all directors with no variation on the outcome variable. For the remaining 8,503 directors, the coefficients offer a better causal interpretation and show how changes in the predictor variables directly affect outcomes *within* a director's career. As the table shows, the results also confirm this stricter causal test on the data.

Figure 2 Interaction effects for familiarity and measures of diversity



Each graph in the figure plots the model-based predicted number of awards (y-axis) for different values of the familiarity variable (based on the full covariate model) as a function of the interacted diversity measure (x-axis). Vertical reference line: mean of diversity measure.

H4, finally, makes an interaction argument: The familiarity effect should become stronger with increasing diversity. Figure 2 tests this assumption. The figure plots the interaction effects of the familiarity variable and the four diversity measures. Each panel in the graph shows one interaction, each based on the full regression model, including the predictors, the interaction term, and all controls.[8]

Each graph in the figure plots the model-based predicted number of awards (y-axis) for different values of the familiarity variable, based on the full covariate model, as a function of the respective diversity measure (x-axis). All other controls are fixed at their means. Each line in the graphs represents the effect of the familiarity variable for a specific value and shows how the expected number of awards for this value varies with regard to the diversity measure. The values of the familiarity measure are chosen in order to represent its distribution. This includes the lowest and highest value, the mean, and the mean +/– one standard deviation above and below the mean. The vertical line on the x-axis displays the mean of the diversity measure.

8 The regression models are shown in Table A2 in the appendix.

The results of the interaction effects largely support H4: For familiarity scores above the mean, the expected number of awards generally increases with more diversity. For scores below the mean, the increase is either at a very moderate level or the expected count does not increase at all. Therefore, as predicted, the familiarity effect is generally stronger when it meets heterogeneous and diverse cultural and social structures. Vice versa, diversity has a greater effect on creativity and critical success if its creative potential is socially embedded within familiar social structures. If diverse structures are not socially embedded in familiar organizations – in other words, if directors operate within teams with no team familiarity at all – then the effect on success is about zero (that is, the line in the diagram has a zero slope). The slope is even negative for new genre, team diversity, and degree of exploration. In this case, increasing diversity reduces the expected critical success. Diversity, while generally being a positive feature in the art world, can then become detrimental for creativity if it is not "bounded" in familiarity.

5 Discussion and conclusion

This article analyzes the individual career patterns of an almost complete population of creative artists: directors of feature films. In line with prior research (Stark 2009; Uzzi/Spiro 2005; de Vaan/Stark/Vedres 2013), the results suggest that familiar network structures and exposure to diverse creative conventions work as complementary elements in the creation of innovative ideas. Improving on existing research, however, this study shows that these features greatly affect individual careers as well. Career diversity maximizes the flow of different ideas, expands the creative palette, and broadens a director's creative vision. Furthermore, this creative potential is boosted if it exists within trust-enhancing familiar social ties that enable and optimize the coordination of creativity and information flow.

The paper therefore adds to the literature on teams by showing that team composition matters not only for team success but also for individual careers. The findings demonstrate that creativity and innovativeness – which I argue are reflected in the critical success of a director – depend on factors largely outside the individual's ability and experience level, but are related to the specific social surroundings in which a director is embedded. Hence, the study suggests that critical recognition derives not only from the merit of individual talent, but is also affected by the specific "art world" (Becker 1982) or the social structures within the labor market that strengthen or weaken individual success.

Talent and human capital certainly represent important factors in career success, and the study's control variables demonstrate their significant effects. This paper shows, however, that contextual factors have their own effects whether creative artists gain critical attention or not. Ronald Burt is probably right to note that human capital points to

individual ability, but "social capital refers to opportunity" (Burt 1998: 7). Only within socially structured opportunities can individual ability bloom and achieve major success, but without the right opportunities, talent alone will not be enough in a market like this. The paper therefore adds to the literature on explaining winner-take-all structures by pointing out that it is not only talent that matters: the structural positions that create opportunities for gifted individuals are equally important.

However, designing the right team, creating a good mixture between familiar and diverse social and cultural structures, and being in the "right" social positions are abilities that might come from individual talent. Some people might have more talent to strategically create and attach themselves to those social structures that enable success. While there might be some truth in this, I believe that Katherine Giuffre is right when she concludes from her study that careers are not linear "ladders" on which one either moves up or down, but "sandpiles of opportunity" in which each individual's career is structurally connected to all other career paths, and in which each career step, each move from project to project, changes the network and opportunity structure of everybody else in the labor market (Giuffre 1999). It is in that sense that mere ability is not decisive for individual success, but also requires opportunities created through social structures of interconnected ties, affiliations, and prior collaborations.

Despite the study's effort to draw on as complete career data as possible, there are certain limitations. One limitation comes from that fact that the study draws solely on career data from feature films, not from related fields, such as TV or theater productions, in which film directors might also engage. Hence, the study cannot estimate whether these missing data affect its results. However, if the assumption holds that the missing data generating process is "MCAR" – missing completely at random – then this omission is largely unproblematic (Little/Rubin 2002). In other words, if we assume that the mechanism that leads directors to seek TV and theater projects is uncorrelated with the study's main variables, then the lack of data is negligible. I leave it to future research to decide whether this assumption holds or not, and whether the study's results can be replicated within different artistic domains.

The findings of the study might be generalized beyond the specific labor market for film directors and be applied to other labor markets in which innovation, creativity, and/or critical recognition play a crucial role for generating reputation and career success, for instance, in the careers of journalists, musicians, designers, politicians, academics, managers, or even professional sports players. Future research could test the study's findings on these other areas and see whether or not the same effects apply.

The findings are also important on a much broader scale than the empirical setting might suggest. As Jones and DeFillippi note (1996), the project-based film industry is probably prototypical of what is to come: the economy has been shifting from a hierarchical organization of labor to network and team-based production (Castells 1996). Careers are becoming "boundaryless" (Arthur/Rousseau 1996). Work is switching from

manual labor to creative and knowledge-driven project work (Boltanski/Chiapello 2005). Hence, the 1900 to 2010 network structure of the film business probably offers a natural test laboratory for explaining outcomes in other sectors of the current twenty-first century market economy.

Appendix

Technical details on the construction of the study's predictors

Let $C \coloneqq \{c_1, \ldots, c_T\}$ the set of all film productions, where smaller indices correspond to earlier release dates. For $c \in C, P(c) \coloneqq \{p_1^c, \ldots, p_{n_c}^c\}$ denotes the set of the n_c individuals in film team c and $S \coloneqq \bigcup_{c \in C} P(c) = \{1, \ldots, N\}$ is the set of all persons ever involved in a production. For $i, j \in S, \delta_{ij}^c$ is defined as 1 if $\{i, j\} \subset P(c)$ and 0 otherwise, i.e. δ_{ij}^c is 1 if and only if i and j collaborated in production c. For the sake of convenience, I also introduce the index set $I(r) \coloneqq \{(i,j)\colon (i > r \wedge j = r) \vee (i = r \wedge j < r)\}$.

Familiarity is defined as:

$$\text{Familarity}_{c_t} = \sum_{\tau=1}^{t} \sum_{i>j} \frac{\delta_{ij}^{c_\tau}}{n_{c_\tau} - 1}$$

To give co-workings in smaller teams more weight, supposing that collaborators are more familiar with each other if they had collaborated in a smaller production as opposed to larger ones, each term of the sum is adjusted by $n_{c_\tau} - 1$.

For any individual $r \in S$, I accumulate all δ_{ij}^c's over all c's that are relevant for r up to production t:

$$\text{Familarity}_t(r) = \sum_{\tau=1}^{t} \frac{1}{n_{c_\tau}} \sum_{I(r)} \frac{\delta_{ij}^{c_\tau}}{n_{c_\tau} - 1}$$

At the team level c, *Cohesion* is given by:

$$\text{Cohesion}_c = \frac{\sum_{v \neq w} (1 + L_{vw}^c) \frac{S_v}{S_c}}{2(q_c - 1)}$$

where q_c is the number of cliques (at least three individuals) within a current team c who collaborated at least once in a prior production. This yields a non-symmetric $q_c \times q_c$-matrix $\boldsymbol{L}^c$ for each team c, within which each matrix element L_{vw}^c is the ratio of the number of individuals occurring both in clique v and w to the cardinality S_v of clique v. Analogously, S_c is the total number of crew members in c. Accumulating all entries of $\boldsymbol{L}^c$ over all c's where r was involved yields an individual level measure that captures the cohesiveness of r's career at each point in time t:

$$\text{Cohesion}_t(r) = \sum_{\tau \leq t \,\wedge\, r \in c_\tau} \text{Cohesion}_{c_\tau}$$

Genre diversity. At the team level, this measure computes the average distance between all members of a film crew, based on the genres of each team member's prior productions. To build this variable, I use the full database consisting of a total of 1,650,006 individuals affiliated in 1,052,724 movie productions. This way I have access to the full genre histories of any team member located in the director dataset I use for the main analysis. Using these data, I first determine each team member's genre background on the basis of the 28 genre dummies in the database. For each team member in a current team, I accumulate the number of productions in each of the 28 genres with which a team member was affiliated during his/her career (prior to the current production). I repeat this procedure for all teams in the database. Then for each team $c \in C$, I compute *K*-dimensional vectors $f_i^c = (f_{i1}^c, \ldots, f_{iK}^c)$, where f_{ik}^c is the fraction of crew member *i*'s genre history in genre category *k*. Based on Jaffe (1986), the genre distance *d* between a team member *i* and *j* is derived by:

$$d_{ij}^c = 1 - \left(\frac{\sum_{k=1}^{K} f_{ik}^c f_{jk}^c}{\left(\sum_{k=1}^{K} f_{ik}^{c\,2}\right)^{\frac{1}{2}} \left(\sum_{k=1}^{K} f_{jk}^{c\,2}\right)^{\frac{1}{2}}} \right)$$

d_{ij}^c ranges between zero and one. Zero means that both genre backgrounds between members *i* and *j* are exactly the same. Value one means that *i* and *j* share the maximum possible difference in their respective genre histories, i.e. they have never worked in the same genre. The genre diversity index of *r* at time *t*, then, is the total of all d_{ij}^c's, adjusted for crewsize n_c, and accumulated over all c of a person's career path up to the current project at time *t*.

$$\text{Genre diversity}_t(r) = \sum_{\tau=1}^{t} \frac{1}{n_{c_\tau}} \sum_{I(r)} d_{ij}^{c_\tau}$$

Additional tables

Table A1 List of film awards

Awards USA	International "A" festivals	International "B" festivals
Academy Awards	Berlin International Film Festival	European Film Awards
Broadcast Film Critics Association Awards	Cairo International Film Festival	German Film Awards
Directors Guild of America Awards	Cannes Film Festival	Ghent International Film Festival
Golden Globe Awards	International Film Festival of India	London Critics Circle Film Awards
Independent Spirit Awards	Karlovy Vary International Film Festival	London Film Festival
Laurel Awards	Locarno International Film Festival	Miami International Film Festival
Los Angeles Film Critics Association Awards	Mar del Plata Film Festival	Monaco International Film Festival
MTV Movie Awards	Montreal World Film Festival	Moondance International Film Festival
National Board of Review Awards	Moscow International Film Festival	Norwegian International Film Festival
National Society of Film Critics Awards	San Sebastian International Film Festival	Sarajevo Film Festival
New York Film Critics Circle Awards	Shanghai International Film Festival	Seattle International Film Festival
People's Choice Awards	Tokyo International Film Festival	Thessaloniki Film Festival
Screen Actors Guild Awards	Venice Film Festival	Toronto International Film Festival
Writers Guild of America Awards	Warsaw International Film Festival	Undine Awards, Austria
		Vienna International Film Festival
		Zurich Film Festival

Table A2 Count regressions including interaction effects

	(1)	(2)	(3)	(4)
Familiarity (ln)	–0.290* (–22.489)	–0.769* (–42.402)	–0.628* (–40.156)	–0.532* (–37.068)
Cohesion (ln)	–0.019 (–2.599)	0.011 (1.460)	0.003 (0.353)	0.017 (2.261)
Vertical strong ties (ln)	–0.053* (–10.443)	–0.059* (–11.486)	–0.059* (–11.615)	–0.059* (–11.696)
Horizontal strong ties (ln)	0.046* (11.375)	0.052* (12.902)	0.046* (11.311)	0.053* (12.928)
Degree of exploration (ln)	–0.306* (–21.483)	–0.130* (–9.734)	–0.172* (–12.869)	–0.129* (–9.709)
Genre spanning (ln)	0.621* (35.978)	0.589* (34.226)	0.727* (41.708)	0.659* (38.033)
New genre (ln)	0.251* (17.412)	0.219* (15.140)	–0.088* (–5.480)	0.234* (16.187)
Genre diversity (ln)	0.447* (17.912)	0.294* (11.350)	0.422* (17.100)	0.163* (6.225)
Age (ln)	0.241* (21.415)	0.234* (20.758)	0.243* (21.615)	0.239* (21.169)
Female	0.473* (19.792)	0.430* (17.967)	0.448* (18.712)	0.436* (18.182)
Origin USA	–0.199* (–11.717)	–0.166* (–9.764)	–0.174* (–10.181)	–0.156* (–9.145)
Origin UK	–0.148 (–3.217)	–0.147 (–3.276)	–0.130 (–2.856)	–0.136 (–3.020)
Origin Germany	0.510* (9.186)	0.538* (9.576)	0.542* (9.665)	0.536* (9.535)
Origin France	0.015 (0.312)	–0.099 (–2.124)	–0.040 (–0.856)	–0.066 (–1.419)
Origin Italy	1.097* (14.674)	1.047* (13.999)	1.078* (14.227)	1.055* (14.120)
Prior success (ln)	0.025* (38.031)	0.025* (38.280)	0.025* (38.002)	0.025* (38.379)
Years in business (ln)	0.227* (67.933)	0.219* (65.101)	0.223* (67.251)	0.215* (63.982)
General job experience (ln)	–0.705* (–29.669)	–0.610* (–25.381)	–0.599* (–25.451)	–0.612* (–25.793)
Has been producer (ln)	–0.009 (–2.553)	–0.013* (–3.808)	0.003 (0.943)	–0.013* (–3.755)
Has been actor (ln)	–0.043* (–8.397)	–0.029* (–5.670)	–0.043* (–8.308)	–0.033* (–6.327)
Has been writer (ln)	0.009 (2.207)	0.012 (2.765)	0.012 (2.961)	0.008 (1.961)
International visibility (ln)	0.402* (73.601)	0.397* (72.836)	0.399* (73.100)	0.399* (73.117)
Major titles (ln)	0.057* (6.382)	0.078* (8.782)	0.063* (7.151)	0.079* (8.928)
Sequels (ln)	–0.039* (–9.923)	–0.042* (–10.774)	–0.063* (–15.807)	–0.044* (–11.147)
Novels (ln)	0.259* (46.023)	0.270* (48.102)	0.232* (41.058)	0.265* (47.263)
Titles in English (ln)	0.049* (4.912)	–0.001 (–0.088)	0.033* (3.365)	0.008 (0.816)
Titles in Spanish (ln)	–0.061* (–13.444)	–0.061* (–13.427)	–0.068* (–15.087)	–0.059* (–12.975)
Titles in German (ln)	–0.080* (–17.141)	–0.083* (–17.621)	–0.092* (–19.472)	–0.083* (–17.688)
Titles in French (ln)	0.064* (12.645)	0.070* (13.920)	0.059* (11.762)	0.072* (14.262)
Titles in Italian (ln)	–0.029* (–5.519)	–0.024* (–4.645)	–0.033* (–6.372)	–0.026* (–5.037)

(continued on next page)

Table A2 (continued)

Production country USA (ln)	0.104* (14.193)	0.112* (15.159)	0.116* (15.674)	0.120* (16.108)
Production country Germany (ln)	–0.139* (–37.573)	–0.126* (–33.951)	–0.128* (–34.603)	–0.124* (–33.516)
Production country France (ln)	–0.130* (–25.901)	–0.115* (–22.816)	–0.114* (–22.483)	–0.114* (–22.614)
Production country Italy (ln)	–0.074* (–14.394)	–0.058* (–11.306)	–0.059* (–11.487)	–0.060* (–11.617)
Crew size (ln)	0.033* (16.809)	0.034* (17.040)	0.033* (16.769)	0.033* (16.489)
Team human capital (ln)	–0.256* (–90.419)	–0.245* (–86.340)	–0.246* (–86.892)	–0.247* (–87.152)
Team star power (ln)	0.321* (141.848)	0.313* (137.212)	0.311* (136.454)	0.313* (137.740)
Hierarchical layer structure (ln)	–0.028* (–11.806)	–0.024* (–10.226)	–0.024* (–10.408)	–0.024* (–10.075)
Time (ln)	0.057* (22.803)	0.048* (19.052)	0.054* (21.429)	0.046* (18.230)
Familiarity*Degree of exploration	0.119* (41.555)			
Familiarity*Genre spanning		0.121* (55.465)		
Familiarity*New genre			0.159* (56.099)	
Familiarity*Genre diversity				0.130* (58.262)
Constant	–1.928* (–40.722)	–1.888* (–39.748)	–1.858* (–39.526)	–1.991* (–41.844)
Ln(r)	0.069* (5.072)	0.074* (5.412)	0.077* (5.652)	0.076* (5.542)
Ln(s)	–2.061* (–134.340)	–2.073* (–135.102)	–2.081* (–136.097)	–2.076* (–135.413)
Genre dummies	yes	yes	yes	yes
Log likelihood	–443523.516	–442784.995	–442833.334	–442650.397
Chi^2	422760.200	419346.440	424025.217	419313.889
AIC	887189.033	885711.989	885808.668	885442.795
BIC	887975.653	886498.610	886595.288	886229.415
N (directors)	55097	55097	55097	55097
N (engagements)	478859	478859	478859	478859

Notes: Random-effects negative binomial regressions; t statistics in parentheses;
* $p < 0.001$ (two-sided tests); ln = logged variables.

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