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ORACLE OR OBSTACLE? INDIVIDUAL LEVEL KNOWLEDGE HETEROGENEITY AND INNOVATION

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Abstract

Boundary spanning is one way to accumulate diverse knowledge. This paper examines the conditions under which boundary spanning increases the value of project participants contributions to team production. Statistical findings from logit regressions show that the cost-benefit tradeoff of boundary spanning depends on whether the focal project is aimed at exploitation or exploration. If the focal project is mostly explorative, diverse knowledge is a valuable resource; in projects where the focus is on exploitation, diverse knowledge impedes project performance. The findings in this paper confirm and extend research on boundary spanning and organizational learning.

1. Introduction

An important element of innovation is the recombination of familiar and new knowledge (Kogut & Zander, 1992), thus, the diversity of the available knowledge has a major effect on the opportunities for innovation. However, knowledge is sticky, with the result that locally available knowledge is relatively homogeneous (Almeida & Kogut, 1999; Nerkar, 2003; Rosenkopf & Almeida, 2003; Song, Almeida, & Wu, 2003), and localized knowledge search poses the risk of lock-in and over-embeddedness (Eisingerich, Bell, & Tracey, 2010; Rosenkopf & Almeida, 2003; Rosenkopf & Nerkar, 2001; Uzzi & Spiro, 2005). Boundary spanning can resolve this problem. It can facilitate knowledge flows across geographical distance and ensure the diverse knowledge necessary for the maintenance of high levels of performance (Rosenkopf & Almeida, 2003; Song et al., 2003). Mobile employees potentially can facilitate knowledge flows between distant contexts, thereby increasing knowledge diversity and potentially improving their own performance levels. Understanding how and why facilitation of these knowledge flows affects individual professionals' careers is important for understanding boundary spanning incentives.

Based on research on brokerage and bridging ties, we would expect mobile employees to act as 'oracles' in innovation projects, and as intermediaries between embedded local contexts and fresh perspectives of new knowledge (Burt, 2004; Lee, 2010; Ryall & Sorenson, 2007; Tortoriello & Krackhardt, 2010). Extant research provides valuable insights into the effects of boundary spanning activities, knowledge flows, and organizational learning. However, the value of the diverse knowledge acquired through boundary spanning activities is likely to depend on the characteristics of the projects in which professionals engage. These moderating focal project characteristics effects have not been explored, and we address this gap in the literature by isolating the effects of project characteristics and the for individual professionals' probability of contributing to high performing projects. We hypothesize that the value of diverse knowledge is moderated by the focal project's characteristics. Diverse knowledge increases the probability of the professional to contribute to a high performing project – especially explorative projects. We hypothesize also that similarity between knowledge contexts reduces the value of the professional's diverse knowledge and the moderating effects of a project focus on exploration/exploitation. The trade-off between exploration and exploitation differs between the organizational and individual levels (March, 1991). While the aggregate effects of diverse knowledge have been researched quite

extensively (Bercovitz & Feldman, 2011; Corredoira & Rosenkopf, 2010; Galunic & Rodan, 1998; Hong & Page, 2001; Nerkar, 2003; Rosenkopf & Almeida, 2003; Singh, 2005; Singh & Agrawal, 2011; Song et al., 2003), individual level trade-offs have received less attention. To the best of our knowledge, this paper is the first to analyze how project characteristics' moderate the value of diverse knowledge for individual professionals.

The study applies methods similar to those employed by Corredoira and Rosenkopf (2010). We utilize labor mobility to study how individual level boundary spanning activities, combining local and foreign knowledge, affects professionals' probability of contributing to high performing projects. We conduct an individual level study of freelancers embedded in a local labor market, a minority of whom occasionally participates in team production outside the local context. By estimating logit models for 1860 professionals collaborating on projects in the film industry, we find that the positive effect of diverse knowledge for professionals' probability of participation in high performing projects, is contingent upon the focal project's characteristics: We find a positive association between knowledge diversity and contribution to high performing projects for professionals engaged in more explorative projects. However, this positive association is not merely moderate but even reversed for professionals' participation in more exploitative projects. We find also that the benefits of integrating local and foreign knowledge decrease with increasing similarity between the knowledge accumulation contexts.

2. Theoretical Background

Knowledge search tends to be highly localized within the immediate context because the limits of bounded rationality (Simon, 1955) lead individuals to focus their attention based on proximity. The term context can refer to proximity along a variety of dimensions (Boschma, 2005), here we follow Rosenkopf and Almeida's (2003) use of the term to refer to the proximate geographical landscape from which knowledge is predominantly sourced (Jaffe, Trajtenberg, & Henderson, 1993). The costs and benefits of localized knowledge spill over, and localized labor markets are especially relevant for knowledge intensive industries (Almeida & Kogut, 1999). Within these industries, knowledge typically is embedded in individuals, and economic transactions are heavily embedded in individual level social networks. These networks of knowledge-endowed professionals are established through

frequent chance encounters, and face-to-face interaction (Gertler, 1995, 2003) developed through collaboration (Sorenson & Waguespack, 2006; Uzzi, 1996; Uzzi & Lancaster, 2003), and tend to be strongly localized.

Knowledge flows follow these social networks (Sorenson, 2003), and consequently also are localized in specific geographical contexts.

Because novel products are created by recombining extent and new knowledge in new ways (Kogut & Zander, 1992), the availability of diverse knowledge will increase the potential for identifying high performing knowledge recombinations (Galunic & Rodan, 1998). There is empirical evidence that innovative organizations and teams benefit from access to diverse knowledge (Bercovitz & Feldman, 2011; Reagans & Zuckerman, 2001) and across-context knowledge exchange (Corredoira & Rosenkopf, 2010; Rosenkopf & Almeida, 2003; Rosenkopf & Nerkar, 2001). While these findings cannot be applied directly to the individual level, individual level research shows positive effects for professionals occupying brokering positions, which suggests that the performance of individuals also benefits from the diversity of local and foreign context knowledge (Burt, 2004; Rodan & Galunic, 2004). However, even within narrowly defined industries, firms, or collaboration networks, projects are a heterogeneous mass requiring different resources depending on size, timeframe, and whether the focus is on exploitation or exploration, and these project characteristics are likely to moderate the value of professionals' knowledge diversity.

2.1. Hypothesis Development

Across-context labor mobility increases the probability of across-context knowledge search, and facilitates professionals' accumulation of diverse knowledge and thus increases the probability of high performance. Because the search for new knowledge relies on localized social networks (Almeida & Kogut, 1999; Singh, 2005; Sorenson, 2003; Sorenson & Stuart, 2001), it often identifies similar knowledge with little novel value. Research has emphasized the benefits of recombination of distant knowledge across contexts (Nerkar, 2003; Rosenkopf & Almeida, 2003; Rosenkopf & Nerkar, 2001; Song et al., 2003), and local search is likely to produce suboptimal outcomes. Some studies explore the potential of across-context labor mobility as a strategy to circumvent localized search and access a broader variety of knowledge (Agrawal, Cockburn, & McHale, 2006; Almeida & Kogut, 1999; Corredoira & Rosenkopf, 2010; Rosenkopf & Almeida, 2003; Rosenkopf & Nerkar, 2001).

Due to their familiarity with different contexts, mobile professionals are better able to absorb and integrate new knowledge related to any of their knowledge bases (Corredoira & Rosenkopf, 2010; Gregoire, Barr, & Shepherd, 2010). This process is driven by three main mechanisms: allocation of attention, access to private information and tacit knowledge, and ability to evaluate and integrate context-external information and knowledge. Attention is a scarce resource, and allocation of attention is crucial in the search for knowledge (Ocasio, 1997). Previous research shows that the focus is often on the local context (Saxenian, 1994). But labor mobility increases attention allocation among the entities involved (Corredoira & Rosenkopf, 2010) and increases access to different contexts and the knowledge generated there. Private information and ‘buzz’ are accessed via personal presence in a given context (Gertler, 1995, 2003) or through very close networks (Sorenson, Rivkin, & Fleming, 2006). Professionals working within the same context are consequently more able to access context specific knowledge. Having accessed the knowledge, its relevance and reliability needs to be assessed, and proximity along social and geographical dimensions influences this process too. Individuals like firms, rely on their existing knowledge when deciding what new knowledge is important, useful, and reliable, and also like firms, they are ‘creatures of habit’ (Aarts & Dijksterhuis, 2000a, b) and tend to stick to predefined routines and build on extant knowledge. Acceptance and absorption of new knowledge is eased by experience with related knowledge (Cohen & Levinthal, 1990).

The three mechanisms work in the same direction: new knowledge is best identified, recognized, and absorbed if individuals have some link to the context in which the new knowledge originates. However, when analyzing the effects of diverse knowledge obtained through across-context labor mobility, we need to control for those individual characteristics, which could affect selection into across-context mobility. Even above and beyond individual characteristics increasing the probability for across-context mobility, mobile professionals will more readily be able to find, absorb, and apply new knowledge if they have experience of other contexts. Consequently, we can expect across-context mobile professionals to be endowed with more diverse knowledge, and be more able to contribute with novel inputs to innovative projects, and thus to achieve higher performance levels.

HYPOTHESIS 1. Experience from across-context labor mobility increases the likelihood of contributing to high performing projects.

The cost-benefit tradeoff between diverse knowledge and performance is likely to depend on whether projects primarily focus on exploitation or exploration. While most projects employ some combination of exploitation and exploration, they tend to lean towards one or the other (March, 1991). On team level, empirical evidence shows that team level diversity benefits exploration project performance the most (Bercovitz & Feldman, 2011). While team level findings cannot be transferred directly to the individual level, the benefit of knowledge diversity for problem solving remains relevant for individuals participating in knowledge intensive projects. A high level of problem complexity is one condition that is needed for diverse knowledge to be valuable (Hong & Page, 2001; Page, 2007). Complex problems have many potential, but not equally good solutions, and drawing on diverse knowledge increases the probability of finding an optimal solution. Efficiency, on the other hand, is fed by stability and routines, which can be obstacles to innovation (Galunic & Rodan, 1998) since divergent perspectives can disrupt routines and add to the costs of coordination and communication in collaborations (Bercovitz & Feldman, 2011). Project participants engaged in exploration face more difficult problems than participants engaged in exploitative projects that rely more on routines. Thus the value of diverse knowledge varies with the focal project's focus on exploration versus exploitation, and we expect project participants to experience weaker positive effects of endowment with diverse knowledge if the project is exploitative:

HYPOTHESIS 2. The positive effect of experience from across-context labor mobility on the likelihood of contributing to high performing projects is reduced if the focal project is aimed at exploitation rather than exploration.

The value of accumulating diverse knowledge can be expected to depend on the scarcity of access to contexts and similarity between context specific knowledge. The value of bridging ties lies in the ability to link otherwise separate entities (Burt, 1992). Thus, the benefits of across-context labor mobility depend heavily on scarcity of access. The value of endowment with diverse knowledge lies in the ability to contribute to development by drawing on new perspectives and heuristics (Hong & Page, 2001; Page, 2007). The benefits of diverse knowledge are strongly related to the lack of similarity between the focal and foreign contexts.

Accordingly, for the positive association between knowledge heterogeneity and performance, we expect project participants to experience varying effects of endowment with diverse knowledge depending on the similarity among the contexts where the knowledge was accumulated. We understand similarity as proposed by Rosenkopf and Almeida (2003), but extend their definition to include diverging distance between geographically proximate but distinct contexts, and geographically distant contexts.

HYPOTHESIS 3. The positive effect of experience from across-context labor mobility on the likelihood of contributing to high performing projects decreases with increasing similarity between focal and foreign context.

3. Data and Methods

3.1. Data description

The hypotheses are tested using data from the Danish film industry, which provides an interesting setting for a study of labor mobility. Several studies utilize collaboration data from the creative industries (especially the film industry) to analyze network effects in settings demanding high rates of new product development and constant differentiation (Cattani & Ferriani, 2008; Cattani, Ferriani, Negro, & Perretti, 2008; Ferriani, Cattani, & Baden-Fuller, 2009; Grabher, 2002a, b; Uzzi, 1997; Uzzi & Spiro, 2005). Project based organization and continuous changes to collaboration partnerships provide an excellent context for studying collaboration networks and collaboration outcomes (Faulkner & Anderson, 1987). Creative industries are characterized by short product life cycles and consumer demand for constant product differentiation (Caves, 2003). This continuous demand for product differentiation results in an industry structure of freelancers constantly shifting between projects, and higher levels of clustering than in other knowledge intensive industries (Grabher, 2002a, b; Malmberg & Power, 2005). This increases the importance of the geographical context and the potential value of across-context labor mobility. Professionals from the Danish film industry often participate in film projects in foreign settings. This allows for comparison of the probability of contributing to high performing projects among project participants with and without experience of across-context mobility. To utilize this data variation, we apply a matching sample approach.

3.2. Data sources and limitations

We constructed an individual level database by combining data provided by the Danish Film Institute (DFI), with data available on official festival web sites, IMDb.com, and industry professionals' resumes. These data allow analysis of the associations between across-context labor mobility and participation in high performing projects. Since all production companies and distributors are legally obliged to report to the DFI, data are reliable and few productions are omitted (collections of short films were removed from the sample and 71 observations were excluded because of lack of budget data). Project participants from outside the local context are excluded from the estimated regression models to avoid bias. The local industry network position is calculated (in UCInet) based on Dfi archival records of collaboration. The first five years (1995-1999) are used to create a basic industry network. Thereafter, network measures are based on a five-year rolling window with a one-year time lag: the level of embeddedness in year t is assumed to be related to contribution to projects in year $t+1$. Across-context labor mobility is identified through IMDb.com and professionals' resumes (December 2010-January 2011). No time dimension is added to the records because collaboration events are perceived as realizations of existing interpersonal ties.

The data cover all Danish films released between 1995 and 2008. Films are defined as Danish based on the nationality of the production company (including cross country collaborations with substantial Danish participation). The cast and crew could be international, the language of the film need not be Danish, and financing can be from international private investors and film funds. Professions such as actors (limited to the five leading players), director, producer, screenwriter, cinematographer, composer, and editor involved in the production process are included in the analysis. These freelancers work on subsequent projects and over time become embedded in collaboration networks that provide the information and resources necessary for the successful execution of these projects (Ferriani et al., 2009). Within the Danish film industry, projects generally are initiated by the director, or the director and producer jointly, and are based on the director's idea or on material that a screenwriter adapts to a film script. Following this initial phase, actors, cinematographers, composers, and editors are hired to work with the core team on the film's production and post-production.

A collaboration represents consolidation of a preexisting social tie. Other, more informal ties might provide similar benefits, but the acquisition and integration of knowledge is enforced through collaboration. Collaboration, therefore, serves as a lower bound for interpersonal relations (Singh, 2005). Some studies analyze collaborations at firm or project level; however, the present study focuses on project participants who collaborate to create novel stylistic expressions to enable analysis of the individual level incentives for accumulating diverse knowledge.

The production of Danish films is heavily subsidized by the Danish state through the DFI: 98.2% of all Danish films produced in the analyzed period were subsidized by DFI (58.6% received subsidy based on DFI consultants' assessment of the artistic merit; 39.6% were based on DFI's assessment of revenue potential). The focus on artistic contribution is substantial and consequently most projects aim to explore possibilities within the framework of "feature films". An exception is the genre of children's and family films which have a sequels rate of 34.3% (all other genres combined have a sequels rate of 3.9%), and show high levels of recycling of old material. This specific genre is more oriented on exploration of existing forms, characters, and narratives. With only 25-30 feature films produced a year, the industry is quite small which leads to frequent repeated collaborations and high internal clustering. Danish films have received increasing international recognition since 1990, culminating in Danish Director Susanne Bier winning Golden Globe and Oscar awards for the best foreign language feature film in 2011.

3.3. Variables

Dependent variable

The dependent variable in the analysis is association with high performing projects, measured as projects nominated for awards or invited for inclusion in the program for selected international festivals (for simplicity both are referred to as nominations). The nominations selected are to the American Academy of Motion Picture Arts and Sciences awards (Oscar), Sundance Film Festival, Cannes Film Festival, Berlin Film Festival, and Amsterdam Film Festival. There are several reasons for choosing nominations. First, previous research shows that it is nominations rather than awards that are the distinctive factor for commercial success and recognition

(Dodds & Holbrook, 1988). Second, the number of awards is (virtually) fixed each year regardless of the innovativeness of the films released, but the number of nominations varies. Choosing foreign nominations further reduces the issue of a fixed number of awards per year, since Danish films are in international competition. Third, foreign nominations of Danish films for the selected awards and festivals are rare and indicate acknowledgement by international industry experts.

An innovative project is the result of a complex process combining many skills and inputs. Positive outcomes of the dependent variables are an indication of the combined effects of the project participant's selection and contribution to stylistically innovative projects. Nomination for foreign awards is positively correlated (at the 0.05 significance level) to receiving a foreign award (0.5701), domestic nominations (0.2624), domestic awards (0.1929), and theater audience numbers (0.0466).

Key Variables

Across-context labor mobility: Because we are interested in the effects of knowledge accumulation through across-context labor mobility, our main key variable is a dummy for whether the observation has participated in projects outside the local context. We follow Corredoira and Rosenkopf (2010) and Rosenkopf and Almeida (2003) in defining across-context labor mobility as mobility between countries. Some reported participations in foreign projects are deemed not sufficiently significant to be recorded as foreign linkages .

Across-context labor mobility between similar contexts: We want to test whether similarity of the contexts between which the mobile employee moves, affects the value of diverse knowledge. We therefore create a measure recording only across-context labor mobility involving countries outside of Scandinavia.

Exploitation project: We hypothesize that diverse perspectives could be less strongly associated with affiliation to innovative projects that are more exploitative, and utilize the variation between focus on exploitation/exploration within the children/family film genre, and all other genres, to test this hypothesis. While we expect projects to follow a continuum of combining exploration and exploitation, it cannot be measured in this way. We use a dummy variable for this variation by identifying exploitation based projects. Within the children/family segment sequel rates are ten times higher than in other genres, and most projects are based on existing material (remakes, books, television shows, fairytales, etc.). The market segment targeted by this genre

demands recognizable elements and less novelty. Therefore projects rely more on exploitation. Since the children/family genre has designated nominations not open to productions in other genres, the lower level of differentiation does not reduce the probability of these productions of receiving nominations.

Controls

Network position: The literature on regional spill-over effects and several studies on the film industry find local network position effects (Cattani & Ferriani, 2008; Cattani et al., 2008; Ferriani et al., 2009). Therefore, we include in the model a quantified measure of each individual's position in the collaboration network, in each year of observation. The probability of acquiring knowledge or mobilizing resources decreases with increasing path length (Lin, 2001; Wasserman & Faust, 1994/1997). We therefore calculate centrality as the normalized eigenvector closeness centrality (for another example of this application see Ferriani et al., 2009). This measure is based on each project participant's closeness to all other network members. For the network (adjacency matrix) A , the eigenvector centrality of participant i (c_i) the eigenvector closeness centrality measure is calculated by the algorithm:

$$c_i = \alpha \sum_j A_{ij} c_j$$

where α is a parameter with reciprocal eigenvector value. Therefore the eigenvector centrality of each participant depends on the eigenvector centrality of its linked participants (c_j). The measure includes both the size of the ego's network and the quality and reachability of the connections. Normalized eigenvector centrality is scaled; eigenvector centrality divided by the maximum difference possible. The eigenvector measure is calculated using the UCInet social network analysis program (Borgatti, 2002).

New entrant: Project participants new to the industry might receive disproportionate attention from critics and the media (Cattani & Ferriani, 2008), especially if they enter from a related industry (e.g. theater). To account for this possible effect we include a dummy variable, *NewEntrant*, to indicate entry in the year of observation.

Production budget: Availability of resources is likely to affect the quality of projects. Production budget data are available for the majority of the films released in the analyzed period and are included in the analyses to control for available resources. This excludes around 5% of total observations due to missing data. Controlling for

budget size creates a small sample bias against films produced without DFI subsidy, but this is preferable to relying on fictive, estimated budgets (Sorenson and Waguespack 2006).

Artistic subsidy: Few agents are involved in films produced without any kind of subsidy, and most participate in projects subsidized by the DFI, with grants based on artistic merit (as perceived by DFI consultants), or commercial potential (based on budget and predicted revenue). The type of subsidy received is an indication of the original intent of the film project in which the agent participated. We include a dummy for participation in productions receiving artistic subsidy.

English: When agents participate in film projects where English is the main language; the aim is most often international recognition of the final product. Professionals participating in English language film projects should have a higher probability of their films being acknowledged beyond the local context, and we therefore include the dummy English.

Sequel: Sequels have the possibility to capitalize on the interest created by the original/previous film. Following the examples of other researchers (Cattani & Ferriani, 2008; Cattani et al., 2008; Ferriani et al., 2009; Ravid, 1999) the variable Sequel indicates whether the observation participated in an original film or a sequel.

Type of distributor: The type of distributor could influence performance because majors are able to offer more (monetary) and higher quality (professional skills) resources (Ferriani et al., 2009; Litman, 1983). The three types of distribution companies identified are: national companies, regional Scandinavian/Nordic companies, and international companies (including companies in exclusive alliances with international companies). We include dummies for regional distributor and international distributor.

Year and period: Due to the dependence of the Danish film industry on state subsidies, we include dummies that distinguish between periods with different negotiated terms for subsidy. Year dummies are included to control for variations in the industry and trends in demand and popularity (Ferriani et al., 2009).

3.4. Sample Matching Procedure

There may be differences between professionals who embrace across-context mobility, and those who do not. Those that establish across-context linkages might reasonably be assumed to be more explorative. There might also be differences based on the project participants' positions in the local industry network, with central

stars and successful project participants receiving more foreign invitations. Different types of professionals with different roles in the production process might experience different obstacles and opportunities in foreign collaboration. Finally, the increasing internationalization of the Danish film industry might be reducing the barriers to across-context labor mobility. To address these issues, we apply a combination of exact matching and propensity score matching (Rosenbaum & Rubin, 1983, 1985) on the variables that reasonably can be assumed to affect the probability of across-context mobility, to create a control sample of comparable professionals with no experience in foreign contexts. This matching procedure allows for investigation of the relationship between diverse knowledge and the probability of contributing to high performing projects, given the conditional probability of across-context mobility.

In the propensity score matching procedure, we include structural position in the local collaboration network (Network position). We also match on professionals' average commercial success in the domestic and foreign markets through variables labeled Ave.dom.rev. and Ave.for.rev respectively. We matched all observations on two exact criteria. Participation in projects released within certain time periods is an exact match variable because the industry shows a tendency towards increasing internationalization. We distinguish between the three periods denoted by state subsidy agreements. The type of role in the production is also an exact match variable since different roles have different levels of public visibility and different career paths. We distinguish between front roles (directors, producers, and actors) and backing roles (editors, composers, screenwriters, and cinematographers).

Due to the limited pool of available untreated matches, some matched observations are used multiple times; potential bias in standard errors is corrected for by employing cluster correction effects in the estimations. Analysis of the matched observations shows no significant differences between treated and untreated observations on the matching variables (see appendix I).

3.5. The Model

The purpose of this study is to analyze the relationship between knowledge heterogeneity and association with innovative projects given differences in project focus on exploitation/exploration and similarity of context specific knowledge. Thus we conducted an individual level study to explain the probability of a given

professional being associated with a project nominated for an international award. We use dummy variables for mobile professionals with diverse knowledge, and participation in projects focusing on exploitation, and the interaction between the dummies. The analysis is repeated with a knowledge diversity dummy denoting access to non-similar contexts.

The data are organized at the individual level and each individual-film combination is one observation. To compare the association between knowledge diversity and performance for professionals contributing to exploitation/exploration, we interact the diverse knowledge dummy with the dummy for contribution to exploitative projects. The model can be written as:

$$Pr(\text{contribution to high performing projects} = 1 | k, e, k^*e, c, \beta)$$

where the probability of contribution to a high performing project depends on the dummy for diverse knowledge labeled k , the dummy for project focus on exploitation labeled e , and a vector of the control variables denoted c . A binary dependent variable dictates either a probit or logit model specification. We found no overall differences in the results from these models, and below we present the logit model results. Since co-variation is common across projects we control for clusters by project. All the estimations considered are robust using a Huber- White-sandwich technique for heteroskedasticity correction and estimated using the matched sample.

4. Results

Descriptive statistics and correlations between variables are presented in table 1. The low levels of correlation between the independent variables do not suggest multicollinearity issues. This is supported by low variance inflation factor estimates. Table 2 presents the estimated models. Model 1 includes only controls, model 2 includes the main effects of explanatory variables, and model 3 includes the interaction term. Models 4-7 repeat the analysis with a knowledge diversity dummy for access to non-similar contexts.

Table 1 Descriptive Statistics

Variable	Mean	Std. dev.	Correlations											
			1	2	3	4	5	6	7	8	9	10		
1. High performance	.202	.402												
2. Diverse knowledge	.5	.500	.040											
3. Diverse knowledge (Non-Scandi)	.395	.489	.048	.808										
4. Exploitation	.279	.449	.084	-.191	-.172									
5. Network position	3.869	8.452	-.058	-.011	.021	.037								
6. New entrant	.294	.456	-.013	-.126	-.107	-.002	-.296							
7. Production budget	18639	15026	-.025	.036	.079	.007	-.027	-.016						
8. Artistic subsidy	.604	.489	.281	.123	.119	-.242	-.1390	.028	-.005					
9. English	.048	.215	.043	.015	.048	-.034	-.093	.069	.579	.121				
10. Sequel	.119	.324	-.135	-.121	-.090	.461	-.034	-.015	-.055	-.379				
11. Scand. distributor	.603	.490	.163	.071	.081	.015	.101	-.050	-.103	.058	-.035			
12. Int. distributor	.239	.426	-.075	-.096	-.081	.118	-.089	.048	-.077	-.073	.176	-.690		

Note. Period dummies and year dummies excluded. All correlation estimates above 0.45 or below -0.45 are significant at a 5% level
N=1860

TABLE 2 Logit Estimates for Association with High Performing Projects

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Diverse knowledge		.0881 (.2191)	.5704** (.2816)				
Diverse knowledge (Non-Scand.)				.1419 (.2303)	.6824** (.2790)		
Diverse knowledge (Scand.)						.1089 (.1926)	.3447 (.2131)
Exploitation		.9632* (.5243)	1.771*** (.5767)	.9765* (.5248)	1.773*** (.5469)	.9617* (.5241)	1.300** (.5708)
Diverse knowledge.*Exploitation			-1.707*** (.3624)		-2.391*** (.4003)		-1.030*** (.3745)
Network position	.0050 (.0171)	.0039 (.0162)	.0004 (.0158)	.0034 (.0162)	.0002 (.0157)	.0046 (.0166)	.0041 (.0164)
New entrant	-.2820 (.2725)	-.2771 (.2784)	-.2271 (.2745)	-.2719 (.2768)	-.2039 (.2756)	-.2732 (.2757)	-.2621 (.2733)
Prod. budget	-1.29e ⁻⁰⁵ (2.08e ⁻⁰⁵)	-1.75e ⁻⁰⁵ (2.36e ⁻⁰⁵)	-1.65e ⁻⁰⁵ (.238e ⁻⁰⁵)	-1.78e ⁻⁰⁵ (2.35e ⁻⁰⁵)	-1.64e ⁻⁰⁵ (2.33e ⁻⁰⁵)	-1.74e ⁻⁰⁵ (2.35e ⁻⁰⁵)	-1.71e ⁻⁰⁵ (2.38e ⁻⁰⁵)
Artistic subsidy	1.690** (.6747)	1.787*** (.6317)	1.881*** (.6256)	1.783*** (.6309)	1.892*** (.6188)	1.788*** (.6314)	1.837*** (.6246)
English language	-.3399 (1.123)	-.1166 (1.274)	-.1501 (1.268)	-.1259 (1.270)	-.2202 (1.256)	-.1131 (1.274)	-.1193 (1.273)
Sequel	-.6626 (1.186)	-.9834 (1.109)	-1.156 (1.119)	-.9914 (1.115)	-1.211 (1.066)	-.9743 (1.108)	-1.014 (1.123)
Scand. distributor	2.091** (.8825)	1.951** (.8959)	1.909** (.9006)	1.940** (.8967)	1.866** (.9026)	1.957** (.8939)	1.961** (.9002)
Int. distributor	1.782* (1.033)	1.590 (1.003)	1.563 (.9949)	1.582 (1.003)	1.563 (.9926)	1.595 (1.002)	1.604 (1.001)
Ave. dom.rev.	-1.54e ⁻⁰⁶ (2.02e ⁻⁰⁶)	-1.61e ⁻⁰⁶ (2.07e ⁻⁰⁶)	1.59e ⁻⁰⁶ (2.11e ⁻⁰⁶)	-1.62e ⁻⁰⁶ (2.06e ⁻⁰⁶)	-1.45e ⁻⁰⁶ (2.06e ⁻⁰⁶)	-1.58e ⁻⁰⁶ (2.08e ⁻⁰⁶)	-1.54e ⁻⁰⁶ (2.10e ⁻⁰⁶)
Ave. for. rev	2.16e ^{-06**} (8.49e ⁻⁰⁷)	1.98e ^{-06**} (8.12e ⁻⁰⁷)	1.84e ^{-06**} (7.72e ⁻⁰⁷)	1.97e ^{-06**} (8.14e ⁻⁰⁷)	1.88e ^{-06**} (7.73e ⁻⁰⁷)	1.98e ^{-06**} (8.10e ⁻⁰⁷)	1.84e ^{-06**} (8.04e ⁻⁰⁷)
Front role	.2500* (.1351)	.2203* (.1330)	.2014 (.1310)	.2157 (.1336)	.1896 (.1365)	.2308* (.1366)	.2346* (.1340)
Period 1	1.428 (1.064)	1.207 (.9638)	1.146 (.9257)	1.198 (.9636)	1.167 (.9245)	1.2105 (.9627)	1.209 (.9421)
Period 2	-.1505 (1.059)	-.3997 (1.137)	-.4493 (1.126)	-.4108 (1.135)	-.4907 (1.1317)	-.4015 (1.1390)	-.4058 (1.137)
Year dummies	yes						
Constant	-4.610*** (1.288)	-4.517*** (1.317)	-4.823*** (1.319)	-4.510*** (1.321)	-4.828*** (1.325)	-4.532*** (1.304)	-4.686*** (1.302)
Wald chi2	33.59**	48.74***	95.95***	50.75***	113.65***	47.59***	69.58***
Pseudo R2	.2119	.2294	.2445	.2297	.2545	.2295	.2345

Note. *p< 0.1, ** p<0.05, *** p< 0.01. N=1860

Hypothesis 1 proposes that mobile professionals accumulating diverse knowledge are more likely to contribute to high performing projects. This relationship is tested directly in model 2. Counter to the our hypotheses, there seems to be no significant association between diverse knowledge and contribution to high performing projects, however, recall that projects with varying differentiation degrees are analyzed together in this model. The estimated effect for participation in a low differentiation project is significantly positive, suggesting over representation of high performance.

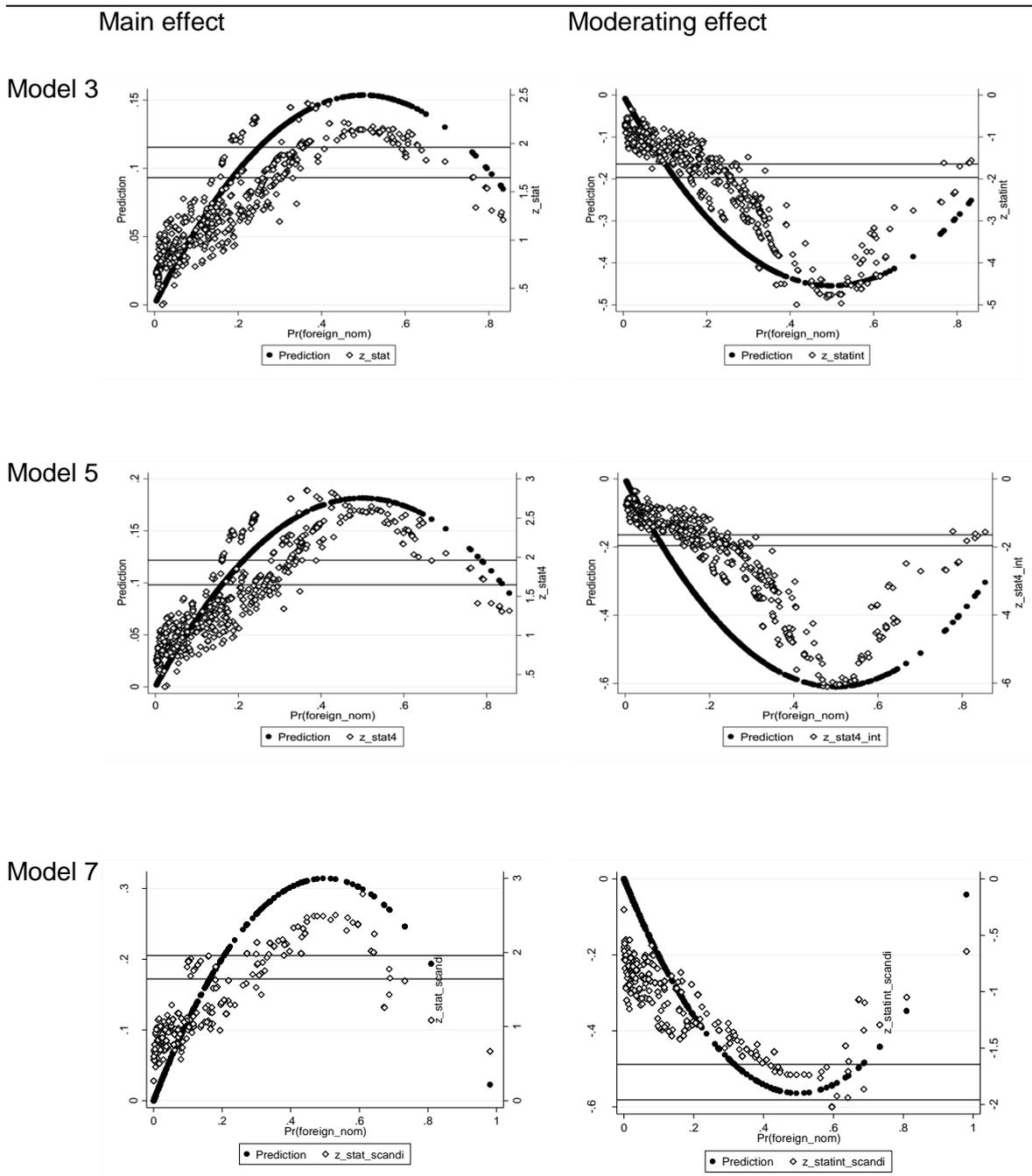
The interaction term between contribution to exploitation and diverse knowledge is introduced in model 3. The model tests hypothesis 2 stating that the relationship between diverse knowledge and association with high performing projects depends on the focal project's focus on exploitation/exploration and re-tests the positive association proposed in hypothesis 1 while taking account of the interaction between exploitation and diverse knowledge. In model 3 we see that diverse knowledge increases the likelihood of contributing to high performing projects. However, the interaction effect of diverse knowledge and exploitation is significantly negative, indicating decreasing returns to diverse knowledge with decreasing project focus on exploration. A Wald chi2 test confirms that the magnitude of the effects differs and they show a significantly negative net effect of diverse knowledge for contribution to exploitation projects.

The effects of across labor mobility to the neighboring Scandinavian countries of Norway and Sweden are explored in models 4-7. Due to the small geographical distance, low language barriers, and tradition of collaboration across borders these countries provide contexts culturally similar to the focal context. Models 4 to 7 investigate and find support for hypothesis 3. The positive association between diverse knowledge and contribution to high performance projects holds, but only in the case of non-Scandinavian linkages is the effect significant.

The intuition from linear models cannot be applied to nonlinear models, such as logit models (Ai & Norton, 2003; Wiersema & Bowen, 2009). Therefore the analysis needs to extend the classic regression tables. Due to the logit function's structure, marginal effects vary with the probability distribution, and the best overview of an estimated effect is provide by a graphical representation. The main and moderating effects of models 3, 5, and 7 are displayed in Figure 2. The main effect is positive for all observations in all three models. Though the association between diverse knowledge and contribution to high performing projects is significantly positive in

the estimated models, the effect is not significant for all observations. The moderating effects are negative for all observations in all three models, but only significantly negative for the upper end of the probability distribution.

Figure 1 Graphical plots of main and moderating effect



Marginal effects are calculated for meaningful values of all the independent variables based on the estimates in model 3. The most distinctive change in the marginal effect of diverse knowledge is for changes in production budgets and professionals' average revenue (not from the focal project). The marginal effect of diverse knowledge is a 27.6 percentage points increase in the probability of contribution to high performing projects for participation in low budget productions, a 24.4 percentage points increase medium budget productions, 16.4 percentage points increase for high budget productions, and a 7 percentage points increase in the probability of contributing to high performing projects for the few productions with extremely high budgets. For participants in projects focused on exploitation, diverse knowledge decreases the probability of contributing to high performing projects by 78.2 percentage points for low budget productions, 78 percentage points for medium budget productions, 73.5 percentage points for high budget productions, and 54.6 percentage points for extremely high budget productions. Thus the magnitude of the marginal effects of the interaction term is affected less by budget size. The marginal effects in models 5 and 7 show similar trends. Marginal effects are larger for the earlier years in the period analyzed because effect magnitude decreases with increasing industry internationalization over time. The magnitude of the marginal effects also decreases with professionals increasing average project revenue (domestic and foreign) from other projects than the focal project.

Participation in artistically subsidized projects, and productions distributed by Scandinavian/North European distributors is positively associated with the probability of contribution to high performing projects. One of the matching variables shows significant within-group variation: average performance in foreign markets is significantly positively associated with the probability of contribution to high performing projects.

4.1. Robustness Checks

The results estimated in models 3, 5, and 7 support the proposed hypotheses. However, it is necessary to control for alternative explanations to ensure the robustness of the results and their interpretation.

The results could be caused by specific costs and benefits arising from labor mobility to certain high performing or high prestige contexts, and not by labor mobility in general. Therefore, mobility to three distinct geographical contexts is analyzed separately. We distinguish among: Continental Europe (France and Germany), the US, and Anglo-Saxon countries outside of the US (primarily the UK and New Zealand). We find no support

for the proposition that our results are caused by linkages to specific contexts rather than labor mobility and accumulation of diverse knowledge in general (results available from the authors upon request).

A final issue is the potential role of selection by foreign gatekeepers for across-context labor mobility. To access foreign contexts, professionals need to create or be invited to foreign projects. The findings presented in this paper could potentially be caused by foreign agent selection bias in the casting and selection process. To control for this, we estimate models equivalent to models 1-3 for the project initiating roles of screenwriters and directors. These professionals are not exposed to selection bias by foreign context gatekeepers. Analyses of the 458 screenwriters and directors confirm the main results, and demonstrate that our findings are not caused by biased selection by foreign gatekeepers (results available from the authors upon request).

5. Discussion

The findings confirm the hypothesis that only those professionals contributing to explorative projects experience performance improvements across-context mobility, while those contributing to exploitation experience across-context mobility impede performance. Projects focused on exploitation face fewer complex problems, and thus have lower levels of need for and benefit less from diverse knowledge (Hong & Page, 2001; Page, 2007). Furthermore, the emphasis on routines in exploitation (Jansen, Bosch, & Volberda, 2006) increases the costs of diverse knowledge.

Diverse knowledge accumulated through across-context labor mobility is a resource whose value rests (partly) on its degree of foreignness. The results presented in table 2 show a difference between the effects of labor mobility to the similar contexts of Scandinavia, and to all other contexts. Research in other fields show, that an element of commonality is necessary to absorb and integrate knowledge exchanged across contexts (Ponds, van Oort, & Frenken, 2010). However, when contexts are very similar, the knowledge accumulated by the mobile professional will lack heterogeneity. In the analyzed setting, the elements of commonality present are: involvement in the feature film industry, recognition of professional standards, and division of roles. Thus, we have a framework for the absorption of foreign knowledge; the issue to be investigated pertains to the value of new perspectives and heuristics provided by mobile professionals.

The Scandinavian countries are culturally similar, and labor mobility is frequent between our local context and the other Scandinavian countries. Geographical proximity between contexts increases the probability of tie formation (Sorenson & Stuart, 2001; Sorenson & Stuart, 2008), and a substantial part of the foreign linkages are with Norway and Sweden: 674 observations have foreign links with Norway or Sweden, 382 with the US, 438 with other Anglo-Saxon countries (primarily the UK), and 555 with continental Europe. Considering the size of the film industries in each country, there is a clear bias favoring Scandinavia. These differences in geographical and social proximity affect the degree of foreignness of the perspectives acquired through collaboration (Boschma, 2005; Hong & Page, 2001; Page, 2007). Consequently, knowledge acquired through linkages to Scandinavian countries is simply less foreign to our local setting, and consequently has a smaller effect on the probability of participation in high performance projects.

The value of foreign knowledge as a resource lies (partly) in its scarcity. The estimated marginal effects of professionals holding diverse knowledge acquired through across-context labor mobility decrease over time. Concurrently, the industry becomes more international and open to across-context labor mobility. As across-context labor mobility becomes more widespread, the diverse knowledge offered by mobile professionals also becomes more widespread. Since the competitive advantage of brokering positions resides exactly in exclusivity of access (Burt, 1992; Ryall & Sorenson, 2007), the impact of diverse knowledge acquired through across-context labor mobility decreases with increasing access and spread.

Diverse knowledge obtained through across-context labor mobility is just one among many resources, and its value is (partly) in its ability to substitute for other resources. The estimated marginal benefits of diverse knowledge obtained through across-context labor mobility show decreasing marginal effects for increasing budget size. There are two interrelated explanations for this finding: 1) When professionals participate in high budget projects, monetary resources are sufficient to acquire any necessary foreign perspectives in the market rather than relying on the experience of project participants. Thus diverse knowledge is not a scarce resource in high budget projects. 2) When professionals participate in low budget projects, diverse knowledge obtained through across-context labor mobility can substitute (lacking) monetary resources by providing cost efficient alternative perspectives and heuristics to solve encountered problems.

An important limitation of the presented results is the lack of data on mobility event timing. However, even though, for practical reasons, we measure across-context mobility as a binary variable it is actually a continuum of across-context interactions of varying intensity. The mobility event itself is a manifestation of established social ties (also transferring knowledge between contexts), rendering across-context labor mobility both an indication and a reinforcement of social capital extending across contexts.

Another limitation is that in this study we follow previous research and view our focal industry as isolated from related industries (studies adopting this perspective include Cattani & Ferriani, 2008; Cattani et al., 2008; Ferriani et al., 2009; Sorenson & Waguespack, 2006; Uzzi & Spiro, 2005). Lack of data on interconnectivity between industry networks excludes the possibility of including across industry knowledge exchange. However, to take all potentially connected industry networks into account is impossible, instead the analysis controls for network position, which to some degree compensates for lack of data on inter industry connections.

6. Conclusion

Our results, based on matched sample analyses of collaboration, background and performance data from the film industry, support that the positive association between across-context labor mobility and professionals' probability of contributing to high performance projects is moderated by the focus of the focal project along the exploration-exploitation continuum. Controlling for endogenous personality traits motivating across-context labor mobility, we found support for the idea that individuals endowed with diverse knowledge have a higher probability of involvement in a high performing project if the project focus is exploration. Surprisingly, the association is reversed for participation in projects focused on exploitation. We found also that the level of similarity between the local and foreign contexts moderates the association between across-context labor mobility and participation in a high performing project. Similarity between the local and foreign contexts decreases the positive association between across-context labor mobility and professionals' probability of contributing to high performing projects. This supports previous research identifying distance as important for the value of new knowledge (Corredoira & Rosenkopf, 2010; Nerkar, 2003; Rosenkopf & Almeida, 2003; Rosenkopf & Nerkar, 2001; Song et al., 2003).

The findings in this paper extend our understanding of the costs and benefits of diverse knowledge and of across-context labor mobility. By analyzing the implication of across-context labor mobility for the careers of individual professionals, we add an individual-based perspective to the literature on labor mobility, and provide a more sophisticated angle on labor mobility research, challenging the idea of universal brokerage effects. There is a growing literature emphasizing that across-context labor mobility provides cross fertilization among geographical, technological and organization contexts (Hansen, 2002; Nerkar, 2003; Owen-Smith & Powell, 2004; Rosenkopf & Almeida, 2003; Ryall & Sorenson, 2007; Singh & Agrawal, 2011; Song et al., 2003). This paper examined conditions moderating the positive association between across-context labor mobility and the performance of mobile professionals. This paper extend our understanding of the benefits of diverse knowledge by identifying instances where it does improve the probability of high performance from those where it provides no such benefit. Analyzing the conditions moderating the association, provides further insights into the costs and benefits of knowledge diversity at the individual and aggregate levels. We also contribute to the literature on brokerage by exploring the conditions moderating the benefits of bridging ties with distant contexts. Others have addressed the issue of moderating conditions from different perspectives, analyzing effects of motivation and ability (Reinholt, Pedersen, & Foss, 2011) or situational conditions (Ryall & Sorenson, 2007). In this paper our point of departure was project characteristics, which we found are essential to the cost benefit tradeoff of integrating diverse knowledge into team production.

From a managerial perspective, this paper offers some important insights into issues related to the organization of knowledge intensive team productions. Project organization is the predominant form of organization of innovative activities within many industries as well as within individual firms. Our results emphasize that project characteristics affect the value of diverse knowledge. Furthermore, similarity – or distance – matters for the impact of knowledge diversity. This suggests that knowledge management should be an important part of orchestrating team productions, and that account must be taken of project aims when deciding on team composition.

To conclude, this paper points to the important moderating effect of project characteristics for individual professionals' possibilities to contribute to team productions. Despite significant contributions to the fields of knowledge exchange and organizational learning, these moderating effects have been largely ignored. This paper

contributes to the debate by providing one example showing why we should include focal project characteristics in analyses of the costs and benefits of across-context knowledge exchange and organizational learning.

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