Strategic Management Journal
Strat. Mgmt. J., **37**: 2307–2322 (2016)
Published online EarlyView in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/smj.2572
Received 30 September 2014; *Final revision received 7 March 2016*

SWIMMING WITH SHARKS IN EUROPE: WHEN ARE THEY DANGEROUS AND WHAT CAN NEW VENTURES DO TO DEFEND THEMSELVES?

MASSIMO G. COLOMBO* and KOUROSH SHAFI
Department of Management, Economics, and Industrial Engineering, Politecnico di Milano, Milan, Italy

Research summary: *This study replicates Dushnitsky and Shaver (2009) in an institutional setting different from the United States, that is, the European venture capital market. We highlight the role played by this switch of boundary condition in influencing how legal defenses protect new ventures' knowledge from misappropriation and encourage the formation of ties between these ventures and same-industry corporate venture capitalists. Furthermore, we consider timing and social defenses and their interactions with legal defenses in Europe. Our results indicate that the use of legal and other defenses by new ventures does vary, depending on the characteristics of the institutional context.*
Managerial summary: *In this study, we focus attention on the formation of corporate venture capital (CVC) ties in Europe. We highlight that the institutional context of the European venture capital market differs from the one in the United States, and this difference influences how legal defenses protect new ventures' knowledge from misappropriation and encourage the formation of ties between these ventures and same-industry CVCs. We also consider the protection offered to new ventures by postponing CVC ties to later stages and by affiliation with prominent independent VCs. We show that, in Europe, these protections are less effective than in the United States. However, the protection provided by legal defenses is reinforced when new ventures are affiliated with prominent independent VCs.*

INTRODUCTION

Dushnitsky and Shaver (2009) (D&S) examine the conditions under which valuable inter-organizational relationships do *not* materialize. They focus attention on corporate venture capital (CVC) investments—that is, minority equity investments made by established firms in young privately held ventures (see Dushnitsky, 2012)—and argue that such relationships with incumbents are a double-edged sword for new ventures. On the one hand, new ventures often have access to limited financial and nonfinancial resources and are attracted by the valuable resources of the parent companies of CVCs (Park and Steensma, 2012). On the other hand, these ties may be accompanied by a substantial risk that the new venture's knowledge will be misappropriated (Alvarez and Barney, 2001), that is, that CVCs will "imitate the innovation [developed by the new venture], and leave the entrepreneur empty-handed" (D&S: 1046). CVCs whose parent company operates in the same industry as the focal new venture (hereafter, same-industry CVCs) are simultaneously the most dangerous and (potentially) the most valuable partners. D&S claim that the propensity of new ventures to partner with same-industry CVCs is

Keywords: replication; corporate venture capital; European new venture; misappropriation risk; defense mechanism; partnership formation
*Correspondence to: Massimo G. Colombo, Politecnico di Milano, Department of Management, Economics, and Industrial Engineering, Via Raffaele Lambruschini 4/b, 20156, Milan, Italy. E-mail: massimo.colombo@polimi.it

moderated by the *tightness of the intellectual property protection (IPP) regime* in the industry of the new venture. If legal mechanisms such as patents and trade secrets provide new ventures with a high level of IPP—as is the case in industries such as biotechnology and pharmaceuticals (Cohen, Nelson, and Walsh, 2000; Levin *et al.*, 1987)[1]—new ventures will be more inclined to partner with same-industry CVCs. However, when IPP is of limited effectiveness in the relevant industry, the opposite holds true.

D&S test these predictions on a sample of 1,646 start-up stage ventures that received funding during the 1990s and *were located in the United States*. These ventures received 167 CVC investments. D&S assess the probability of tie formation for all CVC investor-new venture dyads depending on (1) the tightness of the IPP regime in the industry in which the new ventures operate, and (2) whether the new ventures and the parent company of the CVC investors operate in the same industry or not. D&S find support for their view that "to the extent that a CVC has greater capability and inclination to target same-industry ventures, such industry overlap would exacerbate imitation concerns under a weak IPP regime, yet facilitate an investment relationship under a strong IPP regime" (D&S: 1045).

The aim of the present article is to replicate D&S in an institutional setting different from the United States, that is, the *European* venture capital market. We investigate how this change in the important "boundary condition" of the institutional setting could affect D&S findings. As we illustrate in the next section, although the IPP regimes in Europe and the United States are of similar strength, European countries feature other *institutional characteristics* that differ considerably from those in the United States (e.g., La Porta *et al.*, 2000) and that deeply affect the functioning of the VC market (e.g., Armour and Cumming, 2006; Bruton, Fried, and Manigart, 2005; Li and Zahra, 2012). We analyze the extent to which D&S findings are valid for European new ventures, keeping the same measures, specification, and tests of D&S.

In addition, D&S have left open the question as to how new ventures can form valuable CVC ties in a weak IPP regime and nonetheless protect themselves from knowledge misappropriation. Research indicates that in addition to legal defenses, new ventures can use *timing* and *social defenses* to safeguard their knowledge from misappropriation (Hallen, Katila, and Rosenberger, 2014; Katila, Rosenberger, and Eisenhardt, 2008; Kim, 2014). First, new ventures can delay the establishment of CVC ties to a later stage when it becomes more difficult for CVCs to misappropriate the venture's knowledge. Second, new ventures can affiliate with prominent independent VCs (IVCs), defined as IVCs that occupy a central position in the VC syndication network, and leverage IVCs' central position to deter opportunistic behavior by CVCs.[2] In this article, in addition to the legal defenses, we examine whether timing and social defenses encourage European new ventures to form same-industry CVC ties. In so doing, we provide a comprehensive understanding of both the set of mechanisms that new ventures can use to protect their knowledge and the manner in which legal and other defenses interact with one another in an institutional environment that markedly differs from the U.S. VC market—that is, the VC market considered by all previous studies in this stream of research.

Our analysis takes advantage of data provided by a new data set on VC investments in young high-tech ventures located in Europe: the VICO database. The VICO database was built by the VICO project, which was funded by the European Commission under the 7th Framework Program (http://www.vicoproject.org/. For a detailed description, see Bertoni and Martí, 2011). This database combines information from country-specific proprietary databases and other secondary sources (e.g., VCs' websites), in addition to commercial databases (i.e., Thomson One, VC-pro, and Zephyr). This approach overcomes the well-known limitations of commercial databases, which provide inadequate coverage

[1] We acknowledge that filing for and maintaining patents is costly. Moreover, litigation costs in patent infringement suits can be substantial. Therefore, it is arguable whether patents are an effective defense for small resource-constrained firms (e.g., Lanjouw and Schankerman, 2004). In this study, we focus on firms backed by VCs that presumably are better positioned than non-VC-backed firms to enforce their patents and other legal rights because of the financial and legal resources provided by the VCs.

[2] Affiliation with central IVCs provides social defenses against misappropriation risks by the following two mechanisms. First, for CVCs establishing and maintaining ties with central IVCs is valuable because they are desirable future partners (Burt, 2005). Second, central IVCs can leverage their positions to effectively broadcast alleged misbehavior by CVCs (Raub and Weesie, 1990).

DOI: 10.1002/smj

of VC investments in Europe and frequently miscategorize VC investor types.[3]

The findings of our replication study highlight that the institutional setting substantially influences the relation between the protection from knowledge misappropriation offered by legal defense and the likelihood of same-industry CVC tie formation. In spite of the fact that the strength of IPP in Europe is similar to the one available in the United States, we observe that in contrast to D&S, European new ventures are still attracted to same-industry CVCs even in a weak IPP regime. However, and similar to D&S, in a strong IPP regime, the likelihood of same-industry CVC tie formation is substantially larger than that observed in a weak IPP regime. The difference between our results and those of D&S could be attributed to institutional peculiarities that affect the functioning of the European VC market and reduce the supply of attractive early-stage funding other than CVC for European ventures. Our results also suggest that in Europe timing defenses are ineffective, and social defenses are a complement to, rather than a substitute for, legal defenses.

THE SETTING OF THE REPLICATION: THE VC MARKET IN EUROPE

Studies of VC that are inspired by institutional theory (North, 1990) have shown that the functioning of the VC market in different countries is deeply influenced by country-specific institutional characteristics related to the organization of the financial system, the entrepreneur-friendliness of the legal environment, and cognitive institutions associated with social culture (e.g., Armour and Cumming, 2006; Bruton *et al.*, 2005; Li and Zahra, 2012). We compare the institutional environments in Europe and in the United States as their similarities and differences have consequential implications for our replication study.

For the objectives of the present study, the most important similarity between Europe and the United States involves the IPP regime. The available evidence shows that both the European patent system and the enforcement of IP rights in Europe are as strong as their counterparts in the United States, with only minor variations across European countries (Ginarte and Park, 1997; Park, 2008). Therefore, for European new ventures, the recourse to legal defense mechanisms is likely to be as effective as it is in the United States.

Although the IPP regimes in the United States and Europe are of similar strength, the legal environment in Europe is not as friendly to VC investments as it is in the United States. In Europe, the level of investor protection is generally lower (La Porta *et al.*, 2000), bankruptcy law is typically more protective of lenders to the detriment of equity holders (Armour and Cumming, 2006), and labor market regulation is more rigid, which negatively impacts early-stage investments (Jeng and Wells, 2000). Furthermore, stock markets are less developed in Europe than those in the United States. A less liquid stock market makes it more difficult for VCs to exit successfully through an IPO or a trade sale (Black and Gilson, 1998; Jeng and Wells, 2000). Finally, cognitive institutions related to the culture of a society also create a less favorable environment for VC investments in Europe than in the United States. The major differences include the lower social status of entrepreneurs (Bruton *et al.*, 2005), a greater tendency to avoid uncertainty and a greater inclination to collectivism as opposed to individualism (Li and Zahra, 2012).

These institutional peculiarities of Europe render the functioning of the VC market different from the U.S. market. In particular, three aspects of the European VC market have important implications for our replication study. First, Europe is a less attractive setting for VC investments than the United States. In 2009—the last year of the period considered in this study—the value of the VC & PE country attractiveness index (Groh, von Liechtenstein, and Lieser, 2010) was equal to 67.5 in Europe and 100 in the United States. Accordingly, the European VC market is less developed than the U.S. VC market.

[3] The studies of U.S. new ventures in the VC literature typically use Thomson One, formerly known as VentureXpert, as the source of their data. However, it is common knowledge that Thomson One's coverage of the European VC market is more limited. For example, the total amount of VC investments in European Union countries calculated from Thomson One data in 2005 is equal to approximately 26.7 billion Euros (Oehler *et al.*, 2007; assuming a USD/Euro exchange rate of 1.2 in 2005). However, the same measure reported by the European Venture Capital Association in its 2007 report is equal to approximately 47 billion Euros. Moreover, scholars have expressed concerns regarding the accuracy of the CVC classification in Thomson One (Ivanov and Xie, 2010: 135). In accordance with these concerns, Da Gbadji, Gailly, and Schwienbacher (2014) report that only approximately 55 percent of the CVC programs of non-U.S. firms they identified by using national directories—a methodology similar to that used in building the VICO database—appeared in Thomson One, whereas all U.S. firms that were members of the NVCA were listed as parent companies in Thomson One.

In 2009, the ratio of VC investments to GDP in the United States was 173, 292 and 179 percent higher than the corresponding values in the three largest European VC markets, the United Kingdom, Germany, and France, respectively (OECD, 2011). Second, the European VC market remains fragmented in national submarkets, partly due to regulatory constraints and double taxation problems that hinder cross-border investments.[4] Third, in Europe, there is a dearth of high-quality early-stage IVCs. Whereas IVCs in the United States have historically been active early-stage investors (Ferrary, 2010), the European institutional setting renders IVCs relatively less inclined to invest in early-stage companies (Bruton *et al.*, 2005). IVCs' limited appetite for risk has generated an early-stage funding gap, which in turn, has paved the way for the establishment of VC firms owned by national or local governmental bodies, so-called governmental VCs. Indeed, governmental VCs are widely diffused in European countries, whereas they are all but nonexistent in the United States. In accordance with their mandate, European governmental VCs concentrate their investments in early-stage companies. However, the available evidence indicates that the impact of these investments on European investee firms has been negligible (Colombo, Cumming, and Vismara, 2016. See Guerini and Quas [2016] for an exception).

Overall, the aforementioned circumstances suggest that European new ventures that look for early-stage financing have a more limited set of funding options than their U.S. counterparts do. Hence, they may be relatively more inclined to form same-industry CVC ties even in industries with weak IPP regime. For the same reason, timing defenses are difficult to deploy in Europe.[5] Last, social defenses are also less effective in Europe than in the United States. In Europe, the VC syndication network is less dense than in the United States, and thus, it is more difficult for IVCs to effectively broadcast alleged misbehavior by the CVCs in the co-investment network.

METHODS

Data and sample

Data on CVC investments in European ventures were obtained from the VICO database. The VICO database includes longitudinal data on VC-backed ventures (and a control group of non-VC-backed ventures) located in seven European countries—Belgium, Finland, France, Germany, Italy, Spain, and the United Kingdom—operating in high-tech manufacturing and service industries,[6] and observed from 1994 to 2009.

The sample of VC-backed ventures was obtained through a random draw from commercial databases (i.e., Thomson One, VC-Pro, and Zephyr), and the following country-specific proprietary databases: the yearbooks of the Belgian Venture Capital and Private Equity Association and the Finnish Venture Capital Association, the ZEW Foundation Panel for Germany, the Research on Entrepreneurship in Advanced Technologies (RITA) directory and Private Equity Monitor for Italy, the Web Capital Riesgo database for Spain, and the Library House (now Venture Source) for the United Kingdom. These databases provide accurate coverage of VC investments in their respective countries. Data on VC-backed ventures were then cross-checked with information publicly available from the ventures'

[4] The fragmentation of the European VC market is a serious concern for European policymakers. In a series of recent acts (most notably, the Small Business Act and the Single Market Act), the European Commission has committed itself to promoting cross-border VC investments by adopting new rules ensuring that VC funds established in any member state can raise funds and invest freely throughout the European Union (the so-called pan-European passport for VCs. See, for example, http://ec.europa.eu/enterprise/policies/finance/risk-capital/venture-capital/).

[5] Bertoni, Colombo, and Quas (2015) analyze the patterns of investment specialization of different types of VCs in Europe and compare them with those of VCs in the U.S. Comparable data are available on the age of European and U.S. investee ventures. They find that IVCs' share of investments in newly created ventures in Europe (i.e., ventures that are less than one year old) is significantly smaller (-8%) than their overall share of total VC investments, whereas this measure is 10 percent greater for IVCs in the United States. Moreover, governmental VCs' share of investments in European newly created ventures is 45 percent greater than their overall share of VC investments. Finally, in the United States, CVCs' share of investments in newly created ventures is 25 percent smaller than their share of total VC investments, whereas CVCs in Europe do not exhibit any significant tendency to refrain from investing in this type of venture. In a similar vein, Bottazzi, Da Rin, and Hellmann (2004) show that, in Europe, early-stage CVC investments are more frequent than in the United States.

[6] Ventures included in VICO operate in the following industries: nanotechnology, biotechnology, pharmaceuticals, computers, electronic components, telecommunications equipment, precision, optical and medical instruments, robotics, aerospace, software, telecommunications services, internet and multimedia services, web publishing, renewable energies, and R&D and engineering services.

websites, press releases, initial public offering (IPO) prospectuses (for firms that went through an IPO), and the annual reports and websites of VC firms. A central unit coordinated the data collection process and assured the consistency of data across countries. To be included in the final sample, VC-backed ventures had to comply with the following criteria. First, all VC-backed ventures had to receive their first round of VC between 1994 and 2004. Second, the ventures must have been less than 10 years old at the time of the first VC round. Third, the ventures also had to be independent at their foundation. Fourth, as is customary in the VC literature, the VICO database excludes late-stage investments (e.g., leveraged buyouts, real estate, distressed buyouts, and other private equity investments). Notably, the database includes both surviving and nonsurviving firms, which alleviates possible concerns regarding survivorship bias. By the end of the observation period, sample firms may have gone through an IPO, may have remained privately held and independent, may have been acquired (thereby losing their independence), may have gone bankrupt, or may have otherwise terminated operations. Altogether, the VICO database includes data on 759 VC-backed ventures. VICO provides information on the VC investment rounds for these ventures between 1994 and 2009, including the year of the round, the investment amount, and the identity of all VCs. In addition, it provides information on the sectors of operation of the ventures, their addresses and patenting data from the European Patent Office. For most ventures, it also provides longitudinal accounting data insourced from the Bureau Van Dijk Amadeus database. Furthermore, we double-checked the identity of all CVCs, their locations and legal status (i.e., whether the CVC program is a wholly owned subsidiary), and we collected additional data on the sales and industries of operation of CVCs' parent companies (from Orbis, Amadeus, and Compustat databases), and their geographic coordinates (from Google Maps API Web Services).

After excluding observations with missing data, our analysis considers 658 ventures that received 1,577 VC rounds during the period 1994–2009. Of these ventures, 98 received VC from 75 unique CVCs. CVCs participated in 137 out of the 1,577 VC rounds (i.e., 8.7%). The number of total CVC investments is equal to 155 because in some rounds ventures received more than one CVC investment.

Measures

Dependent variable

In order to explore with whom new ventures form relationships, we follow D&S and perform a dyad-level analysis restricted to the first round of funding. This analysis allows us to investigate factors that drive new ventures' partner-selection decisions. Since the unit of analysis is the dyad between a CVC investor and a venture, we consider all possible combinations between each venture and each unique CVC investor. Our sample encompasses 47,708 dyads (658 ventures × 91 CVCs, minus 12,170 observations with missing information on sales of CVCs' parent company). The dependent variable $Realized_{ij}$ takes the value of 1 if CVC i invested in venture j, and 0 otherwise. There are 56 realized investments versus a counterfactual of 47,652 nonrealized investments.[7]

Independent variables

Industry overlap. We measure industry overlap between the parent companies of CVCs and the sample ventures based on the three-digit (i.e., group-level) NACE rev. 2 industry classification codes.[8] As in D&S, *Industry Overlap* is a dummy variable that is set to 1 if in the focal dyad, there is a match between any of the venture's industry codes and any of the codes of the CVC's parent company; otherwise, it is set to 0.

IPP regime. We follow D&S in defining the strength of the IPP regime and set *IPP regime* to 1 if ventures operate in industries in which legal defenses of IP are relatively more effective. These industries include pharmaceuticals, biotechnology, biological products, chemical products, surgical instruments, and other medical equipment. If ventures operate in any of the remaining industries under consideration, *IPP regime* is equal to 0.

[7] In the description of the nonrealized investments, we keep CVCs with missing values of parent company's sales in the year of their realized investments to create counterfactual dyads in other years (with nonmissing values of sales) if we know that in those years these CVCs have not invested in other ventures of our sample.

[8] NACE (acronym for "*Nomenclature statistique des Activités économiques dans la Communauté Européenne*") classifies economic activities in the European Union and is subject to legislation at European Union level. Three-digit NACE rev. 2 codes roughly correspond to four-digit SIC codes.

DOI: 10.1002/smj

Table 1. Descriptive statistics and correlation matrix

Variable	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Realized	0.001	0.034	—						
2. Industry overlap	0.113	0.317	0.021	—					
3. Subsidiary	0.607	0.488	0.008	0.070	—				
4. Distance[a]	2.805	3.363	−0.016	0.146	0.261	—			
5. Industry no preference	0.648	0.477	−0.009	−0.485	−0.073	−0.086	—		
6. CVC size	4.720	3.692	0.007	0.034	0.501	0.330	−0.058	—	
7. Venture quality	0.288	0.453	0.011	−0.003	0.010	−0.005	0.020	0.014	—
8. CVC to IVC inflow	0.076	0.050	0.003	0.030	−0.041	0.002	−0.003	0.006	0.041

[a] The distance is expressed in thousand kilometer.
N = 47,708.

Control variables

We include in the model specification all controls considered by D&S. Following D&S, we expect CVCs that belong to larger parent companies to be more attractive to new ventures, and we thus control for parent company's relative size. *CVC size* is the natural logarithm of the ratio of the sales of the parent company of the focal CVC investor to the average sales of all firms in the industry (defined at NACE Rev. 2 three-digit, data were obtained from the Amadeus and Orbis databases) in the year of the investment. *Subsidiary* equals 1 if the CVC program is a wholly owned subsidiary, and 0 otherwise. New ventures' fear of misappropriation is less pronounced when the CVC investment is made through a dedicated subsidiary. We control for investor preferences with respect to venture industry (*Industry no preference*). To construct this variable, we consult the membership directory of the European Private Equity & Venture Capital Association (EVCA), and the websites of CVC investors, and complement this information with operating industries of the parent companies. The variable *Industry no preference* takes the value of 1 if an investor is not interested in a given venture's industry of operation because it doesn't seek investments in the venture's industry, and 0 otherwise. To control for the quality of ventures, we track the exit outcomes of ventures up to 2009. We set *Venture quality* to 1 if the focal venture went through a successful exit (i.e., either an IPO or an acquisition), and to 0 otherwise.[9] Because the probability of forming ties decreases as the distance between investors and target ventures increases (Sorenson and Stuart, 2001), we include *Distance* in the set of controls. This variable measures the geographical distance (in thousands of kilometers) between the focal venture and the headquarters of the CVC investor's parent company. *CVC to IVC inflow* is calculated as the ratio of annual CVC inflow to the annual IVC inflow in each country-year to control for the relative supply of CVC versus IVC in each country-year.

RESULTS

Table 1 displays descriptive statistics and the correlation matrix of all variables. The mean of realized CVC investments is 0.001, close to the value in D&S. Ventures operate in the same industry as the CVC's parent company in 11 percent of all dyads. The correlations between variables are low, with the exception of the positive correlation between *CVC size* and *Subsidiary* (0.501, $p < 0.001$). Regarding concerns about multicollinearity, we enter these variables both separately and simultaneously, and the results do not change. Moreover, we estimate standard OLS models and compute variance inflation factors and condition indices. None of these values is close to the cutoffs of 10 and 50 that are associated with multicollinearity concerns (Belsley, Kuh, and Welsch, 2005).

Table 2 presents a univariate analysis of the proportion of same-industry dyads within realized and nonrealized investments contingent on the strength of the IPP regime. This table reproduces Table 2 in D&S. For ease of comparison, we also report the results of D&S in the table. Under a strong IPP regime, realized investments

[9] As recognized also by D&S, we are aware that this *ex post* measure has several limitations, including truncation issues for recently funded ventures and its potential endogenous nature with respect to investor identity.

Table 2. CVC investments contingent on *IPP regime*

	Same industry (Industry overlap = 1)		Different industry (Industry overlap = 0)		
		D&S		D&S	Total
Panel (A): Weak IPP regime					
Nonrealized	11.7%	8.9%	88.3%	91.1%	100%
Realized	26.0% [<0.001]	4.1%**	74.0%	95.9%	100%
Panel (B): Strong IPP regime					
Nonrealized	7.3%	3.1%	92.7%	96.9%	100%
Realized	66.7% [<0.001]	50.0%***	33.3%	50.0%	100%

P-values appear in brackets. The *p*-values for D&S are not available.
For each venture, we only consider the first round of VC investment. N = 47,708 (658 ventures × 91 CVCs, minus 12,170 observations with missing information on sales of CVCs' parent company). Wilcoxon-Mann-Whitney test *$z < 0.10$, **$z < 0.05$, ***$z < 0.01$.

between same-industry pairs constitute a greater share of total realized investments (66.7%) than the corresponding share for nonrealized investments (7.3%). The difference is statistically significant (Wilcoxon *z-stat* = 18.46, $p < 0.001$). Under a weak IPP regime, investments between same-industry pairs are again more frequent among realized than nonrealized investments (26.0% compared with 11.7%; Wilcoxon *z-stat* = 71.15, $p < 0.001$). The univariate results under a strong IPP regime are similar to those of D&S, although the results diverge under a weak regime. Furthermore, the share of realized investments between same-industry pairs out of total realized investments is much larger under a strong IPP regime than under a weak IPP regime. These results point to a possible positive interaction effect between *Industry overlap* and *IPP regime* in explaining the formation of ties with CVCs.

To conduct a multivariate dyad-level analysis and estimate the likelihood that a focal venture receives financing from a unique CVC investor in the first round of investment, we employ a logit model. Consistent with D&S, we resort to a cross-sectional analysis and cluster standard errors at the venture level to control for the nonindependence of observations related to the same venture. We reproduce Table 3 of D&S using an identical specification. Table 3 presents the estimates for a weak IPP regime in Model I and strong IPP regime in Model II. For ease of comparison, we also report the results of D&S in the table.

We first briefly consider the effect of control variables. Whereas all the coefficients of the control variables in our estimates have the same sign as in D&S both in the weak and strong IPP regime models, the significance levels are somewhat lower, which possibly is a result of the smaller number of observations in our study compared to D&S. Regarding the coefficients with low *p*-values, under a weak IPP regime the coefficient of *Venture quality* is positive ($p = 0.05$), and the coefficient of *Distance* is negative ($p = 0.01$). Under a strong IPP regime, the positive coefficient of *CVC size* is the only coefficient among control variables with low *p*-value ($p = 0.02$).

Let us now consider the effect of legal defense on the formation of same-industry CVC ties. The coefficient of *Industry overlap* is positive in *both* IPP regimes ($p = 0.001$). The pattern of tie formation of our sample in a strong IPP regime is similar to D&S; however, it diverges for a weak IPP regime. The column to the right of each model reports the marginal effects of *Industry overlap*, while all other variables are held at their mean. Under a strong IPP regime and holding all other variables at their mean, the probability of a realized investment increase from 0.0260 percent ($p = 0.124$) when the pair is operating in different industries to 0.5990 percent ($p = 0.408$) when the pair operates in the same industry (i.e., increase by 0.0057). The magnitude of the effect of *Industry overlap* is close to the one reported by D&S, and large given that the mean value of the dependent variable is equal to 0.1 percent. Contrary to D&S, within the subsample of weak IPP regime, there is an increase in the probability of tie formation from 0.0590 percent for different-industry pairs ($p = 0.001$) to 0.2223 percent for same-industry pairs ($p = 0.024$) (i.e., an increase by 0.0016), if we hold all other variables at their mean. Under

Table 3. Regression results of the dyad-level analysis: logit model for the likelihood of CVC-new venture dyad forming[a]

IPP regime:	Weak IPP regime				Strong IPP regime			
	Model I	Mrg. eff.	D&S	D&S Mrg. eff.	Model II	Mrg. eff.	D&S	D&S Mrg. eff.
Constant	−7.455 (0.659) [<0.001]		−7.495*** (0.29)		−9.428 (1.469) [<0.001]		−8.938*** (0.73)	
Industry overlap	1.329 (0.407) [0.001]	0.0016 0 → 1 [0.076]	−0.865** (0.44)	−0.0007 0 → 1	3.142 (0.933) [0.001]	0.0057 0 → 1 [0.422]	3.374*** (0.44)	0.0055 0 → 1
Subsidiary	0.395 (0.321) [0.219]		0.543** (0.174)		1.097 (1.268) [0.387]		0.992** (0.45)	
Distance	−0.344 (0.137) [0.012]		−0.017*** (0.004)		−0.140 (0.104) [0.178]		−0.014* (0.01)	
Industry no preference	0.178 (0.373) [0.632]		0.065 (0.20)		−0.636 (1.441) [0.659]		−0.096 (0.48)	
CVC size	0.071 (0.051) [0.166]		0.011*** (0.004)		0.176 (0.077) [0.023]		0.012*** (0.005)	
Venture quality	0.567 (0.289) [0.049]		0.612** (0.18)		0.751 (0.840) [0.372]		0.367 (0.47)	
CVC to IVC inflow	1.770 (3.196) [0.580]		8.141*** (1.12)		3.499 (9.182) [0.703]		6.282*** (3.04)	
N	43,072		98,832		4,636		44,370	
Log pseudo-likelihood	−366.652 [<0.001]		−1043***		−36.971 [<0.001]		−160***	

[a] Robust standard errors appear in parentheses clustered around new ventures.
P-values appear in brackets. For each venture, we only consider the first round of VC investment. The *p*-values for D&S are not available (however, D&S reported one-tailed tests: $*p < 0.1$; $**p < 0.05$; $***p < 0.01$).

a weak IPP regime, D&S detected a negative marginal effect, even though of small magnitude (-0.0007), when *Industry overlap* switches from 0 to 1. However, consistent with the results of D&S, in our estimates the increase in the probability of tie formation associated with *Industry overlap* in a weak IPP regime is substantially smaller than the one detected under a strong IPP regime.

We perform additional analysis to test whether the positive effects of *Industry overlap* on the probability of CVC tie formation in the two IPP regimes are statistically different from each other. Comparison of the coefficients of *Industry overlap* in the two regimes would be only meaningful if the samples in each group were of roughly the same size (Hoetker, 2007). In our case, the number of observations in the strong IPP regime is much smaller than the number in the weak IPP regime, which is therefore likely to violate the assumption of equal residual variation—an assumption that is necessary for a naïve comparison of coefficients across groups in a logit analysis. Therefore, we followed Hoetker's (2007) suggestion and performed Allison's (1999) test, which rejects the null hypothesis that the coefficients of *Industry overlap* are the same across IPP regimes (likelihood ratio $\chi^2(1) = 10.23$, $p = 0.001$).

The results illustrated above are robust to alternative estimation strategies. The results of these robustness checks are presented in Table 4. First, we refrain from splitting the sample and interact *Industry overlap* with *IPP regime* in Model I. Results are fully in line with those presented in Table 3. Second, we perform conditional logit regressions with grouping on new ventures. This specification allows us to control for latent venture characteristics. Following this approach, variables such as *Venture quality*, which do not vary across observations relating to a focal venture, are dropped.

Table 4. Robustness checks for the dyad-level analysis[a]

	Model I Clustered on venture	Model II Conditioned on venture	Model III Clustered on CVC investor	Model IV Conditioned on CVC investor
Industry overlap	1.269	0.836	1.269	1.101
	(0.395)	(0.446)	(0.526)	(0.729)
	[0.001]	[0.061]	[0.016]	[0.131]
IPP regime	−0.764		−0.764	−0.729
	(0.719)		(0.793)	(0.813)
	[0.288]		[0.336]	[0.370]
Subsidiary	0.498	0.591	0.498	
	(0.310)	(0.319)	(0.350)	
	[0.109]	[0.064]	[0.155]	
Distance	−0.290	−0.268	−0.290	−4.203
	(0.088)	(0.077)	(0.159)	(0.699)
	[0.001]	[<0.001]	[0.068]	[<0.001]
Industry no preference	0.131	−0.274	0.131	−0.314
	(0.356)	(0.380)	(0.293)	(0.425)
	[0.713]	[0.471]	[0.655]	[0.460]
CVC size	0.075	0.075	0.075	0.038
	(0.048)	(0.050)	(0.046)	(0.134)
	[0.119]	[0.132]	[0.107]	[0.778]
Venture quality	0.574		0.574	0.519
	(0.272)		(0.262)	(0.257)
	[0.035]		[0.029]	[0.043]
CVC to IVC inflow	1.983		1.983	1.035
	(3.028)		(3.973)	(3.922)
	[0.513]		[0.618]	[0.792]
IPP regime × industry overlap	2.376	2.524	2.376	2.867
	(0.923)	(0.929)	(1.029)	(1.109)
	[0.010]	[0.007]	[0.021]	[0.010]
Constant	−7.589		−7.589	
	(0.615)		(0.588)	
	[<0.001]		[<0.001]	
Log pseudo-likelihood	−405.524	−215.859	−405.524	−274.765
N	47,708	3,975	47,708	22,646

[a] Robust standard errors appear in parentheses.
P-values appear in brackets.

In addition, ventures that are never backed by any CVCs drop out because the dependent variable does not vary across such ventures. Despite a lower sample size, Model II shows similar results to those illustrated earlier. Third, to check whether CVC investor fixed effects drive our results, we repeated the logit analysis while clustering standard errors by CVCs rather than by new ventures (Model III). Clustering on CVCs implies that dyadic observations are independent across investors, but not necessarily independent within investors. Last, we use a conditional logit model grouping on CVCs to control for latent investor characteristics (Model IV). The results again remain unchanged. We also rerun Models II, III, and IV after splitting the sample based on the strength of the IPP regime, and obtain results that are fully in line with those presented in Table 4 (they are available from the authors on request).

EXTENSION

In addition to the legal defenses suggested by D&S, we draw from the contributions of Katila *et al.* (2008) and Hallen *et al.* (2014) to examine whether in Europe, timing and social defenses encourage the formation of same-industry CVC ties. In so doing, our objective is to provide a comprehensive understanding of the set of mechanisms that new ventures can use to protect their knowledge and the manner in which legal and other defenses interact with one

DOI: 10.1002/smj

another. Due to the institutional peculiarities of the European VC market that were described earlier, we expect timing and social defenses to be less effective in Europe than in the United States. In addition, the lower effectiveness of these latter defenses may influence the extent to which they are used by European ventures as a complement to rather than a substitute for legal defense. We proceed first by describing the measures necessary to perform this analysis, and thereafter, we present the results. This analysis requires us to consider all investment rounds.

We follow Katila *et al.* (2008) and Hallen *et al.* (2014) to operationalize the measures that proxy social and timing defenses. To measure social defenses provided by existing VCs, we consider whether new ventures are backed by well-connected VCs (*VC centrality*). More precisely, we consider the eigenvector centrality, which captures the status of existing VCs and their ability to broadcast information about alleged misconduct by CVCs. We operationalize VC centrality in the same manner as Hallen *et al.* (2014).[10,11] The mean value of VC centrality in our sample (i.e., 0.07) is much lower than the corresponding value in Hallen *et al.* (2014), which is consistent with our contention that the syndication network of VCs in Europe is less dense than the corresponding network in the United States. To measure timing defense, we follow Katila *et al.* (2008) and use the ordinal count (first, second, etc.) of the current financing round in the focal venture (*Round*). We complement the dyad-level analysis of D&S by inserting in the model specification the *Round* and *VC centrality* variables, and a set of control variables inspired from studies in the "swimming with sharks" literature (they are described in Appendix S1). Given the inclusion of all investment rounds in this analysis, the new sample encompasses 155 realized investments versus a counterfactual of 121,106 nonrealized investments (1,577 venture-rounds × 91 CVCs, minus 22,246 observations with missing information on sales of CVCs' parent company). Table 5 reports the results of the estimates, whereas Table 6 presents the average marginal effects of *Industry overlap* contingent on the value of the defense variables.

Before considering the interaction between the defense variables and *Industry overlap*, we present the direct effect of the defense variables in Model I. The coefficient of *IPP regime* and that of *VC centrality* are positive with low p-values (respectively, $p = 0.324$ and $p = 0.672$). The coefficient of *Round* is negative ($p = 0.742$). We then include the squared term of *Round* in Model II to test whether this variable has a curvilinear association with the probability of CVC tie formation. In this specification, the coefficient of *Round* is negative, and its squared term is positive ($p = 0.003$ and $p = 0.004$, respectively), which suggests a U-shaped relationship. The average marginal effect of *Round* is negative up to the fourth round and turns positive from the fifth round onward.[12]

In Model III, we interact *Industry overlap* with *IPP regime*. This analysis extends results of D&S to all (early-stage) investment rounds. Panel A of Table 6 shows that the average marginal effect of *Industry overlap* under a strong IPP regime is equal to 0.0097 ($p = 0.062$), while it is equal to 0.0019 ($p = 0.062$) under a weak IPP regime. Holding all remaining variables at their mean, if a new venture is protected by a strong IPP regime, the estimated likelihood of forming a tie with same-industry CVCs is more than 10 times higher than the likelihood of forming a tie with a different-industry CVC investor. Under a weak IPP regime, the corresponding increase in the likelihood of tie formation is substantially smaller. These results confirm that European new ventures are much less attracted by

[10] First, we create an adjacency matrix $\mathbf{A} = [a_{ij}]$, which represents the VCs that are adjacent to (i.e., have syndicated with) other VCs in the prior five years as recorded in the Thomson One database. Therefore, a_{ij} is set to 1 if VC_i and VC_j co-invest in a given venture in the prior five years, and 0 otherwise. Next, we calculate the eigenvector that corresponds to the largest eigenvalue of the adjacency matrix **A**. The eigenvector centrality for a VC is a recursive measure, assigning a higher score to a VC that has syndicated with VCs who have higher centrality scores (Bonacich, 1987). We then scale the measure by the maximum obtained in each year to allow for comparability across years (our results are robust to this normalization). Finally, we define *VC centrality* at each round as the maximum scaled eigenvector centrality of all the participating VCs up to the focal round in the new venture.

[11] As argued previously, Thomson One under-represents VC investments in Europe. Unfortunately, to the best of our knowledge, there is no better alternative record of investments to calculate network measures, such as eigenvector centrality. We acknowledge the limitations of the measure of VC centrality used in this study. However, we believe that the use of the maximum score of centrality up to the focal round, as suggested by Hallen *et al.* (2014), alleviates concerns about the quality of this measure.

[12] To further check these results, we followed the simulation-based approach recommended by King, Tomz, and Wittenberg (2000) to test for curvilinear effects. The results confirm that the effect of *Round* is U-shaped. For further details, see the working paper version of this study (Colombo and Shafi, 2015).

Table 5. Regression results of the additional dyad-level analysis: logit model for the likelihood of CVC-new venture dyad forming[a]

	Model I	Model II	Model III	Model IV	Model V	Model VI
Industry overlap	1.300	1.313	1.069	1.305	1.237	1.102
	(0.360)	(0.370)	(0.387)	(0.483)	(0.382)	(0.401)
	[<0.001]	[<0.001]	[0.006]	[0.007]	[0.001]	[0.006]
IPP regime	0.241	0.297	−0.190	0.296	0.304	0.168
	(0.245)	(0.243)	(0.365)	(0.243)	(0.247)	(0.409)
	[0.324]	[0.222]	[0.603]	[0.223]	[0.218]	[0.681]
VC centrality	0.278	0.440	0.494	0.419	0.180	0.438
	(0.658)	(0.570)	(0.581)	(0.579)	(0.732)	(0.682)
	[0.672]	[0.440]	[0.396]	[0.469]	[0.806]	[0.521]
IPP regime × industry overlap			1.505			0.390
			(0.701)			(0.978)
			[0.032]			[0.690]
Round × industry overlap				−0.060		
				(0.247)		
				[0.808]		
Round squared × industry overlap				0.014		
				(0.021)		
				[0.506]		
VC centrality × industry overlap					0.772	−0.395
					(1.325)	(1.282)
					[0.560]	[0.758]
IPP regime × VC centrality						−4.841
						(2.993)
						[0.106]
IPP regime × VC centrality × industry overlap						10.283
						(4.111)
						[0.012]
Round	−0.041	−0.443	−0.438	−0.416	−0.444	−0.433
	(0.124)	(0.150)	(0.150)	(0.179)	(0.151)	(0.148)
	[0.742]	[0.003]	[0.003]	[0.020]	[0.003]	[0.003]
Round squared		0.041	0.041	0.036	0.041	0.041
		(0.014)	(0.014)	(0.017)	(0.015)	(0.014)
		[0.004]	[0.004]	[0.036]	[0.004]	[0.003]
Trust	3.007	2.978	3.001	2.975	2.978	3.043
	(0.318)	(0.309)	(0.315)	(0.308)	(0.309)	(0.318)
	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[<0.001]
Venture age	−0.090	−0.073	−0.076	−0.073	−0.073	−0.076
	(0.039)	(0.034)	(0.035)	(0.034)	(0.034)	(0.035)
	[0.022]	[0.033]	[0.030]	[0.033]	[0.033]	[0.030]
Citation-weighted patent stock	0.058	0.064	0.066	0.063	0.064	0.065
	(0.051)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
	[0.255]	[0.201]	[0.182]	[0.203]	[0.199]	[0.192]
Venture quality	0.144	0.155	0.142	0.154	0.152	0.166
	(0.204)	(0.201)	(0.204)	(0.201)	(0.202)	(0.200)
	[0.481]	[0.441]	[0.486]	[0.444]	[0.451]	[0.406]
Distance	−0.025	−0.029	−0.029	−0.027	−0.029	−0.028
	(0.036)	(0.035)	(0.036)	(0.035)	(0.035)	(0.035)
	[0.480]	[0.412]	[0.412]	[0.442]	[0.414]	[0.432]

same-industry CVCs when legal defenses are ineffective.

To assess whether in Europe timing and social defenses facilitate swimming with more dangerous "sharks" (i.e., same-industry CVCs), we interact *Industry overlap* with *Round* and *Round squared* in Model IV, and *VC centrality* in Model V. As shown in Panel B, the average marginal effect of *Industry overlap* decreases with an increase of the order of rounds up to the fourth round. Contrary to

Table 5. continued

	Model I	Model II	Model III	Model IV	Model V	Model VI
Industry no preference	0.066	0.087	0.075	0.080	0.091	0.066
	(0.300)	(0.311)	(0.312)	(0.306)	(0.312)	(0.312)
	[0.825]	[0.779]	[0.811]	[0.794]	[0.770]	[0.832]
CVC size	0.038	0.037	0.033	0.037	0.037	0.032
	(0.041)	(0.040)	(0.041)	(0.040)	(0.040)	(0.041)
	[0.352]	[0.363]	[0.425]	[0.364]	[0.359]	[0.442]
Subsidiary	0.624	0.629	0.682	0.625	0.629	0.698
	(0.264)	(0.266)	(0.260)	(0.266)	(0.265)	(0.253)
	[0.018]	[0.018]	[0.009]	[0.019]	[0.018]	[0.006]
CVC centrality	1.417	1.461	1.509	1.457	1.453	1.496
	(0.468)	(0.456)	(0.477)	(0.456)	(0.457)	(0.482)
	[0.002]	[0.001]	[0.002]	[0.001]	[0.001]	[0.002]
Prior CVC investors	1.753	1.928	1.915	1.926	1.930	1.928
	(0.183)	(0.230)	(0.232)	(0.231)	(0.232)	(0.229)
	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[<0.001]
CVC to IVC inflow	2.579	2.477	2.415	2.482	2.475	2.586
	(2.060)	(2.061)	(2.063)	(2.058)	(2.062)	(2.062)
	[0.211]	[0.229]	[0.242]	[0.228]	[0.230]	[0.210]
Constant	−13.430	−12.921	−12.910	−12.918	−12.902	−13.028
	(0.833)	(0.722)	(0.737)	(0.721)	(0.726)	(0.743)
	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[<0.001]
Log pseudo-likelihood	−1021.25	−1017.57	−1012.196	−1016.513	−1016.727	−1006.724
Likelihood ratio χ^2	374.025	351.646	343.762	405.823	350.593	374.171
	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[<0.001]
Wald χ^2 test, H_0: coefficients of interaction terms = 0 (degrees of freedom)	–	–	4.61	5.63	0.34	21.63
			(1)	(2)	(1)	(4)
			[0.032]	[0.060]	[0.560]	[<0.001]

[a] Robust standard errors appear in parentheses clustered around 658 ventures. For each venture, we consider all rounds of VC investments. *P*-values appear in brackets.
N = 121,261 (1,577 venture-rounds × 91 CVCs, minus 22,246 observations with missing information on sales of CVCs' parent company).

the contention of Katila *et al.* (2008), our results do not support the view that new ventures use timing defenses to protect themselves from same-industry CVCs and abstain from forming this type of ties in early rounds. Furthermore, our results in Panel C show that the average marginal effect of *Industry overlap* does not increase substantially with an increase in *VC centrality*, as one would hypothesize in accordance with the social defense argument proposed by Hallen *et al.* (2014). Last, in Model VI, we add a three-way interaction term between *Industry overlap*, *IPP regime*, and *VC centrality*. In Panel D, we report the average marginal effects of *Industry overlap* calculated from Model VI. Under a strong IPP regime and with *VC centrality* set at one standard deviation above the mean, a switch of *Industry overlap* from 0 to 1 increases the likelihood of tie formation by 0.0161 ($p = 0.030$), corresponding to a large percentage increase. The extent of this effect rapidly declines with decreasing values of *VC centrality*. For example, with VC centrality set to the minimum value, the marginal effect of *Industry overlap* is equal to just 0.0039 ($p = 0.323$). By contrast, under a weak IPP regime, we are unable to detect any substantial increase in the marginal effect of *Industry overlap* associated with an increase of *VC centrality*.[13] Altogether, our findings suggest that *VC centrality* in Europe does not substitute for legal defenses, but reinforces them, and both complement each other to increase the likelihood of formation of same-industry CVC ties.

[13] To have a more immediate understanding of the effect of *VC centrality* on the likelihood of forming CVC ties, we plot the likelihood of tie formation in Figure S1 (see the Appendix S1) as a function of *VC centrality*, *IPP regime*, and *Industry overlap*. The graph shows that if we consider a same-industry pair under a strong IPP regime, *VC centrality* clearly has a strong positive effect on the likelihood of tie formation. This effect vanishes if *Industry overlap* is equal to 0 and/or the IPP regime is weak. We also obtain consistent results through the simulation procedure proposed by King *et al.* (2000) and report these results in detail in the working paper version of this study (Colombo and Shafi, 2015).

Table 6. Average marginal effects of *Industry overlap*[a]

Panel A	Model III
Weak IPP regime	0.0019 (0.0010) [0.062]
Strong IPP regime	0.0097 (0.0052) [0.062]
Panel B	**Model IV**
Round at minimum (=1)	0.0034 (0.0016) [0.030]
Round at mean (=2)	0.0025 (0.0011) [0.025]
Round at mean + one S.D. (=4)	0.0018 (0.0010) [0.076]
Panel C	**Model V**
VC centrality at minimum	0.0024 (0.0012) [0.040]
VC centrality at mean	0.0026 (0.0012) [0.029]
VC centrality at mean + one S.D.	0.0031 (0.0015) [0.036]
Panel D	**Model VI**
Weak IPP regime and VC centrality at minimum	0.0019 (0.0011) [0.070]
Weak IPP regime and VC centrality at mean	0.0019 (0.0010) [0.060]
Weak IPP regime and VC centrality at mean + one S.D.	0.0019 (0.0011) [0.088]
Strong IPP regime and VC centrality at minimum	0.0039 (0.0039) [0.323]
Strong IPP regime and VC centrality at mean	0.0066 (0.0047) [0.165]
Strong IPP regime and VC centrality at mean + one S.D.	0.0161 (0.0074) [0.030]

[a] Delta-method robust standard errors appear in parentheses. *P*-values appear in brackets. N = 121,261.

DISCUSSION AND CONCLUSION

The purpose of this study is to replicate the findings of D&S as they relate to the role of legal defenses in favoring the formation of ties with same-industry CVCs. Our replication focuses on a different institutional setting than is investigated by previous studies because we examine European new ventures rather than U.S. new ventures. Whereas our replication study validates some of the results found for U.S. ventures, we also find notable differences. In Europe, the level of legal protection for IP is similar to that in the United States (Ginarte and Park, 1997; Park, 2008). Accordingly, consistent with the results of D&S, European new ventures are more likely to form ties with same-industry CVCs—viewed as the most valuable and the most dangerous partners—under a strong IPP regime rather than under a weak regime. However, in contrast to D&S, European new ventures are still attracted to same-industry CVCs in a weak IPP regime, even if the strength of this attraction is substantially lower than the one detected under a strong IPP regime. This difference with respect to D&S's results can be traced to institutional characteristics that make the European VC market different from the U.S. VC market. As a result of these differences, in Europe, IVCs are less inclined to engage in early-stage investments than they are in the United States (Bertoni *et al.*, 2015; Bruton *et al.*, 2005). Governmental VCs, which are very active in Europe and do invest in early-stage ventures, offer new ventures limited added value (Colombo *et al.*, 2016). As the set of valuable early-stage financing options is limited, European new ventures are more likely to form same-industry CVC ties even in industries with a weak IPP regime.

We also extend D&S by drawing from the "swimming with sharks" literature and consider timing and social defenses, and their interactions with legal defenses. Our study again detects substantial differences with respect to previous findings related to U.S. ventures. Our findings suggest that European new ventures are less inclined than their U.S. peers to resort to timing defenses to mitigate the knowledge misappropriation risks that are inherent in CVC ties; it appears that the opportunity costs of timing defenses are much higher than in the United States due to the above-mentioned institutional peculiarities of the European VC market. Social defenses are also less effective in Europe than in the United States. The syndication network of VCs in Europe is less dense than in the United States. As a consequence, affiliation with a relatively more prominent VC does not offer European new ventures the same level of social protection against dangerous "sharks" as it does in the United States. In accordance with this view, European new ventures do not use social defenses in isolation. Instead, we find that these defenses are used as a complement to legal defenses, perhaps because ventures backed by prominent IVCs use the threat of aggressive pursuit of IP infringements in a strong IPP regime to deter misconduct by CVCs.

Our replication study contributes to the "swimming with sharks" literature by showing the crucial role played by the institutional setting in which new ventures are embedded in influencing the drivers of tie formation with incumbent firms. This contribution is important because all the previous studies in this stream have focused on U.S. ventures and used a theoretical lens that does not include institutional theory. Our findings are in line with the perspective that the level of protection offered by legal and other defenses, and the use that new ventures make of these defenses depend on the institutional characteristics of the country in which new ventures are located (see, e.g., Oxley [1999] for a similar approach that relates to IPP and alliance formation). Our study also contributes to the stream of the literature on VC that engages institutional theory (e.g., Bruton *et al.*, 2005; Li and Zahra, 2012; Nahata, Hazarika, and Tandon, 2014). Most previous studies in this stream focus on IVCs. An exception is Da Gbadji *et al.* (2014), who examine the association between the institutional characteristics of countries and the establishment of CVC programs. Our study takes the analysis a step further by showing that institutional characteristics influence the use that new ventures located in a given country can make of legal and other defenses, making them more or less inclined to form ties with valuable, but dangerous CVCs.

Our study has certain limitations that also open interesting directions for future research. First, our counterfactuals come from prior research that employs data on U.S. ventures that are similar to the European ventures examined here except for their location. An ideal sample would contain both U.S. and European observations, which would enable the direct testing of statistical differences. Second, our study uses data on seven European countries. Future research would benefit from extending this analysis to a larger set of countries with different institutional characteristics (see Nahata *et al.* [2014] for an example). In particular, it would be interesting to investigate how new ventures located in countries with weak IPP protection manage to "swim with sharks." Third, our study explores partner selection decisions in light of the available defense mechanisms, but does not examine the performance impact associated with the use of these defenses. The limited available evidence suggests that ties with same-industry CVCs—the most dangerous "sharks"—are those that are particularly beneficial to new ventures (Gompers and Lerner, 2000). It would be interesting to analyze how the strength of legal and other defenses moderates this positive effect. More generally, future studies that link the ability of new ventures to protect their knowledge, the heterogeneity of partners in terms of misappropriation risks, and performance outcomes for new ventures will contribute to a deeper understanding of entrepreneurs' decisions to "swim with sharks." Fourth, in replicating D&S, we distinguish same-industry and different-industry CVCs. Other corporate characteristics may make CVCs more or less dangerous. For instance, Kim (2014) finds that CVCs with a reputation for integrity are less dangerous. Following Diestre and Rajagopalan (2012), future studies that examine different sources of heterogeneity in terms of the capabilities of incumbent firms to misappropriate new ventures' knowledge and their incentives to do so will further illuminate the drivers of tie formation.

Finally, our empirical results also have interesting managerial implications for entrepreneurs. Non-U.S. new ventures may be pushed into forming ties with CVCs in earlier rounds due to the lack of adequate financing from IVCs. Entrepreneurs that are wary of the misappropriation risks inherent in CVC ties must carefully consider the institutional characteristics of the countries in which their ventures are located because these characteristics make different defenses more or less effective. For example, European entrepreneurs can leverage the protection afforded by IP laws. Our findings suggest that legal defenses are particularly effective when new ventures are affiliated with prominent IVCs that provide them with the legal and financial assistance to commit to aggressive IP protection strategies.

REFERENCES

Allison PD. 1999. Comparing logit and probit coefficients across groups. *Sociological Methods and Research* **28**(2): 186–208.

Alvarez SA, Barney JB. 2001. How entrepreneurial firms can benefit from alliances with large partners. *Academy of Management Executive* **15**(1): 139–148.

Armour J, Cumming DJ. 2006. The legislative road to Silicon Valley. *Oxford Economic Papers* **58**(4): 596–635.

Belsley DA, Kuh E, Welsch RE. 2005. *Regression Diagnostics: Identifying Influential Data and Sources of Collinearity*. John Wiley & Sons: New York.

Bertoni F, Colombo MG, Quas A. 2015. The patterns of venture capital investment in Europe. *Small Business Economics* **45**(3): 543–560.

Bertoni F, Martí J. 2011. Financing entrepreneurial ventures in Europe: description of the dataset developed by the VICO project. SSRN Working paper 1904297, Social Science Research Network, Rochester, NY. DOI: 10.2139/ssrn.1904297.#_blank.

Black BS, Gilson RJ. 1998. Venture capital and the structure of capital markets: banks versus stock markets. *Journal of Financial Economics* **47**(3): 243–277.

Bonacich P. 1987. Power and centrality: a family of measures. *American Journal of Sociology* **92**(5): 1170–1182.

Bottazzi L, Da Rin M, Hellmann T. 2004. The changing face of the European venture capital industry: facts and analysis. *Journal of Private Equity* **7**(2): 26–53.

Bruton GD, Fried VH, Manigart S. 2005. Institutional influences on the worldwide expansion of venture capital. *Entrepreneurship: Theory and Practice* **29**(6): 737–760.

Burt RS. 2005. *Brokerage and Closure: An Introduction to Social Capital*. Oxford University Press: New York.

Cohen WM, Nelson RR, Walsh JP. 2000. Protecting their intellectual assets: appropriability conditions and why U.S. manufacturing firms patent (or not). NBER Working paper 7552, National Bureau of Economic Research, Cambridge, MA. Available at: http://www.nber.org/papers/w7552 (accessed 28 Dec 2013).

Colombo MG, Cumming DJ, Vismara S. 2016. Governmental venture capital for innovative young firms. *The Journal of Technology Transfer* **41**(1): 10–24.

Colombo MG, Shafi K. 2015. Swimming with sharks in Europe: when are they dangerous and what can new ventures do to defend themselves? SSRN Working paper 2695038, Social Science Research Network, Rochester, NY. DOI: 10.2139/ssrn.2695038.

Da Gbadji LAG, Gailly B, Schwienbacher A. 2014. International analysis of venture capital programs of large corporations and financial institutions. *Entrepreneurship: Theory and Practice* **39**(5): 1213–1245.

Diestre L, Rajagopalan N. 2012. Are all “sharks” dangerous? New biotechnology ventures and partner selection in R&D alliances. *Strategic Management Journal* **33**(10): 1115–1134.

Dushnitsky G. 2012. Corporate venture capital in the 21st century: an integral part of firms’ innovation toolkit. In *The Oxford Handbook of Venture Capital*, Cumming D (ed). Oxford University Press: New York; 185–219.

Dushnitsky G, Shaver JM. 2009. Limitations to interorganizational knowledge acquisition: the paradox of corporate venture capital. *Strategic Management Journal* **30**(10): 1045–1064.

Ferrary M. 2010. Syndication of venture capital investment: the art of resource pooling. *Entrepreneurship: Theory and Practice* **34**(5): 885–907.

Ginarte JC, Park WG. 1997. Determinants of patent rights: a cross-national study. *Research Policy* **26**(3): 283–301.

Gompers P, Lerner J. 2000. The determinants of corporate venture capital success: organizational structure, incentives, and complementarities. In *Concentrated Corporate Ownership*, Morck RK (ed). University of Chicago Press: Chicago, IL; 17–54.

Groh AP, von Liechtenstein H, Lieser K. 2010. The European venture capital and private equity country attractiveness indices. *Journal of Corporate Finance* **16**(2): 205–224.

Guerini M, Quas A. 2016. Governmental venture capital in Europe: screening and certification. *Journal of Business Venturing* **31**(2): 175–195.

Hallen B, Katila R, Rosenberger J. 2014. Unpacking social defenses: a resource-dependence lens on technology ventures, venture capital, and corporate relationships. *Academy of Management Journal* **57**(4): 1078–1101.

Hoetker G. 2007. The use of logit and probit models in strategic management research: critical issues. *Strategic Management Journal* **28**(4): 331–343.

Ivanov VI, Xie F. 2010. Do corporate venture capitalists add value to start-up firms? Evidence from IPOs and acquisitions of VC-backed companies. *Financial Management* **39**(1): 129–152.

Jeng LA, Wells PC. 2000. The determinants of venture capital funding: evidence across countries. *Journal of Corporate Finance* **6**(3): 241–289.

Katila R, Rosenberger JD, Eisenhardt KM. 2008. Swimming with sharks: technology ventures, defense mechanisms and corporate relationships. *Administrative Science Quarterly* **53**(2): 295–332.

Kim JYR. 2014. The formation and outcome of corporate venture capital investments between incumbents and new ventures. PhD diss., University of Washington. Available at: http://hdl.handle.net/1773/25633 (accessed 26 Aug 2014).

King G, Tomz M, Wittenberg J. 2000. Making the most of statistical analyses: improving interpretation and presentation. *American Journal of Political Science* **44**(2): 341–355.

Lanjouw JO, Schankerman M. 2004. Protecting intellectual property rights: are small firms handicapped? *Journal of Law and Economics* **47**(1): 45–74.

La Porta R, Lopez-de-Silanes F, Shleifer A, Vishny R. 2000. Investor protection and corporate governance. *Journal of Financial Economics* **58**(1): 3–27.

Levin RC, Klevorick AK, Nelson RR, Winter SG. 1987. Appropriating the returns from industrial research and development. *Brookings Papers on Economic Activity* **18**(3): 783–832.

Li Y, Zahra SA. 2012. Formal institutions, culture, and venture capital activity: a cross-country analysis. *Journal of Business Venturing* **27**(1): 95–111.

Nahata R, Hazarika S, Tandon K. 2014. Success in global venture capital investing: do institutional and cultural differences matter? *Journal of Financial and Quantitative Analysis* **49**(4): 1039–1070.

North D. 1990. *Institutions, Institutional Change and Economic Performance*. Cambridge University Press: Cambridge, UK.

OECD. 2011. *Entrepreneurship at a Glance*. Organisation for Economic Co-operation and Development: Paris, France.

Oehler A, Pukthuanthong K, Rummer M, Thomas W. 2007. Venture capital in Europe: closing the gap to the U.S. In *Venture Capital in Europe*, Gregoriou GN, Kooli M,, Kraeussl R (eds). Elsevier: London, UK; 3–17.

Oxley JE. 1999. Institutional environment and the mechanisms of governance: the impact of intellectual property protection on the structure of inter-firm alliances. *Journal of Economic Behavior and Organization* **38**(3): 283–309.

Park WG. 2008. International patent protection: 1960–2005. *Research Policy* **37**(4): 761–766.

Park HD, Steensma HK. 2012. When does corporate venture capital add value for new ventures? *Strategic Management Journal* **33**(1): 1–22.

Raub W, Weesie J. 1990. Reputation and Efficiency in Social Interactions: An Example of Network Effects. *American Journal of Sociology* **96**(3): 626–654.

Sorenson O, Stuart TE. 2001. Syndication networks and the spatial distribution of venture capital investments. *American Journal of Sociology* **106**(6): 1546–1588.

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix S1. Explanation of control variables used in extension.