Crowdfunding and Patents

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July 25, 2018

Abstract

Patents and crowdfunding both attempt to foster early stage innovations. In theory, patents incentivize the creation of inventions and, in turn, attract investment and remove coordination barriers to facilitate commercialization. Crowdfunding allows multiple individuals to make small contributions to finance start-up ventures. This study explores the interaction between these two innovation tools by examining 9,184 Kickstarter campaigns in patent-eligible categories to determine whether patented, or patent-pending, projects are more likely to reach their funding goal and in turn achieve actual, on-time delivery when compared to non-patented projects. The study finds, perhaps surprisingly, that patented projects are not more likely to obtain funding compared to non-patented ones. However, patent-pending projects are more successful in getting funded. Delivery for those funded patented projects is less likely and delayed substantially longer than their non-patented counterparts. Patent-pending projects exhibited a higher delivery rate, with their delays falling in between patented and no patent projects. The results suggest timing is important. That is, patents are an important signal to crowdfunding contributors, but only when the patent, and thus project, is fresh and truly in its early stages of development, evidenced by the success of patent-pending, but not yet issued, projects. These results provide insights for both what makes a successful crowdfunding campaign and whether patents help attract funding and assist in commercialization in the crowdfunding context.

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1. Introduction

There are a multitude of mechanisms to facilitate innovation and new business ventures. Patents are such a mechanism—a government grant of limited exclusivity for new and nonobvious inventions (35 U.S.C. § 271; Cotropia, 2012). This exclusivity, the theory goes, incentivizes the creation of inventions (Cotropia, 2012; Lemley, 2004) and, in turn, attracts investment and removes coordination barriers to facilitate ultimate commercialization (Sichelman, 2010; Kieff, 2001, Kitch, 1977). A more recent means to enable innovations to come to market is crowdfunding (Davis et al., 2017; Stanko and Henard, 2017; Clauss et al., 2017). Crowdfunding allows multiple individuals to make small contributions to fund the ultimate deployment of an innovation (Fischer and Reuber, 2014; Mollick, 2014; Schwienbacher & Larralde, 2010). Crowdfunding takes many forms, from pre-buy to actual capital investments (Mollick, 2014; Belleflamme et al., 2013). Both patents and crowdfunding are meant to help innovations secure funding and, in turn, reach commercialization.

While some have empirically studied whether either of these mechanisms help innovations reach these goals, this study explores the interplay between the two. That is, what happens when an innovation is patented, or has patents pending, and also the subject of a crowdfunding campaign? This article reports on a study that examines patents in the crowdfunding environment to determine if patented, or patent-pending, crowdfunding campaigns are more likely to obtain their funding goal and in turn achieve actual, on-time delivery as compared to non-patented projects.

The study finds that, perhaps surprisingly, compared to similar non-patented projects, patented projects are not more likely to obtain funding. And delivery for those funded patented is delayed substantially longer than their non-patented counterparts. However, patent-pending projects—with patent applications are filed but not yet issued—exhibit the opposite result. The patent-pending projects are more likely to achieve more funding compared to both patented and non-patented projects. And patent-pending projects reach delivery sooner than those projects that are patented. Still, patent-pending projects evidence greater deliver delays than projects not seeking patent protection.

These results provide insights for both what makes a successful crowdfunding campaign and whether patents help attract funding and reach ultimate commercialization. Having patents pending may signal, and evidence, that the innovation is both new and can benefit greatly from crowdfunding, while projects already patented may be innovations that are older, less in need of

[*] Thanks for Jim Gibson, Mark Lemley, Jack Pries, Kyle Rozema, and David Schwartz for comments on an earlier draft.

crowdfunding, and potentially already failed to secure traditional funding. Put simply, patented crowdfunding campaigns may simply have less merit.

The increase delays in delivery for patented, and even patent-pending innovations, may be due to the complexity of such projects in comparison to non-patented ones. Patented projects are delayed even more than patent-pending ones, likely a product of the low viability of such that have already been rejected by more mainstream funding options. Notably, these findings are limited to the crowdfunding context, making extrapolation of the patent-related findings to other funding and commercialization environments limited.

This article proceeds as follows. First, the background section describes the current theories and literature regarding patenting and crowdfunding and their facilitating the funding and commercialization of innovation. The article then sets forth the specific research questions the study attempts to answer. The data and methods section then describes the specific dataset of 6,487 Kickstarter campaigns used to study patents and crowdfunding and the coding that was done. Next, the results are detailed, focusing on the relationship between patents and (a) successful funding, (b) successful delivery, and (c) delay, if any, in delivery. The article then concludes discussing implications of the findings.

2. Background

2.1 Patents and Commercialization

A patent is a government grant of exclusivity over an invention for a limited time (35 U.S.C. § 271; Cotropia, 2012; Landes and Posner, 2003). The patent itself is a written document that (a) describes the invention and how to make it and (b) defines the invention and thus the scope of exclusivity (35 U.S.C. § 112; Cotropia, 2012). In order to obtain a patent, an inventor must apply and the patent application examined by a government official to determine whether the claimed invention is eligible for patent protection (Frakes and Wasserman, 2017; Lemley and Sampat, 2008). In the United States, this is done by a patent examiner who determines whether the claimed invention is new—having not been done before—and nonobvious—enough of a technological advance to warrant protection (35 U.S.C. §§ 101-103; Frakes and Wasserman, 2015; Cotropia, 2014; Lemley and Sampat 2012). Patent application typically pend, on average, two and a half years at the patent office before issuing as a granted patent (USPTO, 2017). Once issued, a U.S. patent gives the inventor twenty years of exclusivity from the date of filing (35 U.S.C. § 154). And the patent can exclude even "innocent infringers"—those who came in second, having developed the invention on their own but after the inventor (Vermont, 2006).

Patents are part of the innovation ecosystem, believed to, in part, incentivize and facilitate manufacturer and commercialization of the claimed invention (Cotropia, 2012; Sichelman, 2010; Lemley, 2004; Merges and Nelson, 1990; Kitch, 1977). The theory behind this is multifold. First, the potential of patenting is meant to incentivize the initial creation of the invention—the idea (Cotropia, 2012; Landes and Posner, 2003). The prospect of ultimately selling a commercial embodiment of the invention at higher-than-normal prices or by licensing the invention to others

for a fee is meant to incentivize the would-be inventor to take the first steps of creation (Lemley, 2004). Second, the granted patent's exclusivity helps the patentholder coordinate development and commercialization efforts regarding the claimed invention among several players, reducing duplicated costs and preventing competitors' use of unpatentable information generated in the process (Cotropia, 2012; Duffy, 2004; Lemley, 2004; Kitch, 1977). This "prospect theory" views patent exclusivity as promoting the investment needed to actually make and sell invention (Kitch, 1977). For example, the theory goes that venture capitalists are more likely to invest in companies that have patent protection because such patenting will protect the company from competitors and allow them to control price (Sichelman, 2010). Once investment is secured, patents are supposed to help pave the way toward commercialization because they remove certain coordination problems (Sichelman, 2010; Cotropia, 2009; Lemley, 2004; Kieff, 2001).

Finally, the patent document, not the resulting exclusivity, provides "signals" to potential investors that a company has the wherewithal to conceive of new and non-obvious inventions and the discipline to document that knowledge (Long, 2002). This "signaling" theory views the patent as a "proxy for hard-to-measure capabilities and assets" and increases the chances the inventor, particularly in a start-up company, is able to attract investment (Long, 2002). Others assert that patents signal a company's sophistication and its invention's technical worth, thus attracting investment (Sichelman, 2010).

Previous empirical studies examine whether patenting facilitates commercialization, particularly for early stage developments (Hall and Harhoff, 2012). A few of note include multiple studies finding that having patents helped companies receive investment and venture capital funding (e.g., Helmers and Rogers, 2011; Hsu and Ziedonis, 2008; Mann and Sager, 2007). Others found that patents send an important signal to venture capital investors (Haeussler et al., 2009) and aid in obtaining later stage financing (Mann, 2005). Graham, Merges, Samuleson, and Sichelman surveyed 1,332 early-stage technology companies and found patenting more widespread than previously reported and that "early-stage companies patent . . . often seeking competitive advantage, and the associated goals of preventing technology copying, securing financing, and enhancing reputation" (Graham et al., 2009). Graham and Sichelman further examine the study's results and conclude that entrepreneurs patent for "'signaling' reasons, such as improving their chances of securing investment" (Sichelman and Graham, 2010).

2.2 Crowdfunding and Commercialization

Crowdfunding can take many forms, but is essentially a request on-line for resources, in some form, to support a described project (Mollick, 2014; Belleflamme et al., 2013). The typical requested resource is money and the project seeking support is typically a product or service (Cholakova and Clarysse, 2015). The funding provided can be in the form of equity in the project, a reward for providing funding, a loan, or a simple donation (Stanko & Henard, 2017). The reward for many crowdfunding campaigns is the subject of the campaign itself—the product or service (essentially "preselling") (Mollick, 2014). The reward-based crowdfunding is the most prevalent currently, with such popular crowdfunding sites such as Kickstarter and Indiegogo (Mollick, 2014). A crowdfunding campaign is defined by a goal and how contributors can move the

campaign closer to the defined goal (Agrawal et al., 2014). Crowdfunding is seen by many as a mechanism for entrepreneurial individuals to fund their projects, typically new ventures, by getting small contributions from a large number of individuals (Stanko & Henard, 2017).

In the innovation context, crowdfunding is another, albeit unique, funding mechanism to facilitate the commercialization of a particular project (Stanko & Henard, 2017). The funding from the campaign itself can foster innovation. Funding obtained is used to further research, develop, and/or produce the subjects of the campaign. In this way, crowdfunding acts as an alternative to other funding mechanisms for start-ups such as venture capital funding (Schwienbacher and Larralde, 2010). This is even the case with reward-based crowdfunding because, even though contributors to such campaigns are not receiving equity in the project, such contributors feel like they are "investing" in the project (Mollick, 2014; Agrawal et al., 2011). Contributors believe they are "part" of the project and their contribution, however small, was important to bringing the product or service to market (Agrawal et al., 2014; Gerber et al.,2012). Crowdfunding can also further innovation by acting as a marketing tool—creating buzz around a product or service in its early stages. Crowdfunding sites provide a platform for the inventor to communicate the advantages of their product or service and gain media attention (Agrawal et al., 2014; Gerber et al.,2012).

Much of the current research regarding crowdfunding focuses on "what determines the likelihood of a crowdfunding campaign achieving its funding goal?" (Stanko and Henard, 2017; Bouncken, et al., 2015). Ethan Mollick found that personal networks, the project's quality, and geography are associated with crowdfunding success (Mollick, 2014). Others found that focusing on the community, communication, and professionalism help crowdfunding campaigns succeed (Calicand Mosakowski, 2016; Müllerleile and Joenssen, 2015; Hui, 2012). The geographic proximity between the campaign and the contributor is also relevant. (Lin and Viswanathan,2015). The philanthropic nature of the campaign is also correlated with success. (Belleflamme, 2013). Some studies examine what happens after crowdfunding success. For example, Mollick explored what types of projects actually delivered and whether that deliver was on time (Mollick, 2014). Stanko and Henard studied the innovation consequences of crowdfunding, finding that the number of backers, not the amount of funding raised, influences product market performance after funding (Stanko and Henard, 2017).

Some have studied the interaction between patents and crowdfunding, although in either different settings or on a very small scale and have not examined. Gerrit Ahlers, Douglas Cumming, Christina Günther, and Denis Schweizer studied the characteristics of successful equity crowdfunding campaigns and found, in part, that patenting has little to no impact on success of equity financing. (Ahlers, 2015). Azzurra Meoli, Federico Munari, and James Bort compared 272 patented Kickstarter campaigns to a similar, 272 set of unpatented Kickstarter campaigns and found "declaring the underlying possession of a patent negatively affects the likelihood of success." (Meoli et al., 2017). Notably, neither of these studies examined the impact of patents, and, in particular, pending patent applications, on a large scale in the most common, reward-based crowdfunding environment. Furthermore, neither examined the impact of patenting on delivery or delivery delay, a critical part of the innovation environment.

3. Research Questions

This study uses crowdfunding data to test whether crowdfunding campaigns involving products covered by patents (or pending patent applications) are more successful in securing funding, being delivered, and being delivered on time. Previous research regarding crowdfunding indicates that contributors do look for signs of project quality before pledging to a campaign (Mollick, 2014). And patent theory asserts that patents signal product quality—either that the product is uniquely innovative and thus technologically superior or that the patentholder is organized and thus more likely to produce a working product and reach commercialization goals (Sichelman, 2010; Long 2002) This study will provide insights two these two areas of research—the entrepreneurship literature on factors that lead to crowdfunding success (e.g., Bouncken et al., 2015; Mollick, 2014) and the patent literature on whether patents help innovators secure funding (O'Conner, 2013) and, in turn, make commercialization both more likely and easier (Kitch, 1977).

More specifically, the study uses data from Kickstarter (Kickstarter, 2017), a crowdfunding site, to test whether crowdfunding campaigns with products covered by patents, or by pending patent applications, are more likely to: (a) reach their funding goals compared to those campaigns with no patents; (b) be delivered compared to those campaigns with no patents; and (c) meet their delivery date compared to those campaigns with no patents.

4. Data and Methods

This study collected the universe of Kickstarter campaigns in the Technology category from the website's inception in 2009 to June 1, 2017. While Kickstarter has other categories, the Technology category was chosen because it is the one category where the campaigns are most likely to involve products that are eligible for patent protection (35 U.S.C. § 101; Risch, 2008). This category includes the following subcategories: 3D Printing, Apps, Camera Equipment, DIY Electronics, Fabrication Tools, Flight, Gadgets, Hardware, Makerspaces, Robots, Software, Sound Exploration, Wearables, and Web (Kickstarter, 2017). The initial data collection returned information on 9,801 campaigns.[1]

Both non-US originated campaigns and live campaigns were removed from the dataset. The 617 "live" campaigns were dropped because the research focused on completed campaigns so that success and delivery of the campaign could be observed. Of the remaining campaigns, 3,038 (30.99%) were campaigns that originated from outside the United States. However, many of these campaigns—2,119 (69.75%)—had goals that were identified in United States Currency—the U.S. dollar.

[1] Web Robots (webrobots.io) assisted in collecting the data.

After these live campaigns were removed, 9,184 completed campaigns in the Technology category were left. These completed campaigns represented over 230.1 million dollars in pledges. And of the 9,184 campaigns, 2,773 were funded (30.19%). This result matches findings from previous Kickstarter studies (Mollick, 2014).

For these campaigns, basic attributes about the campaign that could provide some insight into the quality of the campaign, and thus its chances of success, were coded—similar to those attributes observed in previous studies (Mollick, 2014). This included the start and end date of the campaign (and thus how long the campaign lasted), the Technology subcategory category the campaign was listed in, the geographic location of the campaign (city and state), the monetary goal of the campaign, the number of bidders, and the final total amount pledged by these bidders. The actual content of the Kickstarter campaign was also coded, including whether images and videos were used. The textual description of the campaign was also examined for common spelling errors. Observers can also comment on a campaign, both before and after its completion (Kickstarter, 2017; Mollick, 2014), and thus the number of comments was coded. The campaign can also be updated both before and after completion (Kickstarter, 2017; Mollick, 2014), and the number of updates was recorded. Finally, whether the campaign was fully funded, and thus successful, was also coded.

Of specific import for this research project, the campaign's textual description was also coded to see if the campaign indicated that the project was either already patented and/or a patent application was filed and was pending. This was done by initially identifying the number of campaigns that mentioned the word "patent" (or relevant derivations) in their description. And then those campaigns were hand coded.

A random sample of fully funded campaigns was further coded to see if the promised product was actually delivered and when delivery occurred. This consisted of coding 374 fully funded campaigns falling into two Technology subcategories that were patent, and patent-pending rich—the Hardware and Gadget categories. The ultimate delivery date was also compared to the promised delivery dates for the campaign.

5. Results

5.1 Descriptive patterns

Initially summary statistics are reported below in Table 1 for all of the U.S., completed campaigns in the dataset, with the mean and median (in parentheses) reported.

Table 1 – Summary Statistics

	ALL	FUNDED	NOT FUNDED	PATENTED	PATENT-PENDING	NO PATENT
FUNDED	0.283			0.280	0.322	0.281
	(0)			(0)	(0)	(0)
US BASED	0.669	0.679	0.665	0.670	0.658	0.671
GOAL ($)	83,456.15	24,165.43	106,850	90,220.01	79,272.49	83,487.50
	(17,000)	(10,000)	(20,000)	(40,000)	(30,000)	(15,000)
FUNDED %	5.38	18.51	0.200	5.53	2.20	5.81
	(0.136)	(1.459)	(0.044)	(0.119)	(0.195)	(0.133)
BACKERS	181.44	544.87	38.04	399.96	351.43	161.30
	(21)	(144)	11)	(32)	(40)	(19)
PLEDGE/BACKER ($)	124.03	176.49	103.33	175.97	175.09	117.81
	(60.91)	(93.30)	(50.025)	(96.68)	(97.06)	(57.86)
UPDATES	5.43	14.28	1.94	7.29	7.79	5.18
	(2)	(11)	(1)	(3)	(3)	(2)
COMMENTS	58.61	192.41	5.80	118.75	108.44	52.96
	(2)	(24)	(0)	(4)	(4)	(1)
DURATION (DAYS)	33.49	32.69	33.80	36.17	34.01	33.33
	(30)	(30)	(30)	(30.24)	(30)	(30)
PATENTED	0.039	0.038	0.039		0.077	0.000
PATENT-PENDING	0.076	0.084	0.072	0.195		0.000
OBSERVATIONS	9184	2773		336	714	8,161

median in parentheses

Notably, and perhaps not surprisingly, patented and patent-pending campaigns have higher goals and higher pledge amounts per backer as compared to those with no patents.[2] This suggests that such projects involve more capital-intense technologies (or is at least perceived as such by the campaigner) (Mollick, 2014) or have longer development cycles. The number of comments is higher for these patent and patent-pending campaigns as well—almost double compared to campaigns with no patent—indicating more community engagement for the patent campaigns.

A higher percentage of patent-pending campaigns are funded (33.5% compared to 31.5% for patented and 30.03% for no patent). Patent-pending campaigns, even when including failed

[2] If a campaign included both patented and pending patents, the campaign was counted in both categories.

campaigns, also get a higher percentage of their funding. In fact, patented campaigns obtain a lower percentage of their funding overall compared to no patent campaigns. This descriptive data indicates that patent-pending campaigns are more successful, and get more funding, than no patent and patented campaigns, and in turn patented fair worse than even no patent campaigns.

Table 2 shows the results of correlations between the observed variables.

Table 2 – Correlations

	SUCCESS	GOAL	FUNDED	US BASED	BACKERS	PLEDGE /BACKER	UPDATES	COMMENTS	DURATION	PATENTED
GOAL	-0.24									
FUNDED	1.00*	-0.24*								
US BASED	0.013	0.01	0.013							
BACKERS	0.23*	-0.002	0.23*	0.004						
PLEDGE/BACKER	0.15*	0.01	0.15*	0.004	0.01					
UPDATES	0.59*	-0.01	0.59*	0.004	0.32*	0.164*				
COMMENTS	0.21*	0.001	0.21*	0.000	0.54*	0.07*	0.38*			
DURATION	-0.086*	0.05*	-0.086*	-0.008	0.01	0.004	-0.012	0.018		
PATENTED	-0.001	0.001	-.001	-0.014	0.05*	0.05*	0.04*	0.03*	0.042*	
PATENT-PENDING	0.025*	-0.001	0.025*	-0.007	0.05*	0.07*	0.07*	0.04*	0.007	0.06*

* p<0.05

5.2 Are patents associated with successful crowdfunding campaigns?

A logistic regression of the odds of successful funding was performed to further explore the relationship between patents and crowdfunding success. When performing the regression, a number of controls were introduced to test the unique influence of indicating that the campaign was either patented or had a patent pending. Specifically, factors that may influence success were controlled for, including the log of the goal of the campaign, the campaign's Technology subcategory, how long the campaign lasted, the year the campaign was listed, the geographic location of the campaign, and whether the campaign was selected by Kickstarter to be featured on the website. The presence of videos, the number of images, and presence of misspellings—all factors that previous researchers have proven influence the likelihood of funding success—were also controlled (Mollick, 2014). Additionally, the regression was performed on only those campaigns with goals of $5,000 or more, to better focus on campaigns that might seek patent protection.

The results of the logistic regression are reported below in Table 3. Model 1 focuses on the size of the campaign goal, whether the campaign described the campaign's product as already patented or had a patent pending, and whether the campaign is U.S. based and in U.S. currency. Model 2 introduces controls for duration and whether Kickstarter picked the campaign to be

featured (Mollick, 2014) and fixed effects for the technology categories, year listed, and geography. Model 3 introduces controls for the presence of videos and the number of images. Finally, Model 4 introduces controls focused on the campaign description, including the number of words, whether there are misspellings, and if there are "novelty" words present in the description.

The novelty language identified included terms, and there synonyms that suggested the campaign was new, innovative, or creative, similar to that used by Yang et. al. when studying the support for innovative campaigns on Kickstarter. (Yang et. al. 2017). The reason such language as isolated was to control for situations where the campaign's creator, or at least backers, believed the campaign to be patent-eligible—being new and innovative—even if no patent was filed or issued.

Table 3 – Predictors of project success with goal > $5000.

	(1)	(2)	(3)	(4)
LOG(GOAL)	0.732***	0.586***	0.483***	0.480***
	(0.0192)	(0.0192)	(0.0181)	(0.0180)
PATENTED	1.26	1.05	0.994	0.975
	(0.158)	(0.148)	(0.152)	(0.149)
PATENT-PENDING	1.515***	1.32**	1.312*	1.272*
	(0.137)	(0.135)	(0.141)	(0.137)
US BASED	1.128*	1.223**	1.260**	1.260**
	(0.067)	(0.087)	(0.095)	(0.095)
US CURRENCY	6.31***	1.278**	1.385***	1.397***
	(1.72)	(0.092)	(0.106)	(0.108)
DURATION		0.996	0.993*	0.993
		(0.003)	(0.003)	(0.003)
STAFF PICK		13.12***	10.17***	10.05***
		(1.215)	(0.988)	(0.977)
VIDEO			3.47***	3.305***
			(0.557)	(0.532)
IMAGES			1.06***	1.054***
			(0.003)	(0.003)
WORD COUNT				0.999
				(0.000)
SPELLING ERROR				1.115
				(0.099)
NOVELTY LANGUAGE				1.367***
				(0.114)
CATEGORY CONTROLS		Yes	Yes	Yes
YEAR CONTROLS		No	No	No
US CITY CONTROLS		No	No	No
N	7,163	7,163	7,163	7,163
EXPONENTIATED COEFFICIENTS; STANDARD ERRORS IN PARENTHESES				
*** P<0.05 ** P<0.01 *** P<0.001**				

The models confirm previous crowdfunding study results showing that the larger the campaign goal, the less likely the campaign will be successful (Mollick, 2014). In contrast, the presence of videos and images increase the odds of success, in line with previous findings (Mollick, 2014). And being selected by Kickstarter increases the odds of success tremendously—twelve times. The Technology subcategory and origination from specific geographic locations also statistically influences the odds of success.

Regarding patented campaigns, there is no statistical significance under any model. The odds-ratio for patented campaigns in Model 1 are slightly above one—suggesting that patents help success. However, in the more detailed models, being patented shows essentially no influence on success.

The patent-pending results tell a different story. The results are statistically significant and increase the odds of success across all models. Under the most detailed model—Model 4—campaigns with patent applications pending are about 36% more likely to be successful compared to those without.

These results held true even when controlling for the described novelty of the campaign. This means that even when a campaign was identified, and likely perceived, as novel or innovative, having a patent pending would increase success, while getting the patent provided no significant effect. This control also tries to remove the selection effect of a campaign being patent-eligible, but the campaign creator not filing for or obtaining a patent. The control is not perfect because mere identification as novel or innovative does not mean the project is patent eligible.

Thus, patented campaigns are not statistically correlated with more crowdfunding success. However, campaigns with patent applications pending are more successful.

5.3 Do crowdfunding campaigns with patents deliver and deliver on time?

A random sample of 374 campaigns in two patent-heavy Technology subcategories—Hardware and Gadgets—that promised delivery by December 2016 were further studied. Specifically, delivery and timing of delivery of the campaign's promised product were examined. Kickstarter campaigns identify delivery targets—both what is going to be delivered and when—at the beginning of the campaign (Kickstarter, 2017). But Kickstarter does not expressly update the campaign page beyond identifying whether the project was funded or not. Thus, getting delivery and delivery date information required reading the campaign and accompanying comments and updates and, in some cases, exploring other information regarding the subject product available on the Internet.

Campaigns with no patent delivered in 210 of 256 successful campaigns (82%). Patent-pending campaigns fared better, delivering on 86.2% of the campaigns (75 of 87). In contrast, patented campaigns showed a much lower delivery rate of 70.3% (26 of 37). Notably, none of these results were statistically significant.

A logistic regression of the odds of successful delivery was performed to further explore the relationship between patents and delivery. The results are show in Table 4 below. Model 1 just focused on the goal amount and how that influenced delivery. Model 2 introduced the patented and patent-pending variable as well as controls for the Technology subcategory. Model 3 introduces the presence of novelty language in the campaign, capturing campaigns that might be harder to deliver, and a log of percentage funded and the number of backers to control for possible overload and overfunding that could influence whether delivery is met.

Table 4 – Delivery of promised product.

	(1)	(2)	(3)
LOG(GOAL)	0.873	0.887	0.829
	(0.0963)	(0.0977)	(0.1118)
US BASED	1.318	1.349	1.357
	(0.3897)	(0.4041)	(0.4096)
PATENTED		0.535	0.551
		(0.2100)	(0.2169)
PATENT-PENDING		1.385	1.401
		(0. 4741)	(0.4819)
NOVELTY LANGUAGE			1.017
			(0.3556)
LOG(PERCENT FUNDED)			0.936
			(0.1986)
TOTAL BACKERS			1.000
			(0.0002)
CATEGORY CONTROL	0.761	0.773	0.783
	(0.2163)	(0.2211)	(0.2252)
N	374	374	374
EXPONENTIATED COEFFICIENTS; STANDARD ERRORS IN PARENTHESES			
*** P<0.05 ** P<0.01 ***P<0.001**			

Notably, nothing is statistically significant. The odds ratios for the log of the goal is predictable, with the higher the goal associated with the lower odds of delivery—presumably because expensive campaigns are just harder to actually produce and deliver. Those campaigns likely involve more complex and expensive products. The log of the percent funded exhibits a similar, less than one odds ratio. The total number of backers does not show any difference in chance of delivery. Delivery appears to not be dependent on the volume of products being delivered, just whether the product can actually be produced in the first place.

With regards to patents, again, nothing is statistically significant. The odds ratios do follow from the descriptives set forth above. Patented campaigns exhibit lower odds of delivery and patent-pending campaigns higher odds. And the novelty (or at least perceived novelty) of the campaign, identified by the language in the description, had no effect on delivery success.

Another aspect of delivery that can be tested is whether the campaign meets its delivery time goal. A campaign will set delivery dates for the campaign's product (Kickstarter, 2017). And thus the delay, if any, of reaching delivery can be observed. This delay is determined by looking at comments and updates on those campaigns that did deliver. Most campaigns exhibited some delay in delivering the promised product, falling in line with entrepreneurs being overly optimistic and over promising, particularly with timelines.

To determine the rate at which delays occur, and the potential causes of delays, a Cox proportional hazard model was used to predict the degree of delay for the random sample. Figure 1 and 2 below show the Kaplan–Meier curve showing cumulative delay separated by the presence of patents and pending patent applications. Figure 2 focuses solely on projects with goals of $50,000 or more.

Figure 1 – Kaplan–Meier curve (all campaigns)

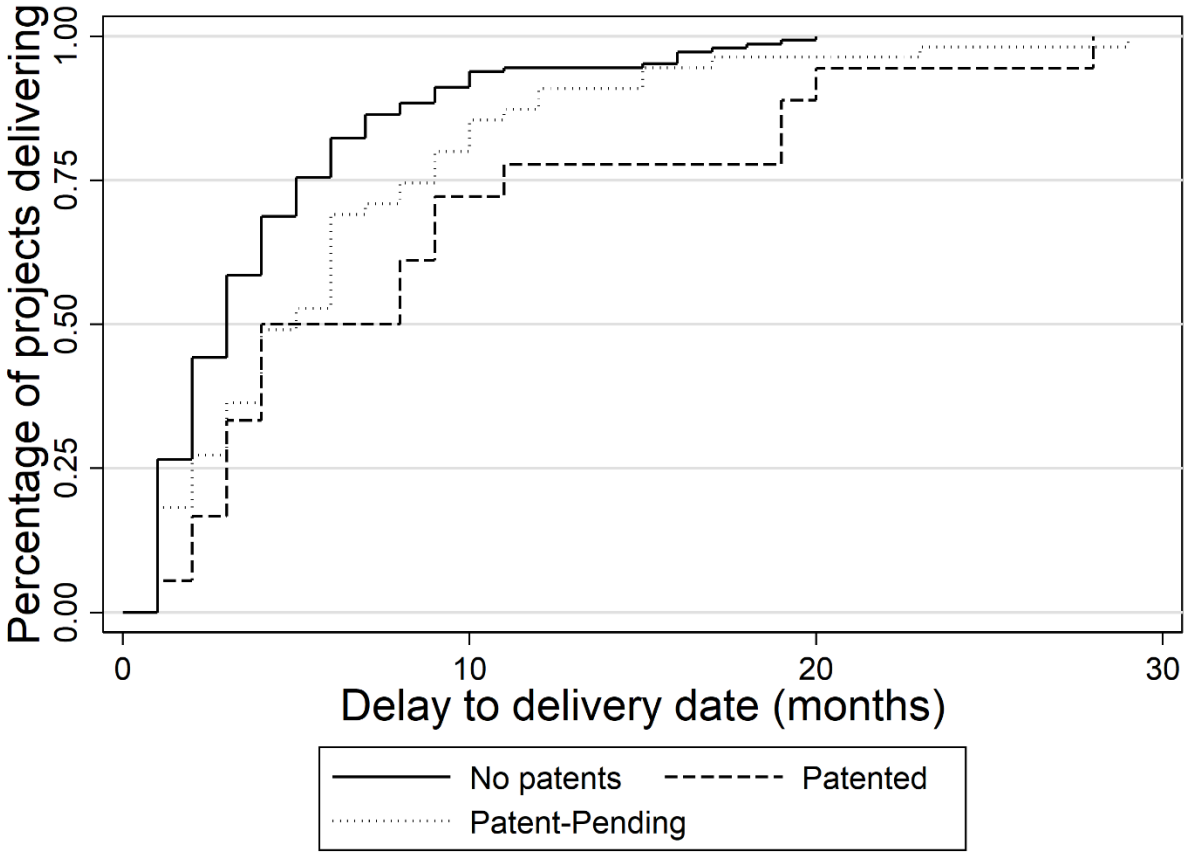
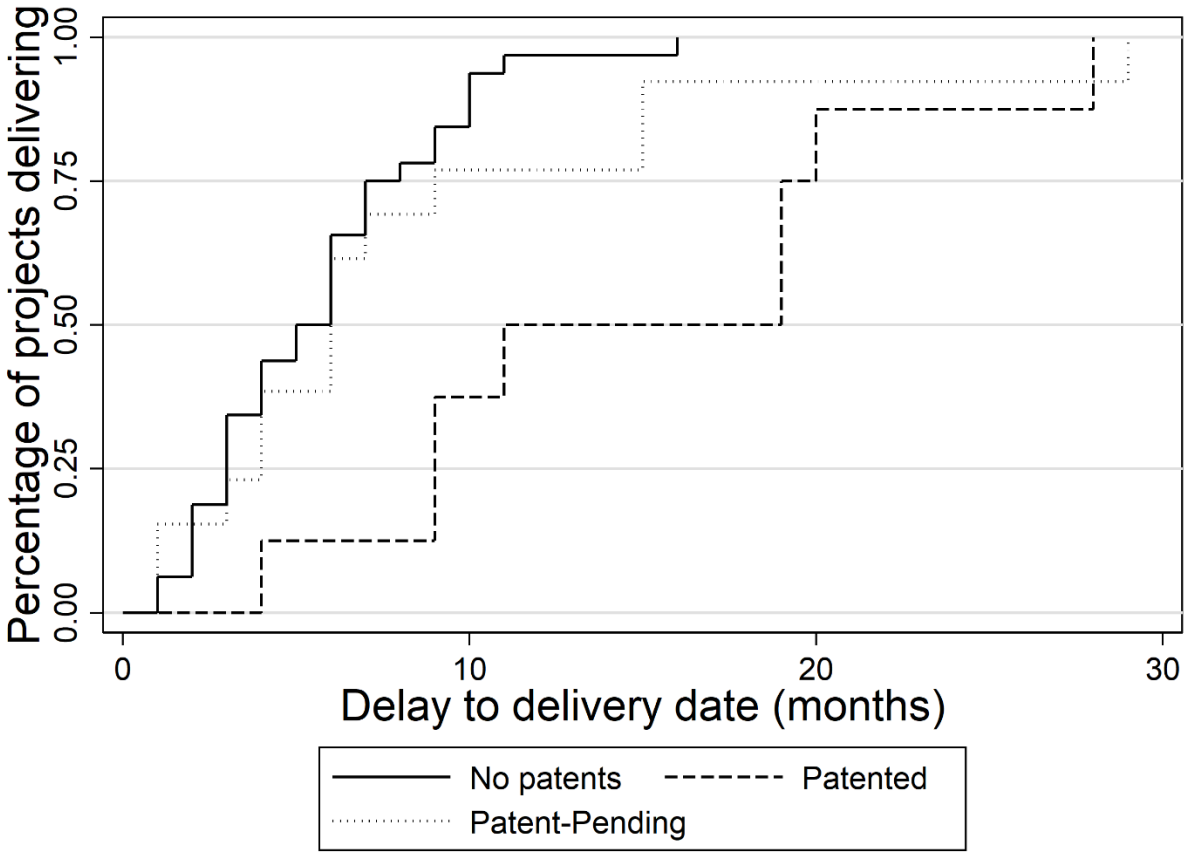


Figure 2 – Kaplan-Meier curve (campaigns > 50K)



Both patent-pending and patented campaigns experience greater delays in comparison to campaigns with no patents. However, the patented campaigns show much greater delays, which become more pronounced when looking at projects over $50,000. And, interestingly, when looking at high-value projects, patent-pending campaigns and no patent campaigns exhibit slightly similar delays (absent the long tail with patent-pending campaigns).

The results of this Cox model are show in Table 5 below.

Table 5 – Cox model for delivery delay

	(1)	(2)	(3)
LOG(GOAL)	-0.295***	-0.293***	-0.311***
	(0.0626)	(0.0640)	(0.066)
US BASED	0.049	0.015	0.011
	(0.1569)	(0.1579)	(0.1586)
PATENTED		-0.471*	-0.550*
		(0.2327)	(0.2367)
PATENT-PENDING		-0.399*	-0.441**
		(0.1622)	(0.1635)
NOVELTY LANGUAGE			-0.182
			(0.1778)
LOG(PERCENT FUNDED)			-0.152
			(0.0917)
TOTAL BACKERS			0
			(0.000)
CATEGORY CONTROL	-0.0874	-0.0292	-0.0254
	(0.1415)	(0.1423)	(0.142)
N	220	220	220
EXPONENTIATED COEFFICIENTS; STANDARD ERRORS IN PARENTHESES			
*** P<0.05 ** P<0.01 ***P<0.001**			

In Model 1, the size of the campaign's goal was controlled, in addition to controlling for the campaign's subcategory. In Model 2, controls for patented and patent-pending were introduced. Model 3 includes controls for the perceived novelty of the campaign, the percent funded for the campaign, and the total number of backers.

The larger the campaign's goal does correlate with increased delay, confirming previous studies' findings (Mollick, 2014). However, overfunding, perceived novelty, the number of backers, and Technology subcategory were not statistically significant.

The presence of patents corresponded with a statistically significant increase in delay. The delay associated with patented campaigns was larger than that for patent-pending campaigns in both Model 2 and Model 3. This reproduces what is seen in the Kaplan-Meier curves in Figures 1 and 2 above.

6. Concluding Discussion

The lack of correlation between patented campaigns and success, and the resulting lower delivery rates and greater delivery delays, is surprising at first blush. However, these results are likely the product of the poor fit between patenting and crowdfunding. First, patented campaigns

are, by definition, campaigns involving innovations that are likely older than other campaigns on crowdfunding sites, particularly older when compared to patent-pending campaigns. The patenting process typically takes at least two and a half years (USPTO, 2017). Thus, the age of the technology, not the fact that they are patented, may make the campaigns less appealable to crowdfunders. These campaigns do not fit within the start-up, very early development environment common in crowdfunding. Second, patenting is resource intensive and typically associated with more complex innovators who typically pursue more sophisticated and traditional means of funding, such as venture capital (Masur, 2010). Therefore, for patented campaigns, crowdfunding is likely not the first option for securing funding. The patented campaigns that appear on Kickstarter may have already been passed over by these traditional funders meaning that, via this filter, the less desirable and less organized patented projects are showing up on crowdfunding websites. Those patentholders that turn to crowdfunding have either already failed to get funding from other sources or are not acting rationally, both of which suggest that either the campaign or the campaigner are of low quality. And the lack of success and delay in delivery bear that out. Third, patented inventions, by definition being new and nonobvious, are likely more complex than non-patented ones, and thus are harder to actually make (35 U.S.C. § 103; Cotropia 2014). Contributors either recognize this fact, and do not fund these projects, or experience the results of these facts via lower delivery rates and higher delivery delays.

In contrast, patent-pending campaigns fare very well in the crowdfunding environment, even though their delivery is greater delayed compared to non-patent campaigns. These findings expose the benefits of simply filing for a patent application. Patent-pending, as opposed to patented, necessarily means the technology is newer, producing the opposite implications than those discussed above regarding patented campaigns (Lemley & Sampat, 2008). And the positive signal of a patent-pending, as opposed to no patent at all, increases the likelihood of success for the reasons articulated in traditional patent theory of commercialization and signaling recited above (*e.g.*, Sichelman, 2010; Long, 2002). The early timing of these campaigns also means that it is less likely they have been filtered through other funding mechanisms. The early stage of these campaigns may also fit better with the crowdfunding environment and culture. And the exhibited delivery delay is supported by patent-pending campaigns being more complex than the average, no patent campaign (35 U.S.C. § 103; Cotropia 2014; Cotropia, 2009).

Notably, this study cannot say much beyond the crowdfunding environment. There are obvious selection effects both as to what patented or patent-pending projects are being observed and the "investors" who are "investing" in these patented or patent-pending projects. An attempt to remove this effect was made by controlling for the "novelty language" used in the campaign description. By controlling for the presence of such language, campaigns that at least believed they were "new," and thus patent-eligible, but did not file or obtain a patent could be identified. Regardless, the results show that patents are not always a net plus for innovators and those who invest in the innovations. But merely applying for patent may have greater benefits then previously articulated.

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