

Association for Information Systems

AIS Electronic Library (AISeL)

ICIS 2019 Proceedings

Innovation and Entrepreneurship

That's Mine! Employee Side Projects, Intellectual Property Ownership, and Innovation

Xi Wu

Temple University, xi.wu@temple.edu

Min-Seok Pang

Temple University, minspang@temple.edu

Follow this and additional works at: <https://aisel.aisnet.org/icis2019>

Wu, Xi and Pang, Min-Seok, "That's Mine! Employee Side Projects, Intellectual Property Ownership, and Innovation" (2019). *ICIS 2019 Proceedings*. 5.

https://aisel.aisnet.org/icis2019/innov_entre/innov_entre/5

This material is brought to you by the International Conference on Information Systems (ICIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in ICIS 2019 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

That's Mine! Employee Side Projects, Intellectual Property Ownership, and Innovation

Short Paper

Xi Wu

Temple University
Philadelphia, PA, U.S.A
xi.wu@temple.edu

Min-Seok Pang

Temple University
Philadelphia, PA, U.S.A
minspang@temple.edu

Abstract

Working on side projects outside their work hours is a growing trend for IT professionals. While employees might believe that everything they create in their spare time belongs to themselves, it is not always the case. In the legal case of Alcatel v. Brown, the court ruled that the employer owned rights to employees' intellectual property including ideas of their side projects. Relatively little is known about how innovation activities are affected when employees are not allowed to retain the ownership of their intellectual property. We leverage the Alcatel v. Brown case as an exogenous shock and apply a difference-in-difference model to examine how the legal case affects innovation activities in different counties. We find that following Alcatel v. Brown, both patent counts and entrepreneurial activities decrease in counties where employees' ownership of their intellectual property is not legally protected. We also find that the dampening effect is more pronounced in IT-related industries. Our work contributes to the literature on innovation management while providing practical implications for policy makers on intellectual property law.

Keywords: *Employee side project, innovation, intellectual property, Alcatel v. Brown*

Introduction

In an information age where knowledge can be easily accessed, individual creativity and innovation lie not only in her daily work but beyond that. It is especially the case for IT professionals because computer programs have become building blocks of products and solutions in multiple industries even outside of technology.¹ Github, one of the major software code hosting services for both open source software and private software projects, has over 28 million users and 57 million repositories (including 29 million private repositories), among which many are for developers' side projects. Side projects are initiatives employees work on beyond their employment scope. They can be just abstract ideas or work in progress, and some of them have never been completed in the end. However, they are still great opportunities for knowledge workers to practice and learn new skills.² Some employers even encourage software developers to showcase their side projects in their resumes to demonstrate their expertise. Firms also realize that brilliant ideas beyond the scope of daily work can be a source of innovation and have a potential toward great products. For example, Google's "20% time" policy, which allows its employees to devote one day a

¹ <https://www.fastcompany.com/3060883/why-coding-is-the-job-skill-of-the-future-for-everyone>

² <https://simpleprogrammer.com/guide-side-projects/>

week to side projects, is considered one of the reasons why it remains one of the most innovative firms in the world.

While working on side projects becomes a growing trend for IT professionals, a concern among them is intellectual property (IP) ownership of their projects. Employees might believe that anything they create in their spare time belongs to themselves. But it is not always the case (Lobel 2014). A common legal principle of employee inventions in the United States (U.S.) stipulates that whether an employee's inventions are owned by the employee or her employer mainly depends on the employment contract between them (Parker 1984). Also, the enforceability of the employment contract depends on the scope of inventions. It is still unclear under what circumstances employers can claim the ownership of employees' side projects. The uncertainty of side projects' ownership becomes a problem when employees begin to devote their spare time to the side projects,³ some of which can be innovative and outstanding work. It is estimated that 80% of all inventions in the U.S. are made by employed inventors (Parker 1984). The effect of the ownership of employees' side projects on their innovation activities is critical for both individuals and the society.

Researchers in the legal field raise concerns that the lack of protection for employee-inventors in the current legal system in the U.S. hampers innovation productivity (Howell 2012; Lafrance 2002; Lobel 2014). Lobel (2014) argues that the scope of IP protection triggers "excessive, unbalanced, poorly designed human capital controls," affecting almost all industries. Yet, to the best of our knowledge, there is relatively little empirical evidence on whether and how innovation activities are affected by such IP laws. In this study, we aim to provide empirical evidence to answer the question of how the legal arrangement of the ownership of employees' side projects affects innovation activities.

We exploit a legal case of *Alcatel v. Brown*, in which the court ruled the company/employer, Alcatel, owned rights to an abstract idea that existed in the thoughts of its former employee, Evan Brown. According to Lai (2003: 296-207), "(b)y recognizing an employer's ownership of intellectual property that does not exist as defined by the law of copyright, patent, trademark, and trade secret, court's decision (of the *Alcatel v. Brown* case) provides companies with a way to restrain the intellectual property market with all-encompassing invention disclosure agreements." The ruling of *Alcatel v. Brown* expands contractual controls over human capital (Lobel 2014). It allows employers to claim IP ownership of all the employees' inventions, even immature side projects, by preinvention assignment agreements (Lai 2003; Lobel 2014). Employers are even allowed to claim the former employees' inventions if the inventions were "made or conceived" while employed (see *Preston v. Marathon Oil Co.* and *Mattel, Inc. v. MGA Entertainment, Inc.*). *Alcatel v. Brown*, therefore, becomes a symbol of outrage felt by inventors required to give up their innovations (Lobel 2014) and also a well-known example of disputes on side project ownership between employees and employers⁴.

Although *Alcatel v. Brown* works as a persuasive precedent⁵ for the courts' future decisions nationwide, the enforceability of IP assignment agreements, which require employees to assign their future invention rights to their employers as a condition of employment, is not binding in eight states. We exploit the situation and implement a difference-in-difference (DID) model to investigate the impact of *Alcatel v. Brown* on innovation activities. Our measures of innovation activities are twofold: (1) patent counts as many innovative ideas are protected through patents, and (2) entrepreneurship to cover innovation activities that are either non-patentable or have far-reaching implications that go beyond patents. Our results show that the overall patent counts decrease after *Alcatel v. Brown* in the states that followed a common legal principle, compared to the states that enacted statutes protecting IP ownership of employees. We also find that the enforcement of *Alcatel v. Brown* attenuates entrepreneurship. Furthermore, we find that following the enforcement of *Alcatel v. Brown*, innovation activities in IT industries decrease more sharply than in other industries.

Our work contributes to the literature on innovation management. While prior literature extensively examines knowledge and innovation creation in organizations (Chesbrough 2003; Nonaka 1994; Nonaka et al. 2006; Tsoukas 2009) there is little research, if any, that explores how ownership of side projects

³ <https://www.joelonsoftware.com/2016/12/09/developers-side-projects/>

⁴ <https://www.nytimes.com/2014/04/14/opinion/my-ideas-my-bosss-property.html>

⁵ The definition of precedent from Wikipedia is "a principle or rule established in a previous legal case that is either binding on or persuasive for a court or other tribunal when deciding subsequent cases with similar issues or facts."

affects innovation activities. To the best of our knowledge, this is one of the first papers to examine the effect of assigning employers the IP rights of side projects on innovation activities. Our results show that assigning side projects' ownership to employers decreases innovation activities aggregated at the county level. Furthermore, this stifling effect is stronger in IT industries than in non-IT industries. This finding provides a valuable perspective to the literature on the knowledge-based view of firms, especially for firms in industries where side projects play an important role in employees' career development.

Our work also has implications for policymakers with respect to issues on knowledge creation and innovation. Our results show that both patenting and entrepreneurial activities decrease after *Alcatel v. Brown*, suggesting the harmful impact of the case at the societal level. The conflict over IP ownership not only stifles innovation in organizations but also presents more cultural and ethical issues that are related to trust, fairness, and justice. Policymakers may look for ways to resolve this issue.

Background and Related Work

To explore the effect of side projects' IP ownership on innovation activities, we first review the legal principle on employee inventions' ownership in the U.S. and the case of *Alcatel v. Brown*. We then discuss the relevant literature on innovation management.

The Legal Framework on Employee Inventions' IP Ownership

The common law of employee inventions has evolved over the past century. Since 1933, the state courts have uniformly followed the early federal precedents and the common law rules to address the employee invention question (Lafrance 2002; Menell et al. 2018; Parker 1984). The common law rule can be simply stated as follows: (1) If there is an employment contract expressly providing that an employee's inventions belong to an employer, the law will generally uphold the express provisions of that contract. (2) Even in the absence of an IP employment agreement, the invention belongs to the employer if the inventor is specifically employed to work on the invention. (3) If the inventor is not hired for the invention, in the absence of an IP assignment agreement, the employer has an implied nonexclusive license to make and use the invention if the employee uses the materials, facilities, or time of the employer to create the invention, while the invention still belongs to the employee. Employee inventors have less bargaining power compared to employers since signing an IP assignment agreement is usually a prerequisite of employment (Allen 1978). To limit the ability of employers to contract around the common law rules, eight states in the U.S. have enacted employee invention legislation to limit the enforceability of IP assignment agreements. Take the example of California (i.e., Cal. Labor Code §2870-2872). It is stated in California that "(a)ny provision in an employment agreement that provides that an employee shall assign or offer to assign any rights in an invention to his/her employer shall not apply to an invention that the employee develops entirely on his or her own time without using the employer's equipment, supplies, facilities, or trade secret information." Such statutes protect employees' ownership of their side projects if the side projects are unrelated to employers' businesses.

The Case of Alcatel USA, Inc. v. Evan Brown

Evan Brown is a software developer from Texas who claimed to have an idea for a software since 1975, long before he joined DSC Communications (subsequently acquired by Alcatel). When Brown mentioned his idea to Alcatel and attempted to negotiate a deal to share the profits of a potential solution with his employer, Alcatel instead fired him and sued him for full ownership over the idea in April 1997. The 219th Judicial District Court of Texas found in July 2002 that the idea is an invention falling under the terms of the employment agreement between Brown and Alcatel, which entitles Alcatel with "full legal right, title and interests" in any inventions (Lobel 2014, Lai 2003). Although Brown appealed the ruling in 2004, the Appeals Court turned it down.

In *Alcatel v. Brown*, the judge's decision was made from a contractual perspective. The court held that "the invention disclosure agreement between Brown and DSC was valid and enforceable." By signing the IP assignment agreement that covers "all inventions (include but not limited to all matters subject to patent)", Brown was obligated to fully disclose the idea to Alcatel. Invention agreements are important to technology companies to protect their IP. However, the ruling of *Alcatel v. Brown* is controversial because the abstract idea created by Evan Brown was not eligible for any of the four forms of IP – copyrights,

patents, trademarks, or trade secrets as all of them require something tangible (Lai 2003; Lobel 2014). Even the court ordered Brown to fully disclose his idea to the company, it was incomplete and had not been confirmed as a workable solution.

The reason why DSC claims the ownership of an incomplete solution is because it seems that Brown's idea could have enormous commercial value (Pinsonneault et al. 1999; Singh and Agrawal 2011). The intellectual intangibles have traditionally kept outside of the scope of IP to keep a balance between monopolized information and the public domain (Lobel 2014). However, this balance can be undermined by cognitive controls through regulatory and contracts on human capital (e.g., IP assignment agreements) since the agreements are subject to the ordinary principles of contract interpretation (Lobel 2014). In *Alcatel v. Brown*, the IP assignment agreement covered "all inventions (include but not limited to all matters subject to patent)." While scholars hold different opinions on whether Brown's idea was in the scope of IP (Lai 2003; Lobel 2014), the court determined that the idea was an invention covered by the agreement. The court's enforcement of Brown's IP assignment agreement sets forth a precedent for future legal cases (Lai 2003) such as *Mattel Inc. v. MGA Entertainment Inc.*

Knowledge and Innovation Creation in Organization

Innovation plays a critical role in the firm's strategies to stay competitive in the global market (Barney 1991; Kogut and Zander 1992; Newell 2015). The stream of literature on open innovation emphasizes that the firms should use external ideas as well as internal ones to pursue innovation (Chesbrough 2003). There are several ways to connect with external sources of innovation. One way is to acquire the right to use external knowledge by strategic alliances and licensing (Beamish and Lupton 2009; Cassiman and Veugelers 2006). Another is to enrich the company's own knowledge base through the integration of different parties such as suppliers (Enkel et al. 2009), customers (Cui and Wu 2016) and crowdsourcing communities (Hwang et al. 2019). Besides the firm-level exploration of external ideas, the interactions of individuals and external knowledge resources also affect knowledge creation in organizations (Rothaermel and Hess 2007; Salter et al. 2015). For example, Procter & Gamble has encouraged its employees to connect with its innovation network to develop new products so as to improve its innovative capacity (Sakkab 2002). An external knowledge source can be employees' exploration in tasks outside the daily work. Google's well-known "20% time" policy encourages developers to invest part of their working time pursuing projects outside their official area of responsibility. It is estimated that about half of Google's products, including Gmail and News, started out as 20% projects (Savoia and Copeland 2011). This policy is a response to the trend of side projects among software developers. While working on side projects has become popular among IT professionals, a major concern among them is the IP ownership of their projects. It is unclear that how the uncertainty of employees' side project ownership affects their innovation activities.

On the one hand, the fact that an organization owns employees' side projects encourages innovation by providing a larger network of knowledge and stimulating knowledge integration. On the other hand, losing the ownership of side projects raises employees' concern that their work and contribution are not treated fairly. The literature on psychological climate emphasizes the relationship between individual perceptions of an organizational environment and work output (Koys and DeCotiis 1991; Parker et al. 2003). Researchers (Durcikova et al. 2011) find that a climate for innovation (i.e. if employees believe that their creativity is encouraged in the workplace) and a climate for autonomy (i.e. if they have self-determination with respect to work procedures, goals, and priorities) are both positively related to their innovation activities. When employees' side projects are owned by employers, it is uncertain for the employees whether their ideas receive enough attention from collaborators. Also, losing the control of the side projects reduces autonomy in the process. Hence, it may hinder their creativity and interests on side projects, decreasing overall innovation activities.

In the following sections, we will explore the theoretical tension and investigate how the legal framework with respect to IP ownership of side projects to employers affects innovation activities.

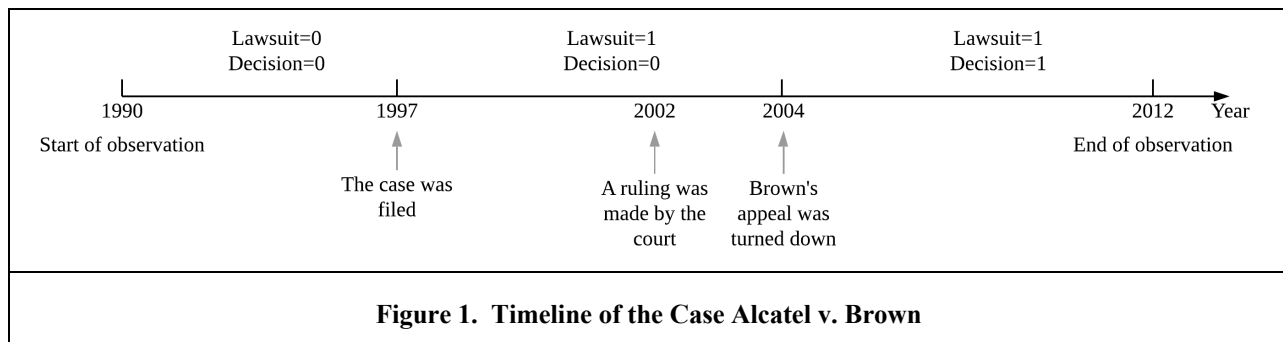
Identification Strategy and Data

In this section, we describe our identification strategy and data. We exploit a legal case of *Alcatel v. Brown* and the differences in state statutes on the ownership of employee inventions to apply a DID

approach. This basic idea in our approach is to examine the treatment group before and after the treatment compared to the control group. Since eight states limit the enforceability of employment contracts in the IP assignment disputes, the effect of *Alcatel v. Brown* as a precedent is not binding in these eight states, compared to other 42 states and the District of Columbia (D.C.). Among the eight states, the statute of employee invention ownership was enacted in Delaware in 1995. We exclude Delaware from our analysis so that we can include observations for a longer time window. We consider the time window of 1990-2012 and designate counties in the remaining seven states (after excluding Delaware) to the control group and counties in other 42 states and D.C. to the treatment group. In the following subsections, we discuss (1) the treatment in our setting (*Alcatel v. Brown*) and (2) variable definitions.

Treatment: Alcatel v. Brown

Based on an extensive search of major news outlets and literature review, we find that *Alcatel v. Brown* is the first time an employee's abstract idea was considered an invention and its ownership can be claimed by employers. It attracts extensive attention of both the public and the academia (Lai 2003; Lobel 2014; Sample 2018). This case reminds employees of a risk of losing control on their side projects and affects the future judgment of related cases. We, therefore, consider the filing and resolution of *Alcatel v. Brown* as an exogenous shock that may affect employees' subsequent innovation activities. Because the lawsuit lasted for seven years, we introduce two treatment variables (i.e. *Lawsuit* and *Decision*) that capture respectively the time when the case was filed (i.e. 1997) and the time when the Appeals Court turned down Brown's appeal (i.e. 2004). The timeline of *Alcatel v. Brown* is shown in Figure 1. There are three periods of time: (1) before the filing year of the case (*Lawsuit*=0, *Decision*=0), (2) after the filing year but before the decision year (*Lawsuit*=1, *Decision*=0), and (3) after the decision (*Lawsuit*=1, *Decision*=1). Accordingly, we make two comparisons in the DID model: relative to the control group, we compare the treatment group not only between Period 1 and Period 2, but also between Period 2 and Period 3. A visual inspection of the pre-treatment trends for the control and treatment groups is presented in Figure 2.



Variable Definitions

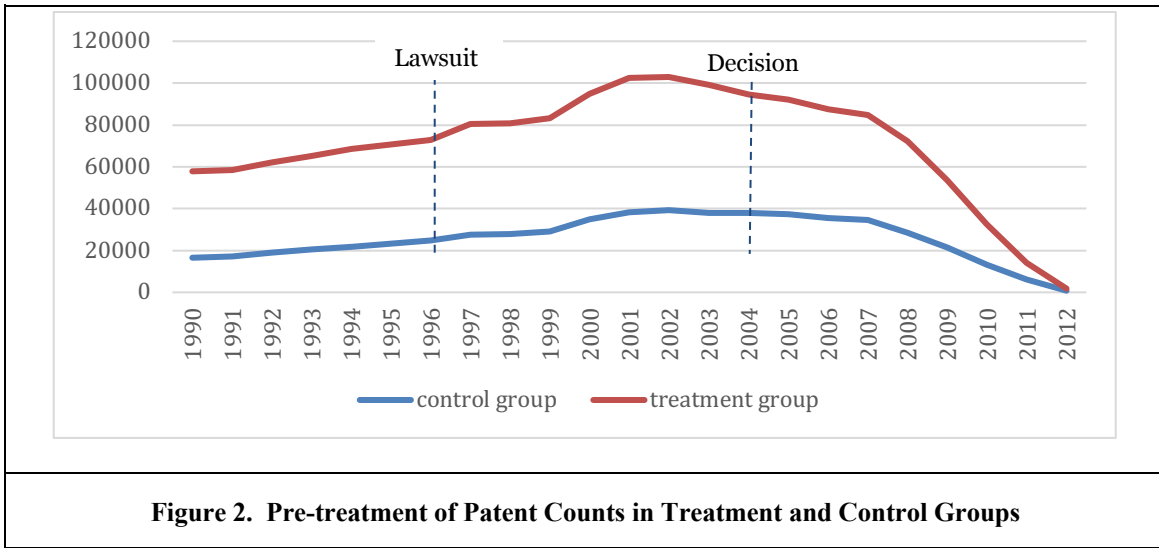
Dependent Variable - To quantify innovation activities, we utilize a public dataset of patents provided by the U.S. Patent and Trademark Office (USPTO). Patent statistics have been extensively used as an innovation indicator (Lederman and Saenz 2005; Nagaoka et al. 2010; Rothaermel and Hess 2007). The USPTO has grouped all the patents in more than 400 classes based on the common subject matter.⁶ To examine the effect of IP ownership on innovation activities in different industries, we map patent classes to the North American Industry Classification System (NAICS) according to the method applied by USPTO⁷ and consider the category of "Computer and Electronic Products" (Code: 334) as IT-related industry⁸ (denoted by category "IT", $Tech_j=1$) and compare them with patents in other classes (denoted by category "non-IT", $Tech_j=0$). We construct a county-year-level panel dataset that includes the number of utility patents in the IT and non-IT categories in 2,792 counties during the 1990-2012 period. The

⁶ <https://www.uspto.gov/sites/default/files/patents/resources/classification/classescombined.pdf>

⁷ https://www.uspto.gov/web/offices/ac/ido/oeip/taf/data/naics_conc/2012/

⁸ USPTO does not map patents into every NAICS categories. The category 334 is the most relevant to IT industry.

dependent variable is $\ln(\text{NumPatent})_{ijt}$, which is the log of patent counts in county i and category j (i.e., IT or non-IT) filed during year t .



Independent Variables - We have a number of dummy variables as our independent variables. First, we introduce two treatment variables: $Lawsuit_t$ which equals 1 if the lawsuit was filed but the final decision was not yet made at year t (0 otherwise), and $Decision_t$, which equals 1 if the final decision was made at year t . We include a variable $NoStatutes_i$ which is equal to 1 if county i is in the treatment group (i.e., states with no statutes of employee IP protection). $Tech_j$ indicates whether the patents are IT-related (i.e., in the IT category) or not.

Control Variables - We include a set of controls to capture time-varying observable heterogeneity in each county. The controls include population, the number of jobs, and income per capita.

Model Specification and Results

The formal DID specification is as below.

$$\ln(\text{NumPatent})_{ijt} = Tech_j + NoStatutes_i + Lawsuit_t + Decision_t + NoStatutes_i \times Lawsuit_t + NoStatutes_i \times Decision_t + CountyFE + YearFE + Controls_{ijt} + \varepsilon_{ijt} \quad (1)$$

$$\ln(\text{NumPatent})_{ijt} = Tech_j + NoStatutes_i + Lawsuit_t + Decision_t + NoStatutes_i \times Lawsuit_t + NoStatutes_i \times Decision_t + Tech_j \times NoStatutes_i + Tech_j \times Lawsuit_t + Tech_j \times Decision_t + NoStatutes_i \times Lawsuit_t \times Tech_j + NoStatutes_i \times Decision_t \times Tech_j + CountyFE + YearFE + Controls_{ijt} + \varepsilon_{ijt} \quad (2)$$

$CountyFE$ and $YearFE$ represent county and year fixed effects respectively. $Controls_{ijt}$ is a vector of control variables for county i in category j at year t . Robust standard errors are clustered at the county level.

Results are shown in Table 1. The coefficients of $Lawsuit \times NoStatutes$ and $Decision \times NoStatutes$ in Column (1) indicate that in counties with no employee IP protection statutes (i.e., the treatment group), the legal case has a negative and significant effect on the number of patents. The coefficients of $Tech \times NoStatutes \times Lawsuit$ and $Tech \times NoStatutes \times Decision$ in Column (2) indicate that the legal case decreases patent counts to a greater extent in IT-related fields than in other fields. Specifically, there is a 4% decrease of patent counts in IT-related fields in the treatment group after *Alcatel v. Brown* was filed than before. There is a 7% decrease of patent counts in IT-related fields in the treatment states after the appeal of Brown was rejected.

Table 1. DID Model: Patent Counts

VARIABLES	(1) ln(NumPatent)	(2) ln(NumPatent)
Tech	-0.571*** (0.00952)	-0.797*** (0.0273)
Tech×NoStatutes		0.104*** (0.0304)
Tech×Lawsuit		0.103*** (0.0218)
Lawsuit×NoStatutes	-0.0673*** (0.0180)	-0.0452** (0.0186)
Tech×NoStatutes×Lawsuit		-0.0442* (0.0235)
Tech×Decision		0.373*** (0.0227)
Decision×NoStatutes	-0.0441*** (0.0165)	-0.0104 (0.0223)
Tech×NoStatutes×Decision		-0.0674*** (0.0246)
Controls	Yes	Yes
County and Year FE	Yes	Yes
Observations	117,726	117,726
R-squared	0.823	0.826

Note: Robust standard errors clustered at state level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Empirical Extension

Although patenting activity serves as a valid indicator of innovation, there are ideas that do not meet the requirement of patent filing but are still innovative and creative. We next examine whether assigning the IP ownership of side projects to employers affects entrepreneurship. We use the dataset of County Business Patterns (CBP) from the U.S. Census Bureau and aggregate the number of establishments in each county from 1990 to 2012. We further divide the establishments into two categories: the category of IT industries if the establishments lie in the industry codes of 7370, 7372 and 7374 in Standard Industrial Classification (SIC) or the code of 5415 in NAICS, and non-IT category otherwise. The variable *Tech* indicates whether the establishments are in the IT category or not. To estimate the effect of *Alcatel v. Brown* on entrepreneurship, we adopt a DID model and replace the dependent variables of Eq. (1) and (2) with the logged number of establishments in county i and category j at year t .

The results are shown in Table 2. From the coefficients of *Lawsuit×NoStatutes* and *Decision×NoStatutes* in Column (1), we find that in the treatment states, entrepreneurial activities significantly decline after *Alcatel v. Brown*. The negative and significant coefficients of *Tech×NoStatutes×Lawsuit* and *Tech×NoStatutes×Decision* in Column (2) indicate that entrepreneurial activities in IT industries decrease more sharply after *Alcatel v. Brown* than those in non-IT industries.

Conclusion

In this study, we investigated how ownership of side projects affects innovation activities. Our result shows that *Alcatel v. Brown* decreases both patent counts and entrepreneurial activities in the states that

do not have laws that protect employees' IP right of side projects. The dampening effect on innovation activities are more pronounced in IT-related industries. Our work contributes to the literature on knowledge and innovation as well as human capital management. We also provide practical insights to firms and policymakers. As our next step, we will conduct a set of robustness checks to support our empirical findings and offer additional analysis to improve the theoretical framework.

Table 2 DID Model: Entrepreneurship

VARIABLES	(1) ln(NumEstab)	(2) ln(NumEstab)
Tech	-5.109*** (0.0118)	-5.170*** (0.0303)
Tech×NoStatutes		0.00847 (0.0334)
Tech×Lawsuit		0.0531*** (0.0194)
Lawsuit×NoStatutes	-0.0436*** (0.0113)	-0.00991*** (0.00375)
Tech×NoStatutes×Lawsuit		-0.0674*** (0.0214)
Tech×Decision		0.190*** (0.0210)
Decision×NoStatutes	-0.0393*** (0.0125)	-0.0119** (0.00541)
Tech×NoStatutes×Decision		-0.0548** (0.0234)
Controls	Yes	Yes
County and Year FE	Yes	Yes
Observations	119,322	119,322
R-squared	0.980	0.981

Note: Robust standard errors clustered at state level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Acknowledgement

The third author of the submission is Charlotte R. Ren, Temple University, whom we are unable to include due to ICIS policies.

Reference

- Allen, K. R. 1978. "Invention Pacts : Between the Lines," *IEEE Spectrum* (March), pp. 54–59.
- Barney, J. 1991. "Firm Resources and Sustained Competitive Advantage," *Journal of Management* (17:1), pp. 99–120.
- Beamish, P. W., and Lupton, N. C. 2009. "Managing Joint Ventures," *Academy of Management Perspectives* (23:2), pp. 75–94.
- Cassiman, B., and Veugelers, R. 2006. "In Search of Complementarity in Innovation Strategy: Internal R&D and External Knowledge Acquisition," *Management Science* (52:1), pp. 68–82.
- Chesbrough, H. W. 2003. *Open Innovation: The New Imperative for Creating and Profiting from Technology*, Harvard Business Press.
- Cui, A. S., and Wu, F. 2016. "Utilizing Customer Knowledge in Innovation: Antecedents and Impact of

- Customer Involvement on New Product Performance,” *Journal of the Academy of Marketing Science* (44:4), Journal of the Academy of Marketing Science, pp. 516–538.
- Durcikova, A., Fadel, K. J., Butler, B. S., and Galletta, D. F. 2011. “Knowledge Exploration and Exploitation: The Impacts of Psychological Climate and Knowledge Management System Access,” *Information Systems Research* (22:4), pp. 855–866.
- Enkel, E., Gassmann, O., and Chesbrough, H. 2009. “Open R&D and Open Innovation: Exploring the Phenomenon,” *R & D Management* (39:4), pp. 311–316.
- Howell, P. A. 2012. “Whose Invention Is It Anyway? Employee Invention-Assignment Agreements and Their Limits,” *Washington Journal of Law, Technology and Arts* (8:2), pp. 79–106.
- Hwang, E. H., Singh, P. V., and Argote, L. 2019. “Jack of All, Master of Some: Information Network and Innovation in Crowdsourcing Communities,” *Information Systems Research* (30:2), pp. 389–410.
- Kogut, B., and Zander, U. 1992. “Knowledge of the Firm , Combinative Capabilities , and the Replication of Technology,” *Organization Science* (3:3), pp. 383–397.
- Koys, D. J., and DeCotiis, T. A. 1991. “Inductive Measures of Psychological Climate,” *Human Relations* (44:3), pp. 265–285.
- Lafrance, M. 2002. “Nevada’s Employee Inventions Statute: Novel, Nonobvious, and Patently Wrong,” *Nevada Law Journal* (3:88), pp. 88–114.
- Lai, J. C. 2003. “Alcatel USA , Inc . v . Brown : Does Your Boss Own Your Brain?,” *The John Marshall Journal of Information Technology & Privacy Law* (21:3), pp. 295–324.
- Lederman, D., and Saenz, L. 2005. “Innovation and Development around the World, 1960-2000,” *World Bank*.
- Lobel, O. 2014. “The New Cognitive Property : Human Capital Law and the Reach of Intellectual Property,” *Texas Law Review* (93), pp. 789–851.
- Menell, P. S., Lemley, M. A., and Merges, R. P. 2018. *Intellectual Property in the New Technological Age: 2018*, (Vol. I).
- Nagaoka, S., Motohashi, K., and Goto, A. 2010. “Patent Statistics as an Innovation Indicator,” *Handbook of the Economics of Innovation* (1st ed., Vol. 2), Elsevier B.V.
- Newell, S. 2015. “Managing Knowledge and Managing Knowledge Work: What We Know and What the Future Holds,” *Journal of Information Technology* (30:1), pp. 1–17.
- Nonaka, I. 1994. “A Dynamic Theory of Organizational Knowledge Creation,” *Organization Science* (5:1), pp. 14–37.
- Nonaka, I., Von Krogh, G., and Voelpel, S. 2006. “Organizational Knowledge Creation Theory: Evolutionary Paths and Future Advances,” *Organization Studies* (27:8), pp. 1179–1208.
- Parker, C. P., Roberts, J. E., Baltes, B. B., Young, S. A., LaCost, H. A., Huff, J. W., and Altmann, R. A. 2003. “Relationships between Psychological Climate Perceptions and Work Outcomes: A Meta-Analytic Review,” *Journal of Organizational Behavior* (24:4), pp. 389–416.
- Parker, H. D. 1984. “Reform for Rights of Employed Inventors,” *Southern California Law Review* (57:4), pp. 603–630.
- Pinsonneault, A., Barki, H., Gallupe, R. B., and Hoppen, N. 1999. “Research Note. The Illusion of Electronic Brainstorming Productivity: Theoretical and Empirical Issues,” *Information Systems Research* (10:4), pp. 378–380.
- Rothaermel, F. T., and Hess, A. M. 2007. “Building Dynamic Capabilities: Innovation Driven by Individual-, Firm-, and Network-Level Effects,” *Organization Science* (18:6), pp. 898–921.
- Sakkab, N. Y. 2002. “Connect & Develop Complements Research & Develop at P&G,” *Research Technology Management* (45:2), pp. 38–45.
- Salter, A., Ter Wal, A. L. J., Criscuolo, P., and Alexy, O. 2015. “Open for Ideation: Individual-Level Openness and Idea Generation in R&D,” *Journal of Product Innovation Management* (32:4), pp. 488–504.
- Sample, E. A. 2018. “Assigned All My Rights Away: The Overuse of Assignment Provisions in Contracts for Patent Rights,” *104 Iowa L. Rev.* 447 (1), pp. 447–490.
- Savoia, A., and Copeland, P. 2011. “Entrepreneurial Innovation at Google,” *Computer* (44:4), pp. 56–61.
- Singh, J., and Agrawal, A. 2011. “Recruiting for Ideas: How Firms Exploit the Prior Inventions of New Hires,” *Management Science* (57:1), pp. 129–150.
- Tsoukas, H. 2009. “A Dialogical Approach to the Creation of New Knowledge in Organizations,” *Organization Science* (20:6), pp. 941–957.