JOURNAL OF FINANCIAL AND QUANTITATIVE ANALYSIS Vol. 59, No. 5, Aug. 2024, pp. 2425–2458

doi:10.1017/S0022109023000194

Corporate Patenting, Customer Capital, and Financial Market Outcomes

Mine Ertugrul
University of Massachusetts Boston College of Management
mine.ertugrul@umb.edu (corresponding author)

Karthik Krishnan
Northeastern University D'Amore-McKim School of Business
k.krishnan@northeastern.edu

Bo Xu
Harbin Institute of Technology (Shenzhen) School of Economics and Management
boxu@hit.edu.cn

Qianqian Yu
Lehigh University College of Business
qiy617@lehigh.edu

Abstract

We study how patenting enhances customer capital and creates financial value in a product market characterized by information asymmetry between firm insiders and customers. We find that firms with more and higher quality patents develop greater customer capital, as measured by more positive customer perceptions of product novelty and quality. To establish causality, we exploit the exogenous variation in the random assignment of patent examiners to review applications and use the average examiner leniency as an instrument for patent grants. Our mediation analysis documents a positive impact of patenting on firm performance and financial market valuation through enhanced customer capital.

I. Introduction

Patents grant temporary monopoly rights to firms, preventing copycats and allowing higher returns to innovative activity. Surveys have revealed that patents are used by firms to deter copying, avoid litigation, and strengthen bargaining power in licensing negotiations (Cohen, Nelson, and Walsh (2000)). The recent literature examines the effect of patenting on firm outcomes for young firms and

We thank an anonymous referee and Mara Faccio (the editor) for valuable comments that helped to greatly improve this article. We are grateful for comments and suggestions from Thomas Chemmanur, Uliana Filatova, Avi Goldfarb, Po-Hsuan Hsu, Ahmet Kurt, Xinjie Ma, Debarshi Nandy, and conference and seminar participants at the 2022 AMA Summer Academic Conference, 2021 INFORMS Marketing Science Conference, 2021 SFA Annual Meeting, 2018 EFA Annual Meeting, 2017 FMA Annual Meeting, 2016 Northeastern University Center for Emerging Markets seminar, and the 2018 University of Massachusetts Boston finance seminar. Bo Xu acknowledges the funding support from HITSZ Research Startup Fund (GA45001031), Shenzhen Key Research Base of Humanities and Social Sciences (KP191001), and 2020 "13th Five-Year" Planning General Project of Philosophy and Social Science of Guangdong Province (GD20CYJ13). Any errors and omissions are the responsibility of the authors.

finds that patents increase IPO probability, pre-money valuation, firm size, and employment (Mann and Sager (2007), Balasubramanian and Sivadasan (2011), Hsu and Ziedonis (2013), and Gaulé (2018)), primarily through enabling access to external funding. Existing studies also show that innovation, typically proxied by patenting activities, affects firm performance (e.g., Hirshleifer, Hsu, and Li (2013), Fitzgerald, Balsmeier, Fleming, and Manso (2021)). However, research on the mechanisms through which patenting affects firm performance, especially for large, established firms, remains rather limited. In this article, we examine, for the first time in the literature, how patenting affects firms' customer capital, which in turn affects their performance in the financial market, using a novel customer survey data set on large, established firms.

Customer capital, the value of a firm's relationships with its customers, is considered an important intangible asset (e.g., Rudanko (2017), Dou, Ji, Reibstein, and Wu (2021)). Customer capital is mainly built through customers' appreciation or positive perceptions of the firm's products. These positive customer perceptions would allow the firm to retain and attract more customers who may become loyal to the firm and its products, engage in repeat purchases, purchase a larger quantity of the firm's products, and pay a premium price for each unit of the firm's products. This price premium can be viewed as a form of quasi-rent that may accrue in perpetuity if the positive customer perceptions are well maintained.[1] Thus, customer capital is likely to enhance the firm's operating performance and financial market valuation. An emerging literature shows that customer capital affects valuation and various corporate policies when there are imperfections in the product or capital markets (see, e.g., Larkin (2013), Gourio and Rudanko (2014), and Dou et al. (2021)).[2] In this article, we consider a product market characterized by information asymmetry between firm insiders (e.g., top management teams) and customers, and argue that patenting leads to greater customer capital by reducing the information asymmetry faced by customers, which in turn enhances firm performance and valuation.

In a product market characterized by information asymmetry between firm insiders and customers, firm insiders know the true quality of their research and technology and all the characteristics of the products they produce, but customers only have incomplete information about the firm's research and its products. We conjecture that patents can serve as a credible signal through which a firm conveys to its customers positive information about the quality of its research and technology and hence its overall product excellence (given that at least some of the underlying inventions may be embedded in the firm's existing or new products).[3]

[1]Similar to the brand name capital model of Klein and Leffler (1981), customer capital is a type of intangible capital that allows firms to charge a price premium for their products.

[2]Larkin (2013) shows that customer capital helps to alleviate financial frictions and increase a firm's debt capacity. Gourio and Rudanko (2014) find that customer capital affects firm value and investment dynamics when search costs of products are born by customers. Dou et al. (2021) document that customer capital affects stock returns when customer capital depends on the contribution of key employees who are subject to flight risk.

[3]Firms often highlight and emphasize their patents in their advertisements, press releases, or product packaging, so that their patent information can be made known to their customers and investors. For example, Samsung Electronics announced in a press release that it had been ranked first in the number

There are at least two reasons to support this conjecture. First, it is costly for a firm to obtain patents: The firm needs to devote significant resources to research and development (R&D) to develop the inventions, and also incur direct and indirect costs to apply for, maintain, and protect the corresponding patents. The considerable costs associated with obtaining patents make patents a credible signal that is hard to mimic by a firm that conducts only lower-quality research. Second, patents are approved by the United States Patent and Trademark Office (USPTO) to have met the requirements for patentable inventions and hence can certify the quality of the firm's research and technology and, in turn, its overall product excellence.

In addition to serving as a direct signal about the firm's research and technology and its overall product excellence, patents may also lead to a greater extent of new product introduction by encouraging the firm to embed the underlying inventions in its products (Webster and Jensen (2011)). Further, patenting helps firms to attract and retain key talent such as inventors (e.g., Melero, Palomeras, and Wehrheim (2020)), whose skills, knowledge, and reputation are key to offering novel and high-quality products. Therefore, a greater extent of new product introduction and a greater net inflow of inventors to the firm may serve as additional signals to convey positive information about the firm and its products to customers.

Since patents can convey positive information about the quality of a firm's research and its product excellence as discussed above, ceteris paribus, firms with more patenting activities are likely to achieve more positive customer perceptions of their products (which allow such firms to retain and attract more customers who may become loyal to the firm and its products) and thus accumulate greater customer capital. Further, firms that achieve more positive customer perceptions and accumulate more customer capital through patenting are also likely to sell a larger quantity of their products to customers and charge them a premium price for each unit of their products, thereby leading to better firm performance and financial market valuation.

Based on the above framework, we develop testable hypotheses on the relationship between corporate patenting and customer capital as well as its implications for financial market outcomes. We empirically test these hypotheses using a novel data set from BAV Consulting (a subsidiary of Young & Rubicam), which surveys over 16,000 U.S. households to evaluate brands on a wide range of attributes. Using these data, we construct firm-year level measures of customer capital based on customer perceptions of corporate brands, which broadly focus on perceived product novelty and quality. The existing literature (e.g., Fornell, Johnson, Anderson, Cha, and Bryant (1996), Zeithaml, Berry, and Parasuraman (1996), Tsiotsou (2006), Henard and Dacin (2010), and Kunz, Schmitt, and Meyer (2011)) documents that product novelty and quality are two important perceived product attributes that are crucial in attracting and retaining customers, achieving customer satisfaction, and generating repeat purchases. This body of work motivates our use of perceived novelty and quality to measure customer capital. Further, customer perceptions have the advantage of providing a direct lens into how

of granted patents for 5G and compared the number of its 5G patents to those held by other main competitors (e.g., Nokia, LG, and Huawei) to demonstrate its dominant position (https://newsroom.ibm.com/history-of-innovation-and-patent-leadership).

customers view a firm's products, which allows us to directly examine the effect of patenting activity on customer capital built through product novelty and quality, compared to accounting or price-based measures.

For our analyses, we merge the BAV data with corporate patent data constructed and made available by Kogan, Papanikolaou, Seru, and Stoffman (2017) (henceforth KPSS). The KPSS data set contains detailed information on patents issued to U.S. firms by the USPTO through 2019. Our final sample comprises 462 unique firms with 3,581 firm-year observations from 2000 to 2014. Our sample mostly consists of consumer-facing companies, which play a significant role in the economy given that consumer spending accounts for over 70% of U.S. GDP and supports more than 60% of nonagricultural wage and salary employment (Barello (2014)).

We find that patenting activity is positively associated with a firm's customer capital, as measured by customer perceptions of the firm's product novelty and quality. In terms of economic magnitude, a one inter-quartile range increase in patents is associated with a 0.52 percentage point increase in perceived product novelty, representing an 11.6% increase relative to one inter-quartile range of perceived product novelty. We document similar effects for the relation between patenting and perceived product quality. Thus, our results reflect economically significant increases in customer capital associated with a higher degree of patenting activity.

One may be concerned about whether the positive relation between patents and customer capital, as documented in our baseline (OLS) analysis, can be interpreted as causal. For example, one such concern is that increased customer capital may not be caused by patenting, but rather by some unobserved firm characteristics or the value of the underlying invention. To establish the causal effect of patenting on customer capital, we exploit the exogenous variation in patent grants due to the random assignment of patent examiners to review these applications. Specifically, we conduct an instrumental variable (IV) analysis using the average examiner leniency faced by all applications filed by a firm in a year as an instrument for the number of patent grants. Our instrument is motivated by the following facts: First, conditional on technology area and application year, patent applications are randomly assigned to patent examiners who are affiliated with certain art units (Lemley and Sampat (2012), Gaulé (2018)), irrespective of the characteristics/quality of patent applicants or applications. Therefore, examiner leniency affects customer capital only through the number of granted patents, satisfying the exclusion condition of a valid instrument. Second, although the application review process is fairly structured, patent examiners still have significant discretion during the review process, and they vary in their propensity to approve applications (i.e., leniency). An application reviewed by a more lenient examiner is more likely to be approved compared to an otherwise similar application reviewed by a stricter examiner. We therefore expect and empirically show that the average examiner leniency is a positive and significant determinant of a firm's patent grants, satisfying the relevance condition of a valid instrument.

The results of our IV analyses using the average examiner leniency as the instrument for the number of patent grants at the firm-year level are consistent with those of our baseline analyses. We continue to document a positive and significant relation between corporate patenting and customer capital (as measured by customer perceptions of product novelty and quality), even after controlling for the potential endogeneity concerns.

Next, we explore the implications of the positive association between patenting activity and customer capital on various dimensions of firm performance, including revenue, market share of sales relative to industry peers, profitability, gross profit margin, and financial market valuation. Specifically, we are interested in how a firm's patenting activity affects its performance through its customer capital. We therefore conduct a mediation analysis to systematically evaluate the indirect effect of patenting activity on firm performance through enhanced customer capital, over and above any direct effect of patenting activity. We provide strong evidence that patenting activity indeed has a positive and significant effect on firm performance and valuation through enhanced customer capital.

We then delve deeper into how patenting enhances customer capital in a product market characterized by information asymmetry between firm insiders and customers. First, we argue that patenting can serve as a direct signal conveying favorable information about a firm and its products, which helps to differentiate the firm's products from those of its competitors and can be used as part of the firm's marketing strategy to attract and retain more customers. If this is the case, we would expect the effect of patenting on customer capital to be stronger in highly competitive industries (where standing out from competitors is more important) and in firms with greater advertising intensity (where patenting can be made better known by customers through intensive advertising). Consistent with our expectation, we find that the impact of patenting on customer capital is more pronounced for firms that face stronger competition in the product market and that have higher advertising intensity.

In addition, we propose that patents can also convey positive information about the firm and its products indirectly through new product introduction, which helps to attract and retain more customers. Patenting activity is likely to be associated with increased commercialization of inventions (Webster and Jensen (2011)), thereby leading to a greater number of new products introduced to the market. The ability to develop and introduce new products continuously can serve as an additional signal to convey positive information about the firm and its products, thereby enhancing customer capital. To test this hypothesis, we retrieve information from RavenPack News Analytics on news coverage about a firm's product releases to measure the extent of the firm's new product introduction. We find that patenting activity is indeed associated with significant increases in a firm's introduction of new products.

Finally, we argue that patenting helps firms to attract and retain key employees such as inventors. Patents typically remain the property of the employer (not the inventor) and thus provide incentives for inventors to stay with the firm (Melero et al. (2020)). Additionally, firms with more patenting activities may be viewed by inventors as more conducive environment for them to work in, thereby attracting more inventors. As inventors' skills, knowledge, and reputation are key to offering novel and high-quality products, a continuous net inflow of inventors into the firm can also certify the ability of the firm to continue conducting high-quality research and offering novel and high-quality products, thereby leading to more favorable customer perceptions and enhancing customer capital. To test this hypothesis, we examine the relation between the net inflow of inventors and customer capital. We find that the net inflow of inventors to a firm is positively related to customer capital, as reflected by perceived product novelty.

Our study contributes to several strands in the literature. First, we add to the rapidly growing literature on the interaction between customer capital and finance. While much of the previous literature examines how financing availability and financial characteristics affect firm performance in the product market (e.g., Frésard (2010), Chemmanur, Krishnan, and Nandy (2011)), recent studies explore the implications of customer capital for valuation and various corporate policies, such as debt policy (Larkin (2013)), firm investment dynamics (Gourio and Rudanko (2014)), and equity returns (Dou et al. (2021)). We contribute to this literature in several important ways. First, our study is the first to demonstrate a clear link between patenting activity and customer capital and the mechanisms through which patenting may affect customer capital in a product market characterized by information asymmetry. Second, we establish the causal relationship between patenting and customer capital using a novel instrument, unveiling an important economic force through which patenting provides benefits even for large, established firms. Finally, our finding that patenting enhances customer capital and thereby creates financial market value adds to the debate regarding whether patents provide incremental value or are purely a tool to stifle competition (e.g., Gilbert and Newbery (1982)).

Second, we contribute to the literature that analyzes the impact of patenting on firm value and the underlying mechanisms through which this may occur.[4] Several studies focus on young startups and document positive associations between patenting and firm outcomes, as characterized by investment from prominent venture capitalists, higher pre-money valuations, and greater chances of successful exits (see Hall (2019) for a review). These studies find evidence that patenting enables young firms to have better access to external financing (Mann and Sager (2007), Helmers and Rogers (2011), Hsu and Ziedonis (2013), and Farre-Mensa, Hegde, and Ljungqvist (2020)) and helps to mitigate information ambiguity to investors (Hussinger and Pacher (2019)), which in turn may positively affect the performance of young startups. However, the above studies mainly explore the role of patenting in young firms, and the research on how patenting may create value for large, established firms remains very limited. We add to this literature by documenting a novel channel through which patenting may create value for large, established firms, that is, through enhancing customer capital and thereby creating value in the financial market.

Third, our article is also related to the broader marketing literature on management, product value, and innovation commercialization. For example, Goldfarb,

[4]Our article is also related, albeit indirectly, to the broader literature analyzing the relation between corporate innovation activities (as proxied by R&D, patents, and patenting efficiency) and performance (see, e.g., Griliches (1990), Lerner (1994), Eberhart, Maxwell, and Siddique (2004), Lanjouw and Schankerman (2004), Cohen, Diether, and Malloy (2013), Hirshleifer et al. (2013), and Fitzgerald et al. (2021)). Different from the above studies, our article focuses on the effect of patenting itself (rather than the effect of broad innovation activities) on customer capital, which in turn affects firm performance.

https://doi.org/10.1017/S0022109023000194 Published online by Cambridge University Press

Lu, and Moorthy (2009) and Borkovsky, Goldfarb, Haviv, and Moorthy (2017) utilize sales data to estimate product value, showing that product value indeed carries information relevant to financial value. Palacios Fenech and Tellis (2016) highlight the importance of the need to innovate to keep product market momentum. We add to these studies by providing direct evidence linking patent protection to product market outcomes and customer capital.

Finally, our article complements the broader empirical literature that examines how firm characteristics, financing availability, and policy and regulation affect firm innovation (e.g., Marx, Strumsky, and Fleming (2009), Manso (2011), Hirshleifer, Low, and Teoh (2012), Atanassov (2013), Seru (2014), Tian and Wang (2014), Balsmeier, Fleming, and Manso (2017), and Chemmanur, Krishnan, Kong, and Yu (2019)). While the above studies analyze the determinants of innovation as proxied by corporate patenting, our focus in this article is how patenting creates value in the product and financial markets.

II. Hypotheses Development

In this section, we develop hypotheses on how patenting may affect customer capital, which in turn affects firm outcomes in the financial market. We consider a product market characterized by information asymmetry between firm insiders and customers, where firm insiders know the true quality of their research and technology and all the characteristics (such as novelty and quality) of their products, but they are not able to convey all this information credibly to customers. In other words, customers only have incomplete information about the quality of the firm's research and technology and the characteristics of its products. We conjecture that patents can serve as a credible signal through which a firm conveys positive information about the quality of its research and technology and its overall product excellence to its customers (given that at least some of the underlying inventions may be used in the firm's products to improve their overall product performance). There are at least two reasons to support this conjecture.[5] First, it is costly for a firm to obtain patents: a firm needs to devote significant resources to R&D to develop the inventions and also incur direct and indirect costs to apply for, maintain, and protect the corresponding patents. The considerable costs associated with obtaining patents make patents a credible signal that is hard to mimic by a firm that conducts only lower-quality research. Second, patents are approved by the USPTO to have met the requirement for patentable inventions and hence can certify the quality of the firm's research and technology and, in turn, its overall product excellence.

In addition to serving as a direct signal about the firm's research and technology and its overall product excellence, patents can also lead to a greater extent of new product introduction by encouraging the firm to embed its inventions in its products (Webster and Jensen (2011)). Further, patenting helps firms to retain key

[5]This conjecture is consistent with the prediction of the theoretical model by Long (2002), who demonstrates how a firm's patent portfolio may serve as a credible signal of the intrinsic firm value to outside observers and thus reduce the information asymmetry between the firm and outside observers. This conjecture is also consistent with the arguments of Conti, Thursby, and Thursby (2013), Hsu and Ziedonis (2013), and Farre-Mensa et al. (2020), who analyze the signaling effect of patents on startup financing.

talent such as inventors (Melero et al. (2020)), whose skills, knowledge, and reputation are key to offering novel and high-quality products. Therefore, a greater extent of new product introduction and a greater net inflow of inventors to the firm may serve as additional signals to convey positive information about the firm's ability to conduct high-quality research and to offer excellent products to the customers. Given the above, firms with more patents are likely to achieve more positive customer perceptions of their products. These positive customer perceptions, in turn, may enable these firms to attract and retain more customers who may become loyal to these firms and their products, engage in repeat purchases, and be willing to pay premium prices. Therefore, we expect a firm's patenting activity to be positively associated with its customer capital. This is the first hypothesis that we test (Hypothesis 1).

The relation between patenting and customer capital may, in turn, generate significant implications for firm performance and valuation. As discussed above, since patents can serve as a credible signal to customers about a firm's research and technology and hence the overall excellence of its products, firms with more patenting activities are likely to achieve more favorable customer perceptions toward their products and accumulate greater customer capital. Firms that accumulate greater customer capital through patenting, in turn, are likely to sell a larger quantity of their products to customers and may be able to charge a premium price for each unit of their products, compared to their competitors with less customer capital. This means that such firms are likely to have greater revenues and market shares relative to their competitors with less customer capital. Further, such firms are likely to have greater profitability and higher gross profit margin. Finally, such firms are also likely to have higher financial market valuations because of the greater present value of cash flows. In sum, we expect that patenting improves a firm's performance (including revenue, market share, profitability, and gross profit margin) and financial market valuation through enhanced customer capital. This is the second hypothesis that we test (Hypothesis 2).[6]

We now discuss in more detail how corporate patenting enhances customer capital in a product market characterized by information asymmetry between firm insiders and customers. First, patents can serve as a direct signal conveying positive information about the firm and its products, which helps to differentiate the firm's products from those of its competitors and can be used as part of the firm's marketing strategy to attract and retain more customers.[7] If this is the case, we would expect the effect of patenting on customer capital to be stronger in highly

[6]As in the model of Klein and Leffler (1981), it is also plausible that patenting may allow firms to invest in high-quality production and charge premium prices. These premium prices, in turn, may lead to better customer perceptions since customers may associate the price premiums with better product quality and novelty. Thus, patenting improves a firm's performance and financial market valuation through enhanced customer capital.

[7]Firms often use their patents as part of their marketing strategies. For example, Mercedes advertised in its E-class commercials that it had 80,000 patents with the following slogan: "To hold a patent that has changed the modern world would define you as an innovator. To hold more than one patent of this caliber would define you as a true leader. To hold over 80,000, well, that would make you the creators of the 2012 Mercedes Benz E-Class" (https://www.wsj.com/articles/BL-LB-42195). Apple's patent litigation against Samsung was seen by some as a marketing strategy, trying to depict Apple as the innovator and Samsung as the imitator (https://hbr.org/2014/06/are-apples-patent-wars-a-marketing-strategy).

competitive industries (where standing out from competitors is more important) and in firms with greater advertising intensity (where patenting can be made better known to customers through intensive advertising) (Hypothesis 3).

We further hypothesize that patents can also convey positive information about the firm and its products indirectly through the introduction of new products. Patent protection may encourage firms to embed their inventions in their products (Webster and Jensen (2011)) and introduce a greater number of new products.[8] The ability to develop and introduce new products may serve as an additional signal to convey positive information about the firm and its products to customers (compared to firms with little new product introduction), thereby enhancing customer capital. This is the next hypothesis that we test (Hypothesis 4).

Finally, patenting helps firms to attract and retain key employees such as inventors (i.e., scientists and engineers). Patents typically remain the property of the employer (not the inventor) and thus provide incentives for inventors to stay with the firm (Melero et al. (2020)). In addition, firms with more patenting activities may be viewed by inventors as more conducive environment for them to work in, thereby attracting more inventors. As inventors' skills, knowledge, and reputation are key to offering novel and high-quality products, a continuous net inflow of inventors into the firm can also certify the ability of the firm to continue conducting high-quality research and offering novel and high-quality products, thereby leading to more favorable customer perceptions and enhancing customer capital. This is the final hypothesis that we test (Hypothesis 5).

III. Data, Sample Selection, and Variable Descriptions

A. Data

We gather data from multiple sources for our empirical analyses. To construct our measures of customer capital, we obtain information on customer perceptions of corporate brands over 2000–2014 from Brand Asset Valuator (BAV), a proprietary brand assessment data set provided by BAV Consulting, a subsidiary of Young & Rubicam. The BAV data set is the world's largest study of consumer evaluation of product brands (Keller (2007), Stahl, Heitmann, Lehmann, and Neslin (2012)). Each year, BAV Consulting surveys more than 16,000 U.S. households to evaluate brands on a wide range of attributes.[9] The BAV data offer several advantages that suit our research setting. First, the BAV model relies on a customer-survey approach rather than a financial valuation approach used by other brand assessment models (e.g., Interbrand). Second, the BAV model uses a large sample of survey respondents that is carefully constructed to represent the U.S. population based on factors including gender, ethnicity, age, income, and geographic location (Larkin (2013)). Since BAV surveys are conducted at the brand level, we manually link the brand to

[8]For example, IBM announced that it received 9,130 U.S. patents in 2020 and emphasized that these patents represent IBM's ongoing commitment in R&D, which have "paved the way for new products" and have greatly benefited the customers (https://newsroom.ibm.com/history-of-innovation-and-patent-leadership).

[9]BAV Consulting conducted pilot surveys in 1993 and 1997 and has been conducting the survey annually since 2000.

https://doi.org/10.1017/S0022109023000194 Published online by Cambridge University Press

public companies in Compustat following Larkin (2013). Section IA1 of the Supplementary Material provides more details of the linking procedure based on different brand types. We exclude financial and utility firms (i.e., firms with SIC codes from 6000 to 6999 and from 4901 to 4999, respectively).

We collect firm-year level patent and citation information from the KPSS patent data set, which contains detailed information on patents issued to U.S. public firms by the USPTO from 1926 to 2019.[10] We collect the inventor information associated with each patent from the PatentsView database of the USPTO. For our IV analysis, we retrieve information on patent examiners who reviewed patent applications in the corresponding art units from the USPTO Patent Examination Research Data set, which sources information from the Public Patent Application Information Retrieval system (Public PAIR). We merge our BAV data set with Compustat, PatentsView, and the Patent Examination Research Data set based on firm names.

To construct a proxy for the number of new products introduced at the firm-year level, we employ news coverage data on "Product Release" from the RavenPack News Analytics. To compute firm performance and control variables, we collect financial statement items from Compustat and stock price information from the Center for Research in Security Prices (CRSP). Our final merged sample consists of 462 unique public firms with 3,581 firm-year observations spanning from 2000 to 2014.

B. Measures of Customer Capital

To assess customer capital, we focus on two important perceived product attributes that are relevant for a wide range of products across different industries: perceived product quality and novelty (innovativeness), which are crucial in attracting and retaining customers, achieving customer satisfaction, and generating repeat purchases.

Perceived product novelty is central to helping firms to retain customers. For example, Henard and Dacin (2010) find that the reputation for launching novel and innovative products generates customer excitement toward and heightened loyalty to the firm and leads to more willingness by customers to try products launched by the firm. Kunz et al. (2011) find that firms with a reputation for developing creative and novel ideas and solutions can achieve higher customer satisfaction and loyalty, since such a reputation can strengthen customers' belief that the firm has expertise to perform reliably and excite them about the firm's products.

Perceived product quality largely determines customer satisfaction (Fornell et al. (1996)) and has direct implications for firms to attract and retain customers, as evidenced in the existing literature both theoretically and empirically. For example, in the model of Klein and Leffler (1981), by signaling product quality to customers, brand names and favorable reputations may enable firms to charge price premiums. Several empirical studies (e.g., Zeithaml et al. (1996), Tsiotsou (2006)) show that customer perceptions of product and service quality have a

[10]The initial KPSS data set covers information of patent grants from 1926 to 2010, but has been updated recently to 2019.

direct effect on customers' purchase intention. Collectively, the above studies motivate the use of customer perceptions of product novelty and quality as valid measures of customer capital.

To construct our customer capital measures based on customer perceptions of product novelty and quality, we use brand metrics in the BAV data set, which surveys a large sample of respondents to evaluate brands on a wide range of attributes. The overall results are aggregated across respondents at the brand-year level and are used to create components that capture different aspects of a brand. In our analysis, we measure customer capital using nine brand metrics that are closely related to perceived novelty and quality of the product. The individual components that reflect product novelty are INNOVATIVE, DYNAMIC, INTELLIGENT, and PROGRESSIVE, which are the percentage of respondents who evaluated a certain brand as innovative, dynamic, intelligent, and progressive, respectively. The individual components that reflect product quality are LEADER, RELIABLE, HIGH QUALITY, HIGH PERFORMANCE, and TRUSTWORTHY, which are the percentage of respondents who evaluated a certain brand as a leader, reliable, of high quality, of high performance, and trustworthy, respectively.[11] To capture the overall effect on customer capital, we construct two composite measures, NOVELTY and QUALITY, which are the arithmetic averages of the above four individual novelty components and of the five individual quality components, respectively. In Section V.A, we consider a battery of alternative measures of customer capital and document consistent results.

C. Measures of Patenting Activity and Inventor Mobility

Our primary measure of corporate patenting activity is ln(PATS), which is the natural logarithm of one plus the class-adjusted number of patents filed by a firm in a year that were eventually granted. In addition, we consider two measures to assess the quality and impact of patents: ln(CITES) and ln(MKV). ln(CITES) is the natural logarithm of one plus the class-adjusted number of citations received by patents filed by a firm in a given year. ln(MKV) is the natural logarithm of the market value (measured in 1982 real U.S. dollars) of patents filed by a firm in a given year, following Kogan et al. (2017). Patent counts and citation counts are subject to two types of truncation problems: First, there is a significant lag (about 2 years) between patent filings and patent grants, so a smaller number of patent applications can be observed toward the end of our sample period; Second, it takes time for patents to receive citations, so citation counts for recent patents are downward biased. To mitigate the impact of the truncation bias, we make the class adjustment by dividing each patent (or citation) for each firm-year by the average number of patents (or citations) in the same 3-digit patent class in that year.[12]

Information on inventors is collected from the PatentsView database of the USPTO, in which the inventors are uniquely identified over time so that the moves of inventors across different firms or organizations are trackable. Following

[11]Note that most of these components are used by the BAV to construct its pillars, which have been widely used to measure brand equity and brand assets in the marketing and economic literature.

[12]Following the existing literature, we assign zero patents and citations to firms without any patenting activity.

Chemmanur et al. (2019), we define a move across employers if an inventor filed two consecutive patent applications that are assigned to two different employers. Since we need at least two patents to detect a move, any inventor who filed only one patent throughout her career is excluded from this analysis. For a given firm, the move-in year of an inventor is the year when she filed her first patent while with the firm; the move-out year is the year when she filed her first patent at her subsequent employer. We assume that an inventor stays with her very last employer all the way to the end of our sample period. Once we identify each inventor's move-in and move-out years, we aggregate the number of inventors who move in and move out at the firm-year level to obtain the total inflows and outflows of mobile inventors for a firm in a year. Our measure of inventor mobility or net inflow (NET_INFLOW) is defined as the difference between the natural logarithm of one plus the total inflow and the natural logarithm of one plus the total outflow.

D. Measure of New Product Introduction

We use the natural logarithm of one plus the number of unique news articles about a firm's product release in a given year (ln(PRODUCT_RELEASE)) to assess the extent of new product introductions by a firm. We use the information on news coverage from the RavenPack Analytics database. In constructing our measure, a news article is counted if it satisfies the following criteria: First, it is firm-specific news (rather than macro news); second, the relevance score of the news given in RavenPack is above 90 (i.e., the news is very related to the company); third, the type of news specified in RavenPack is "Product Release."[13] Our measure is similar to that used by Mukherjee, Singh, and Žaldokas (2017), who measure new product introductions using the number of news announcements by searching key words related to new products in the Lexis-Nexis News database.

E. Measures of Firm Performance

We employ five different proxies to measure various dimensions of firm performance: revenue, market share, profitability, gross profit margin, and financial market valuation. Specifically, the five proxies are defined as follows: ln(SALES) is the natural logarithm of a firm's sales in a year; MKT_SHR (in %) is the percentage of sales made by a firm in a year divided by the sum of sales made by all firms in the same 3-digit SIC code industry and year; ROA is the operating income before depreciation divided by total assets; PROFIT_MGN is sales minus the cost of goods sold divided by sales; MB is total assets plus the market value of equity minus the book value of equity divided by total assets.

F. Control Variables

We collect accounting and other financial data from Compustat and stock return data from CRSP. ln(ASSETS) is the natural logarithm of a firm's book value

[13]Results are insensitive to using only firm-specific news on "Product Release" that has a relevance score of 100.

of total assets. AD is advertising expenses divided by total assets. RD is research and development expenses divided by total assets. Consistent with the prior literature, we replace the missing values for advertising and R&D expenses with zeros. To account for the effect of industry concentration, we construct the Herfindahl–Hirschman Index (HHI) at the 2-digit SIC level.[14] BHR is 1-year buy-and-hold returns compounded monthly. STD_DEV is the annual standard deviation of monthly returns. All these control variables are winsorized at the 1st and 99th percentiles.

G. Sample Characteristics

Table 1 presents the summary statistics of key variables for the BAV sample that we use in our regression analyses. The novelty and quality composite measures of customer capital have means of around 9% and 17%, respectively. The individual novelty and quality components have similar means. As for the patenting metrics, the mean value of the logged adjusted number of patents (ln(PATS)) is 1.39 and that of the logged adjusted number of patent citations (ln(CITES)) is 0.32.

To check whether our sample of BAV firms is representative of the broader Compustat universe, we examine the distribution of market capitalization by Fama–French 12 industry classifications in our BAV sample versus the broader Compustat sample (reported in Table IA1 in the Supplementary Material due to space constraints). Compared with the Compustat universe, the BAV sample roughly exhibits consistent rankings for most industries, although the BAV sample is more heavily weighted toward retail, consumer durables, and nondurables. However, the BAV sample still covers a wide variety of companies from different industries, and firms in the BAV sample account for 45% of the market value of firms in Compustat. Further, a comparison of the distribution of market capitalization yields similar variation in the BAV and the broader Compustat sample. Collectively, these observations suggest that the BAV sample is representative of all major sectors.

IV. Empirical Methodology and Results

A. Baseline Analyses: The Effect of Corporate Patenting on Customer Capital

To test our Hypothesis 1 on the relation between patenting and customer capital, we regress our customer capital measures as described in Section III.B on patenting variables, including the adjusted patent counts, adjusted citation counts, and market value of patents, along with other control variables. Our baseline regression is specified as follows:

$$(1)\quad \text{CUSTOMER\_CAPITAL}_{i,t+1} = \alpha + \beta \text{PATENTING}_{i,t} + \phi X_{i,t} + v_i + \mu_t + \varepsilon_{i,t},$$

[14]Results are qualitatively similar if we use the HHI based on Hoberg and Phillips (2016)'s Text-based Network Industry Classifications (TNIC).

TABLE 1
Summary Statistics

Table 1 presents the summary statistics of our key variables. NOVELTY is product novelty composite measure, defined as the arithmetic average of INNOVATIVE, DYNAMIC, INTELLIGENT, and PROGRESSIVE. INNOVATIVE, DYNAMIC, INTELLIGENT, and PROGRESSIVE are the percentages of BAV survey respondents who evaluated the brand as innovative, dynamic, intelligent, and progressive, respectively. QUALITY is the product quality composite measure, defined as the arithmetic average of LEADER, RELIABLE, HIGH_QUALITY, HIGH_PERFORMANCE, and TRUSTWORTHY. LEADER, RELIABLE, HIGH_QUALITY, HIGH_PERFORMANCE, and TRUSTWORTHY are the percentages of BAV survey respondents who evaluated the brand as leader, reliable, having high quality, having high performance, and trustworthy, respectively. ln(PATS) is the natural logarithm of one plus the class-adjusted number of patents for a firm in a year. ln(CITES) is the natural logarithm of one plus the class-adjusted number of citations for a firm in a year. ln(MKV) is the natural logarithm of the market value of patents for a firm in a year (measured in 1982 real U.S. dollars). NET_INFLOW is the difference between the natural logarithm of one plus the inflow of mobile inventors and that of one plus the outflow of mobile inventors for a firm in a year. ln(PRODUCT_RELEASE) is the logarithm of one plus the number of news on product release by a firm in a year. ln(SALES) is the natural logarithm of a firm's sales in a year. MKT_SHR (in %) is the percentage of sales made by a firm in a year scaled by the sum of sales made by all firms in the same 3-digit SIC code industry in the same year. ROA is the operating income before depreciation divided by total assets. PROFIT_MGN is sales minus the cost of goods sold divided by sales. MB is total assets plus the market value of equity minus the book value of equity scaled by total assets. ln(ASSETS) is the natural logarithm of a firm's total assets. AD is the advertising expenses divided by total assets. RD is the research and development expenses divided by total assets. HHI is the Herfindahl–Hirschman Index defined at 2-digit SIC code level. BHR is the 1-year buy-and-hold stock returns compounded monthly. STD_DEV is the 1-year standard deviation of monthly returns.

Variables	*N*	Mean	Std. Dev.	Min	P25	Median	P75	Max
Panel A. Customer Capital Variables								
NOVELTY	3,581	8.92	3.64	1.79	6.29	8.11	10.75	32.25
INNOVATIVE	3,581	9.03	3.85	0.00	6.25	8.27	11.08	31.21
DYNAMIC	3,581	7.59	2.96	1.36	5.59	7.08	8.87	24.61
INTELLIGENT	3,581	11.11	6.07	0.00	6.75	9.44	13.93	52.98
PROGRESSIVE	3,581	7.96	3.34	0.91	5.60	7.22	9.70	28.79
QUALITY	3,581	17.44	7.30	4.13	11.88	16.27	21.57	47.73
LEADER	3,581	17.30	7.39	2.39	11.66	15.75	22.08	47.88
RELIABLE	3,581	18.59	8.75	1.23	11.81	16.83	23.76	55.69
HIGH_QUALITY	3,581	20.28	9.49	2.01	12.74	18.75	26.31	59.11
HIGH_PERFORMANCE	3,581	11.97	5.97	0.00	7.53	10.66	14.85	40.46
TRUSTWORTHY	3,581	19.08	9.09	1.45	12.20	17.06	24.35	58.31
Panel B. Patent, Citation, Inventor Mobility, and Product Release Variables								
ln(PATS)	3,581	1.39	1.75	0.00	0.00	0.31	2.70	6.85
ln(CITES)	3,581	0.32	0.56	0.00	0.00	0.00	0.39	2.80
ln(MKV)	3,581	3.44	3.60	0.00	0.00	2.68	6.83	11.34
NET_INFLOW	3,581	0.47	0.96	−6.29	0.00	0.00	1.10	4.53
ln(PRODUCT_RELEASE)	3,581	1.57	1.37	0.00	0.00	1.39	2.56	5.73
Panel C. Firm Performance Variables								
ln(SALES)	3,581	8.65	1.80	1.27	7.40	8.70	9.97	13.07
MKT_SHR (in %)	3,576	15.71	20.25	0.00	2.32	7.93	21.09	100.00
ROA	3,581	0.15	0.11	−1.28	0.10	0.15	0.21	0.43
PROFIT_MGN	3,581	0.41	0.21	−3.21	0.27	0.39	0.54	0.99
MB	3,581	2.15	1.38	0.50	1.30	1.74	2.53	14.58
Panel D. Control Variables								
ln(ASSETS)	3,581	8.63	1.92	1.78	7.26	8.71	10.10	13.59
AD	3,581	0.03	0.05	0.00	0.00	0.02	0.05	0.22
RD	3,581	0.02	0.04	0.00	0.00	0.00	0.03	0.35
HHI	3,581	0.08	0.07	0.02	0.04	0.06	0.10	0.31
BHR	3,581	0.09	0.56	−1.00	−0.21	0.05	0.27	3.95
STD_DEV	3,581	0.12	0.09	0.02	0.06	0.09	0.14	0.91

where i indexes firm and t indexes time. We use the 1-year leading value for the customer capital measures.[15] Patenting activity is measured for firm i over its fiscal year t. X is a vector of control variables that could influence a firm's customer capital, as described in Section III.F. We include firm (ν_i) and year (μ_t) fixed effects

[15]We obtain results consistent with those reported here if we use 2-year or 3-year leading values for the customer capital measures as the dependent variables. We also obtain consistent results if we use cumulative patenting measures in a rolling 2-year or 3-year window as the independent variables.

to control for the influence of firm-level unobserved heterogeneity and time trends on a firm's customer capital.[16] We cluster the standard errors at the firm level in all regressions unless otherwise specified.[17]

Table 2 reports the results of these regressions. Our main explanatory variables are ln(PATS), ln(CITES), and ln(MKV) in Panels A, B, and C, respectively. In each panel, columns 1 and 6 use the novelty and quality composite measures, respectively, as the dependent variable. Columns 2–5 report results from specifications using the individual novelty components as the dependent variables, and columns 7–11 report results using the individual quality components as the dependent variables.

In Panel A of Table 2, we report a positive and statistically significant association between patenting and various measures of customer capital in most specifications. The economic magnitudes are significant as well. For example, a one inter-quartile range increase in the class-adjusted number of patents (2.70) is associated with a 0.52 (0.191 $\times$ 2.70) percentage point increase in the product novelty composite measure, which is equivalent to 11.6% of the inter-quartile range of the product novelty composite measure. In Panel B, we find that the effects of citation counts on customer capital are positive and significant as well, both statistically and economically. Consistently, in Panel C, we find a positive and significant association between the market value of patents and all the product novelty measures and two individual components of the quality measures.

For robustness, we consider a battery of alternative measures of customer capital. We rerun our baseline regressions (equation (1)) using these alternative measures of customer capital as the dependent variables (as discussed in detail in Section V.A) and find consistent results. Collectively, our results suggest that patenting is positively and significantly associated with enhanced customer capital, which lends strong support to our Hypothesis 1.

B. Instrumental Variable Analyses

1. Motivation of the Instrumental Variable: Institutional Details of the Patent Examination Process

To identify the causal effect of a firm's patenting activity on its customer capital, we exploit the exogenous variation in patent grants due to the random assignment of examiners to review patent applications. As described in detail in Section IV.B.2, we use the average examiner leniency as an instrument for the number of patent grants for a firm in a given year. In doing so, we build on a novel and growing literature leveraging the patent examination process in the USPTO (Gaulé (2018), Sampat and Williams (2019), Farre-Mensa et al. (2020), and Melero et al. (2020)). In this subsection, we briefly describe the institutional

[16]To shed more light on the relationship between patenting and customer capital, we also study the effect of changes in patenting on changes in customer capital (by taking the first difference of all continuous variables in equation (1)). As reported in Table IA2 in the Supplementary Material, we find a positive and significant effect of changes in patenting on changes in customer capital.

[17]Note that we report within-firm R^2 for all the regressions with firm fixed effects throughout the paper, except the first-stage of the IV regression as reported in column 1 of Table 3.

TABLE 2

The Effect of Patenting on Customer Capital

Table 2 presents the OLS regression results of customer capital on different measures of patenting activities. Panels A, B, and C report regression results with class-adjusted number of patents, class-adjusted number of citations, and market value of patents as the main explanatory variable, respectively. All dependent variables are leading 1-year. All variables are defined in detail in Table 1. Firm- and year-fixed effects are included in all regressions. All standard errors are adjusted for clustering at the firm level and corresponding *p*-values are reported in parentheses below the coefficient estimates. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Main Explanatory Variable: Adjusted Number of Patents

		NOVELTY_COMPONENTS					QUALITY_COMPONENTS				
	NOVELTY	INNOVATIVE	DYNAMIC	INTELLIGENT	PROGRESSIVE	QUALITY	LEADER	RELIABLE	HIGH_ QUALITY	HIGH_ PERFORMANCE	TRUSTWORTHY
Variables	1	2	3	4	5	6	7	8	9	10	11
ln(PATS)	0.191**	0.101	0.180***	0.317**	0.166**	0.367**	0.209	0.335*	0.419**	0.538***	0.332*
	(0.014)	(0.310)	(0.006)	(0.014)	(0.045)	(0.012)	(0.132)	(0.054)	(0.031)	(0.000)	(0.080)
ln(ASSETS)	0.772***	0.737***	0.450***	1.177***	0.725***	1.476***	1.819***	1.324***	1.760***	1.082***	1.393***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MB	0.231***	0.230***	0.199***	0.222***	0.274***	0.021	0.264***	−0.142*	0.054	0.071	−0.141
	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)	(0.789)	(0.004)	(0.091)	(0.604)	(0.388)	(0.147)
AD	2.037	3.750**	1.839	−0.337	2.895*	2.795	−0.219	2.131	5.781	2.651	3.629
	(0.162)	(0.049)	(0.226)	(0.896)	(0.094)	(0.410)	(0.940)	(0.616)	(0.222)	(0.329)	(0.424)
RD	6.399***	5.719***	0.027	13.834***	6.016***	1.418	4.266	0.343	−2.828	4.383*	0.925
	(0.000)	(0.003)	(0.985)	(0.000)	(0.006)	(0.623)	(0.170)	(0.914)	(0.446)	(0.086)	(0.817)
ROA	0.208	−0.304	0.762	0.311	0.061	2.518**	1.471	2.283	3.452**	2.269***	3.116**
	(0.737)	(0.687)	(0.177)	(0.731)	(0.933)	(0.032)	(0.196)	(0.108)	(0.036)	(0.010)	(0.022)
HHI	0.460	−0.127	−1.122	2.448	0.642	−0.558	1.224	−0.554	−3.333	2.154	−2.278
	(0.724)	(0.931)	(0.422)	(0.261)	(0.603)	(0.834)	(0.673)	(0.858)	(0.303)	(0.297)	(0.548)
BHR	−0.080	−0.066	−0.055	−0.079	−0.120**	0.103	−0.022	0.176*	0.114	0.025	0.221**
	(0.116)	(0.316)	(0.289)	(0.325)	(0.028)	(0.222)	(0.821)	(0.075)	(0.301)	(0.753)	(0.045)
STD_DEV	0.718*	0.773	0.450	0.866	0.782**	−1.358**	0.093	−1.991**	−1.374	−0.836	−2.680***
	(0.065)	(0.110)	(0.241)	(0.208)	(0.043)	(0.045)	(0.903)	(0.033)	(0.130)	(0.134)	(0.002)
No. of obs.	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581
R^2	0.242	0.188	0.156	0.189	0.249	0.453	0.280	0.362	0.530	0.322	0.342
Firm and year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

(continued on next page)

TABLE 2 (continued)

The Effect of Patenting on Customer Capital

Panel B. Main Explanatory Variable: Adjusted Number of Citations

Variables	NOVELTY	NOVELTY_COMPONENTS: INNOVATIVE	NOVELTY_COMPONENTS: DYNAMIC	NOVELTY_COMPONENTS: INTELLIGENT	NOVELTY_COMPONENTS: PROGRESSIVE	QUALITY	QUALITY_COMPONENTS: LEADER	QUALITY_COMPONENTS: RELIABLE	QUALITY_COMPONENTS: HIGH_ QUALITY	QUALITY_COMPONENTS: HIGH_ PERFORMANCE	QUALITY_COMPONENTS: TRUSTWORTHY
	1	2	3	4	5	6	7	8	9	10	11
ln(CITES)	0.177***	0.092	0.181***	0.298***	0.138**	0.339***	0.223*	0.308**	0.341**	0.502***	0.323**
	(0.006)	(0.265)	(0.002)	(0.007)	(0.049)	(0.005)	(0.062)	(0.033)	(0.031)	(0.000)	(0.042)
ln(ASSETS)	0.777***	0.740***	0.449***	1.184***	0.735***	1.485***	1.813***	1.334***	1.788***	1.095***	1.396***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MB	0.230***	0.229***	0.197***	0.220***	0.273***	0.018	0.262***	−0.144*	0.051	0.066	−0.144
	(0.000)	(0.000)	(0.000)	(0.005)	(0.000)	(0.818)	(0.004)	(0.084)	(0.621)	(0.416)	(0.136)
AD	2.072	3.770**	1.859	−0.282	2.941*	2.863	−0.207	2.196	5.903	2.748	3.677
	(0.158)	(0.048)	(0.222)	(0.914)	(0.089)	(0.408)	(0.944)	(0.610)	(0.220)	(0.325)	(0.423)
RD	6.311***	5.677***	−0.101	13.677***	5.991***	1.252	4.079	0.197	−2.869	4.127	0.727
	(0.000)	(0.003)	(0.943)	(0.000)	(0.005)	(0.663)	(0.186)	(0.950)	(0.437)	(0.101)	(0.857)
ROA	0.212	−0.301	0.762	0.318	0.069	2.527**	1.469	2.291	3.474**	2.281**	3.120**
	(0.734)	(0.691)	(0.180)	(0.728)	(0.924)	(0.034)	(0.199)	(0.111)	(0.037)	(0.011)	(0.023)
HHI	0.417	−0.148	−1.181	2.372	0.625	−0.639	1.140	−0.626	−3.367	2.029	−2.371
	(0.748)	(0.920)	(0.397)	(0.275)	(0.612)	(0.810)	(0.693)	(0.839)	(0.297)	(0.322)	(0.531)
BHR	−0.081	−0.066	−0.055	−0.080	−0.121**	0.102	−0.022	0.175*	0.112	0.024	0.220**
	(0.114)	(0.315)	(0.283)	(0.320)	(0.028)	(0.226)	(0.816)	(0.076)	(0.307)	(0.768)	(0.045)
STD_DEV	0.717*	0.772	0.451	0.865	0.779**	−1.359**	0.096	−1.992**	−1.381	−0.838	−2.680***
	(0.066)	(0.111)	(0.240)	(0.208)	(0.044)	(0.044)	(0.901)	(0.032)	(0.128)	(0.131)	(0.002)
No. of obs.	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581
R^2	0.242	0.188	0.157	0.189	0.249	0.453	0.281	0.362	0.530	0.322	0.342
Firm and Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

(continued on next page)

TABLE 2 (continued)

The Effect of Patenting on Customer Capital

Panel C. Main Explanatory Variable: Market Value of Patents

		NOVELTY_COMPONENTS					QUALITY_COMPONENTS				
	NOVELTY	INNOVATIVE	DYNAMIC	INTELLIGENT	PROGRESSIVE	QUALITY	LEADER	RELIABLE	HIGH_ QUALITY	HIGH_ PERFORMANCE	TRUSTWORTHY
Variables	1	2	3	4	5	6	7	8	9	10	11
ln(MKV)	0.092***	0.069*	0.064*	0.164***	0.072**	0.048	0.117*	0.009	0.034	0.112*	−0.033
	(0.009)	(0.099)	(0.070)	(0.005)	(0.040)	(0.467)	(0.096)	(0.912)	(0.642)	(0.055)	(0.742)
ln(ASSETS)	0.774***	0.723***	0.468***	1.171***	0.732***	1.573***	1.808***	1.438***	1.886***	1.194***	1.537***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MB	0.224***	0.224***	0.195***	0.209***	0.269***	0.020	0.254***	−0.140	0.054	0.064	−0.135
	(0.000)	(0.001)	(0.000)	(0.007)	(0.000)	(0.809)	(0.005)	(0.102)	(0.611)	(0.438)	(0.173)
AD	2.286	3.893**	2.061	0.082	3.108*	3.203	0.062	2.485	6.236	3.272	3.958
	(0.132)	(0.046)	(0.186)	(0.975)	(0.078)	(0.358)	(0.984)	(0.564)	(0.199)	(0.249)	(0.390)
RD	6.620***	5.782***	0.298	14.173***	6.229***	2.191	4.466	1.142	−1.888	5.403**	1.831
	(0.000)	(0.002)	(0.833)	(0.000)	(0.004)	(0.453)	(0.153)	(0.719)	(0.613)	(0.038)	(0.652)
ROA	0.231	−0.297	0.790	0.347	0.084	2.599**	1.492	2.366	3.550**	2.375***	3.210**
	(0.716)	(0.698)	(0.169)	(0.707)	(0.910)	(0.031)	(0.196)	(0.101)	(0.035)	(0.010)	(0.020)
HHI	0.454	−0.171	−1.081	2.417	0.652	−0.309	1.185	−0.257	−3.006	2.434	−1.899
	(0.729)	(0.908)	(0.439)	(0.269)	(0.597)	(0.908)	(0.682)	(0.934)	(0.355)	(0.240)	(0.612)
BHR	−0.082	−0.067	−0.056	−0.083	−0.122**	0.100	−0.024	0.174*	0.111	0.021	0.219**
	(0.112)	(0.310)	(0.277)	(0.312)	(0.027)	(0.239)	(0.804)	(0.081)	(0.319)	(0.794)	(0.048)
STD_DEV	0.654*	0.730	0.401	0.756	0.730*	−1.420**	0.017	−2.032**	−1.436	−0.947*	−2.702***
	(0.093)	(0.134)	(0.301)	(0.268)	(0.059)	(0.036)	(0.983)	(0.029)	(0.115)	(0.098)	(0.002)
No. of obs.	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581
R^2	0.242	0.188	0.155	0.189	0.248	0.450	0.281	0.360	0.528	0.314	0.340
Firm and year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

details of the patent examination process, with a focus on events that are crucial to the underlying rationale of our instrumental variable.

Upon arriving at the USPTO, patent applications are received by a central office that performs an initial review to ensure that applications are ready for examination. Then patent applications are assigned a filing date, patent class, and subclass codes, and allocated to an art unit specialized in certain technology areas (Lemley and Sampat (2012), Gaulé (2018)). After an application arrives in an art unit, the supervisory patent examiner (SPE) of that unit assigns it to a patent examiner, who will have continuing responsibility for examining the application throughout the process until it is disposed of either through patent issue or abandonment (Cockburn, Kortum, and Stern (2002), Carley, Hedge, and Marco (2015)). Our instrument for the number of patent grants, average examiner leniency, is motivated by the following facts. First, both the institutional details and the existing literature suggest that the assignment of patent applications to examiners is quasi-random. For example, interviews with patent examiners conducted by Lemley and Sampat (2012) document that applications are assigned based on the last 4 digits of the application number, docket flow management, or familiarity with certain technologies, none of which is related to the application or applicant (firm) quality.[18] Second, patent examiners have significant discretion in the application review process, and they vary in leniency (i.e., the propensity to approve applications).[19] Therefore, a patent application reviewed by a more lenient examiner is more likely to be approved compared to an otherwise similar application that is reviewed by a stricter examiner.

In sum, we expect and confirm empirically in the first stage of our IV regressions that the average examiner leniency is a positive and significant determinant of the number of patents granted to a firm in a year. Therefore, the relevance condition for a valid instrument is satisfied. Further, examiner leniency affects a firm's customer capital only through the number of patents granted to the firm due to the quasi-random assignment of patent-examiners, as supported by institutional details as mentioned above, the prior literature (e.g., Lemley and Sampat (2012)), and our robustness test results (as discussed in Section V.B). Therefore, the exclusion restrictions for a valid instrument are also satisfied.

[18]We conduct two robustness tests in Section V.B to empirically show that the assignment of applications to examiners is effectively random (irrespective of application or applicant (firm) characteristics) and that the instrument is uncorrelated with various observed application or firm characteristics.

[19]Figure IA1 in the Supplementary Material depicts the distribution of the yearly examiner approval rate adjusted for the art-unit average approval rate (as defined in equation (4)), in which substantial variation in examiner leniency is prevalent. Further, we find that the leniency of an examiner in approving applications is persistent over time. Specifically, we regress individual examiner leniency on various fixed effects (including year, art unit, and examiner as well as different combinations of these fixed effects). As reported in Table IA3 in the Supplementary Material, we find that examiner fixed effects explain an extremely large fraction of the variation in examiner leniency and they are jointly significant, while year and art unit fixed effects explain only a tiny fraction of the variation and are not jointly significant. Further, we show that the leniency of an examiner is not correlated with the quality of the application, as proxied by the number of independent claims in a patent application (which are standalone patent claims that contain all the boundaries necessary to define an invention). In summary, these results confirm that different examiners systematically differ in their tendency to grant patents, which represents an important motivation underlying the use of our instrument.

https://doi.org/10.1017/S0022109023000194 Published online by Cambridge University Press

2. Construction of the Instrumental Variable

In this subsection, we describe in detail the construction of our instrumental variable for the number of patents granted to a firm in a year. We first construct the time-varying measures of leniency at the application level and then aggregate the time-varying measures across all applications at the firm-year level. Building on the existing literature that makes use of patent examination process at the USPTO (Gaulé (2018), Sampat and Williams (2019), Farre-Mensa et al. (2020), and Melero et al. (2020)), we compute the time-varying measures of examiner leniency at the application level as follows:

(2) $$\text{EXAMINER\_LENIENCY}_{aikut} = \frac{\text{GRANTS}_{kut} - 1(\text{GRANT}_a = 1)}{\text{APPLICATIONS}_{kut} - 1},$$

(3) $$\text{ART\_UNIT\_LENIENCY}_{aiut} = \frac{\text{GRANTS}_{ut} - 1(\text{GRANT}_a = 1)}{\text{APPLICATIONS}_{ut} - 1},$$

(4) $$\text{ADJ\_LENIENCY}_{aikut} = \text{EXAMINER\_LENIENCY}_{aikut} - \text{ART\_UNIT\_LENIENCY}_{aiut}.$$

In equation (2), $\text{EXAMINER\_LENIENCY}_{aikut}$ is the yearly approval rate (excluding the focal patent) of examiner k, who works for art unit u and is assigned to review patent application a filed by firm i in year t. Grants_{kut} and $\text{Applications}_{kut}$ are the total number of patents granted and applications reviewed in art unit u by examiner k in year t. In equation (3), $\text{ART\_UNIT\_LENIENCY}_{aiut}$ is the yearly approval rate (excluding the focal patent) of the art unit u that handles the application a filed by firm i in year t. Grants_{ut} and Applications_{ut} are the total number of patents granted and applications reviewed by all examiners in art unit u in year t. 1 (Grant_a=1) is equal to 1 if patent application a was eventually granted by the examiner who reviewed it, and 0 otherwise. In line with the existing literature, we exclude patent examiners who reviewed fewer than 10 applications for an art unit in a year to avoid excessive variations in leniency due to a very small number of applications reviewed by certain examiners.

For a given application, $\text{ADJ\_LENIENCY}_{aikut}$ in equation (4) captures the extent of leniency of an individual examiner while reviewing this application, relative to that of her peers in the same art unit during the same time frame. Figure IA1 in the Supplementary Material plots the distribution of this variable, showing substantial variation. To construct an instrument for the total number of patents granted to a firm in a year, we take the average of $\text{ADJ\_LENIENCY}_{aikut}$ of all applications made by firm i in year t. Specifically, the instrument for the number of patents granted to firm i in year t is given by

(5) $$\text{AVG\_LENIENCY} = \frac{1}{N_{it}} \sum_{a=1}^{N_{it}} \text{ADJ\_LENIENCY}_{aikut},$$

where N_{it} is the number of applications (successful or unsuccessful) filed by firm i in year t.

3. Results of Instrumental Variable Analysis

We conduct the following IV (2-stage least squares) regressions using AVG_LENIENCY as an instrument for the number of patents granted to a firm in a year:

$$\text{(6)}\quad \ln(\text{PATS}) = \alpha_1 + \beta_1 \text{AVG\_LENIENCY}_{it} + \kappa_1 \ln(\text{APPS}) + \phi_1 X_{it} + \nu_i + \mu_t + \varepsilon_{i,t},$$

$$\text{(7)}\quad \text{CUSTOMER\_CAPITAL} = \alpha_2 + \beta_2 \ln(\text{PATS})_{it} + \kappa_2 \ln(\text{APPS}) + \phi_2 X_{it} + \nu_i + \mu_t + \varepsilon_{i,t},$$

where i indexes firm and t indexes year. In addition to the set of control variables used in the OLS regressions, we include the logged number of patent applications filed by a firm in a year (ln(APPS)) to account for the possibility that firms that filed more applications may have a larger number of patents granted. We include firm (ν_i) and year (μ_t) fixed effects in both stages and cluster standard errors at the firm level.

We report the IV regression results in Table 3.[20] Column 1 reports the first-stage regression results. As expected, the coefficient estimate of average leniency is positive and statistically significant at the 1% level. The R^2 is 73.2%, and the first-stage F-stat is 37.12, which is significantly greater than the critical value suggested in Stock and Yogo (2005). Collectively, these results suggest that the average examiner leniency is a strong determinant of a firm's patent grants, confirming that the relevance condition of a valid instrument is satisfied.

Columns 2–12 of Table 3 report the second-stage results of our IV regressions. As shown in columns 2 and 7, the adjusted number of patents continue to have a positive and statistically significant impact on our two main measures of customer capital (i.e., NOVELTY and QUALITY), even after controlling for the potential endogeneity concern between patenting and customer capital. Further, the effects of the adjusted number of patents on most novelty and quality components are positive and significant as well.

In our IV analysis, we rely on a subsample of firms that have made at least one patent application but with varying degrees of success in obtaining patent grants. To alleviate the concern that the IV sample may be different from the whole sample, we rerun our baseline regressions (equation (1)) using the IV sample and report these results in Table IA5 in the Supplementary Material. We find the results are similar to those presented in Table 2 using the whole sample. Further, comparing IV and OLS results, the coefficient estimates of ln(PATS) from the IV analyses are greater in magnitude than those from the OLS analyses using the same sample. This is likely because our IV estimates uncover a local average treatment effect (LATE) since examiner leniency mainly affects the success of patent applications that are on the margin of getting approved or rejected (Jiang (2017)). Collectively, the results of our IV analyses establish a positive causal effect of corporate patenting on a firm's customer capital.

C. Patenting, Customer Capital, and Firm Performance

We next examine whether patenting exerts a positive impact on firm performance and valuation through enhanced customer capital (corresponding to

[20]We report the reduced-form results of our IV regressions, that is, regressing all the customer capital measures on the instrument and other control variables in Table IA4 in the Supplementary Material.

TABLE 3

Instrumental Variable Analysis on the Effect of Patenting on Customer Capital: IV Results

Table 3 presents the IV regression results of customer capital on patent grants. Column 1 reports the first-stage results (i.e., regressing ln(PATS) on the instrument, AVG_LENIENCY, and other control variables). Columns 2–12 report the second-stage results. Firm- and year-fixed effects are included in all regressions. All variables are defined in detail in Table 1. All standard errors are adjusted for clustering at the firm level and corresponding *p*-values are reported in parentheses below the coefficient estimates. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

			NOVELTY_COMPONENTS					QUALITY_COMPONENTS				
	ln(PATS)	NOVELTY	INNOVATIVE	DYNAMIC	INTELLIGENT	PROGRESSIVE	QUALITY	LEADER	RELIABLE	HIGH_QUALITY	HIGH_PERFORMANCE	TRUSTWORTHY
Variables	1	2	3	4	5	6	7	8	9	10	11	12
AVG_LENIENCY	0.603***											
	(0.000)											
ln(PATS)		1.646**	2.111***	0.617	2.652***	1.205	2.889*	2.051*	3.062*	3.470*	2.912**	2.949
		(0.011)	(0.008)	(0.375)	(0.008)	(0.248)	(0.058)	(0.090)	(0.077)	(0.091)	(0.039)	(0.154)
ln(ASSETS)	0.150***	0.914***	0.791**	0.767***	1.148***	0.948***	1.450**	1.804***	1.090*	1.724**	1.402***	1.227*
	(0.002)	(0.001)	(0.034)	(0.002)	(0.002)	(0.005)	(0.013)	(0.000)	(0.069)	(0.030)	(0.010)	(0.066)
MB	0.019	0.328***	0.328***	0.257***	0.329***	0.400***	0.009	0.360***	−0.175	0.002	0.078	−0.222
	(0.125)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.943)	(0.002)	(0.184)	(0.988)	(0.543)	(0.153)
RD	0.341	1.813	0.975	−1.631	5.344**	2.567	−3.381	−2.302	−4.998	−3.703	−0.916	−4.985
	(0.535)	(0.326)	(0.697)	(0.381)	(0.037)	(0.331)	(0.388)	(0.588)	(0.245)	(0.418)	(0.797)	(0.354)
AD	−0.108	7.406***	10.068***	4.190**	7.227**	8.140***	5.568	6.367	4.422	7.582	4.161	5.308
	(0.884)	(0.001)	(0.001)	(0.017)	(0.043)	(0.003)	(0.339)	(0.249)	(0.483)	(0.324)	(0.405)	(0.443)
ROA	−0.155	0.827	0.284	1.351	1.252	0.421	5.118***	2.901*	5.190**	7.313***	4.349***	5.837***
	(0.283)	(0.445)	(0.831)	(0.125)	(0.382)	(0.736)	(0.007)	(0.089)	(0.025)	(0.002)	(0.005)	(0.009)
HHI	0.576	−2.968*	−6.087***	−3.838*	0.696	−2.642	−5.889	−5.643	−7.233	−6.873	−2.355	−7.343
	(0.246)	(0.090)	(0.001)	(0.056)	(0.832)	(0.129)	(0.168)	(0.245)	(0.146)	(0.120)	(0.442)	(0.227)
BHR	−0.015***	−0.007	0.001	0.015	−0.036	−0.009	0.130***	0.094**	0.138**	0.189***	0.024	0.204***
	(0.003)	(0.849)	(0.981)	(0.574)	(0.499)	(0.879)	(0.008)	(0.038)	(0.033)	(0.003)	(0.581)	(0.004)
STD_DEV	−0.033	0.317**	0.377**	0.330**	0.497	0.063	0.031	0.293*	0.245	0.010	0.167	−0.561**
	(0.286)	(0.032)	(0.012)	(0.014)	(0.142)	(0.630)	(0.880)	(0.075)	(0.642)	(0.967)	(0.234)	(0.036)
ln(APPS)	0.615***	−0.913**	−1.195**	−0.335	−1.467**	−0.657	−1.802*	−1.114	−1.971*	−2.157*	−1.843**	−1.924
	(0.000)	(0.027)	(0.016)	(0.443)	(0.026)	(0.312)	(0.064)	(0.146)	(0.080)	(0.094)	(0.038)	(0.149)
R^2	0.732											
Kleibergen–Paap Wald *rk* *F*-statistic	37.12											
No. of obs.	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330
Firm and year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

https://doi.org/10.1017/S0022109023000194 Published online by Cambridge University Press

https://doi.org/10.1017/S0022109023000194 Published online by Cambridge University Press

Hypothesis 2). In other words, we are interested in the indirect effect of patenting on firm performance and valuation through customer capital (as reflected in both product novelty and product quality), over and above any direct effect that patenting may have on firm performance and valuation.

We conduct a mediation analysis to systematically assess the indirect effect of corporate patenting on firm performance through customer capital as well as the direct effect, following the existing literature (e.g., Cronqvist, Previtero, Siegel, and White (2016)). In our mediation analysis, we use the average examiner leniency (rather than patents) to capture patenting to alleviate the endogeneity concern that both patents and firm outcomes might be driven by unobserved firm characteristics. To measure firm performance, we consider 5 outcome variables: revenue (ln(SALES)), market share of sales relative to industry peers (MKT_SHR)), profitability (ROA), gross profit margin (PROFIT_MGN), and financial market valuation (MB). The mediating variables are the two main measures of customer capital, NOVELTY and QUALITY. We use the seemingly unrelated regression model (Zellner (1963)) to estimate the set of equations below for outcome variables (Y_{it}) and the main explanatory variable, AVG_LENIENCY:

(8) $$Y_{i,t+1} = \eta_1 + \lambda_1 \text{AVG\_LENIENCY}_{i,t} + \gamma \text{NOVELTY}_{i,t+1} + \delta \text{QUALITY}_{i,t+1} + \theta_1 Z_{i,t} + v_i + \mu_t + \varepsilon_{i,t},$$

(9) $$\text{NOVELTY}_{i,t+1} = \eta_2 + \lambda_2 \text{AVG\_LENIENCY}_{i,t} + \theta_2 Z_{i,t} + v_i + \mu_t + \varepsilon_{i,t},$$

(10) $$\text{QUALITY}_{i,t+1} = \eta_3 + \lambda_3 \text{AVG\_LENIENCY}_{i,t} + \theta_3 Z_{i,t} + v_i + \mu_t + \varepsilon_{i,t}.$$

The direct effect of patenting (as proxied by examiner leniency) on firm performance is captured by the coefficient λ_1 estimated in equation (8). The indirect effects of patenting on firm performance through perceived novelty and product quality are captured by $\gamma\lambda_2$ and $\delta\lambda_3$, respectively. Therefore, the combined indirect effect of patenting activity through customer capital is given by $\gamma\lambda_2 + \delta\lambda_3$.

We report the direct and indirect effects of examiner leniency on firm performance and summarize our results in Table 4.[21] We compute the standard errors of coefficient estimates using the bootstrapping method based on 500 repetitions. As presented in the upper panel of Table 4, we do not find a significant impact of examiner leniency on firm performance variables. In the lower panel, we find that the indirect effect of examiner leniency through the novelty aspect of customer capital is significant at the 5% level for a firm's market valuation and is significant at the 10% level for a firm's revenue and ROA. Additionally, the indirect effect through the quality aspect of customer capital is significant at the 5% level for a firm's revenue, market share, and profitability, and is significant at the 10% level for a firm's gross profit margin. By summing both indirect effects, we find that the combined indirect effect of examiner leniency through customer capital on performance is positive and statistically significant (at least at the 5% level) for all 5 performance variables. In summary, the results of our mediation analysis support

[21]The results of seemingly unrelated regressions above (equations (8)–(10)) are reported in Table IA6 in the Supplementary Material.

TABLE 4

Mediation Analysis of the Direct and Indirect Effects of Patenting on Firm Performance

Table 4 presents the mediation analysis results of the direct and indirect effects of the average examiner leniency on various outcome variables, including revenue (logged sales), market share (percentage of sales across all firms in the same 3-digit SIC code industry in a year), profitability (ROA), gross profit margin, and firm valuation (MB). The mediating variables are the composite measures of customer capital (NOVELTY and QUALITY). All variables are defined in detail in Table 1. *p*-values based on bootstrapped standard errors are reported in parentheses below the coefficient estimates. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

	ln(SALES)	MKT_SHR	ROA	PROFIT_MGN	MB
Variables	1	2	3	4	5
Direct effect					
AVG_LENIENCY	0.060	0.978	0.004	−0.002	0.151
	(0.435)	(0.644)	(0.848)	(0.904)	(0.575)
Indirect effect					
NOVELTY	0.015*	0.079	0.004*	0.003	0.115**
	(0.085)	(0.536)	(0.100)	(0.12)	(0.050)
QUALITY	0.028**	0.749**	0.007**	0.004*	0.000
	(0.022)	(0.024)	(0.028)	(0.06)	(0.998)
Combined indirect effect	0.043***	0.829**	0.010***	0.007**	0.115*
	(0.009)	(0.017)	(0.008)	(0.018)	(0.062)
No. of obs.	1,429	1,424	1,424	1,429	1,428

Hypothesis 2 that corporate patenting exerts a positive impact on firm performance and valuation through enhanced customer capital.

D. Additional Analyses on How Patenting Enhances Customer Capital

In this section, we delve deeper into how patenting enhances customer capital in a product market characterized by information asymmetry between firm insiders and customers, corresponding to our hypotheses Hypotheses 3–5.

1. Patenting, Product Market Competition, and Advertising Intensity

We argue that patenting can serve as a direct signal conveying favorable information about the firm and its products to customers, which can be used as part of the firm's marketing strategy and enhance customer capital. If this is the case, we would expect the effect of patenting on customer capital to be stronger in more competitive industries (where standing out from competitors is more important) and for firms with greater advertising intensity (where patenting can be made better known by customers through intensive advertising). To test these conjectures, we regress our main customer capital measures on the interaction between patenting variables and a variable for greater competition (HIGH_COMP), as well as on the interaction between patenting variables and a variable for greater advertising intensity (HIGH_AD). Specifically, HIGH_COMP is a dummy variable equal to 1 if the HHI based on TNIC (Hoberg and Phillips (2016)) is in the lowest quartile, and 0 otherwise. HIGH_AD is a dummy variable equal to 1 if advertising expenditures for the year are greater than the sample median, and 0 otherwise.

Table 5 reports the results of the regressions interacting patenting measures with these two variables. Panel A reports the results of the regressions interacting the patenting variables with greater competition. We find that the interaction between the number of patents and the dummy variable for greater competition

https://doi.org/10.1017/S0022109023000194 Published online by Cambridge University Press

TABLE 5

Product Market Competition, Advertising Intensity, Patenting, and Customer Capital

Panel A of Table 5 presents the OLS regression results of customer capital on the interaction of product market competition and patenting activities. HIGH_COMP is a dummy variable equal to 1 if Hoberg and Phillips' TNIC HHI is in the lowest quartile, and 0 otherwise. Panel B presents the OLS regression results of customer capital on the interaction of advertising intensity and patenting activities. HIGH_AD is a dummy variable equal to 1 if the ratio of advertising expenses to total assets is greater than the sample median, and 0 otherwise. The same set of control variables as in Table 2 are included in all regressions but the coefficients are not reported in order to conserve space. Firm- and year-fixed effects are included in all regressions. All variables are defined in detail in Table 1. All standard errors are adjusted for clustering at the firm level and corresponding *p*-values are reported in parentheses below the coefficient estimates. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	NOVELTY 1	QUALITY 2	NOVELTY 3	QUALITY 4	NOVELTY 5	QUALITY 6
Panel A. Product Market Competition, Patenting, and Customer Capital						
ln(PATS) × HIGH_COMP	0.206**	0.023				
	(0.011)	(0.859)				
ln(PATS)	0.241***	0.363**				
	(0.004)	(0.013)				
ln(CITES) × HIGH_COMP			0.211***	0.011		
			(0.003)	(0.933)		
ln(CITES)			0.165***	0.336***		
			(0.008)	(0.005)		
ln(MKV) × HIGH_COMP					0.088***	0.011
					(0.006)	(0.852)
ln(MKV)					0.083**	0.046
					(0.016)	(0.483)
HIGH_COMP	0.084	−0.172	−0.078	−0.155	−0.116	−0.192
	(0.428)	(0.453)	(0.417)	(0.496)	(0.234)	(0.413)
No. of obs.	3,581	3,581	3,581	3,581	3,581	3,581
R^2	0.0762	0.453	0.247	0.453	0.247	0.450
Controls, firm, and year FE	Yes	Yes	Yes	Yes	Yes	Yes
Panel B. Advertising Intensity, Patenting, and Customer Capital						
ln(PATS) × HIGH_AD	0.247*	0.405**				
	(0.062)	(0.024)				
ln(PATS)	0.107	0.228				
	(0.244)	(0.134)				
ln(CITES) × HIGH_AD			0.219*	0.400**		
			(0.083)	(0.019)		
ln(CITES)			0.097	0.194		
			(0.219)	(0.136)		
ln(MKV) × HIGH_AD					0.077	0.126
					(0.158)	(0.103)
ln(MKV)					0.054	−0.015
					(0.198)	(0.848)
HIGH_AD	−0.137	−0.564**	−0.106	−0.574**	−0.065	−0.444
	(0.344)	(0.047)	(0.447)	(0.040)	(0.664)	(0.106)
No. of obs.	3,581	3,581	3,581	3,581	3,581	3,581
R^2	0.250	0.458	0.249	0.458	0.246	0.452
Controls, firm, and year FE	Yes	Yes	Yes	Yes	Yes	Yes

loads positively and significantly for the novelty aspect of customer capital but not for the quality aspect. These results suggest that the effect of patenting on customer capital is stronger for firms in more competitive industries. Panel B reports the results of the regressions interacting patenting measures with greater advertising intensity. In general, the results suggest that the positive effect of patenting activity on customer capital is more pronounced for firms with higher advertising intensity. We obtain consistent results when we use the individual novelty and quality components as the dependent variables (see these results in Tables IA7 and IA8 in the Supplementary Material). Collectively, these results lend strong support to our Hypothesis 3.

2. Introduction of New Products

We hypothesize that patents can convey positive information about the firm and its products indirectly through new product introductions and thus lead to greater customer capital (corresponding to Hypothesis 4). To test this hypothesis, we use the number of unique news articles on a firm's product releases (ln(PRODUCT_RELEASE)) to assess the extent of new product introductions, as detailed in Section III.D. We regress ln(PRODUCT_RELEASE) on our patenting variables, along with control variables and fixed effects. We report the results of these tests in Table 6. Since there is limited within-firm time series variation in the number of new products introduced, we first include industry and year-fixed effects in the

TABLE 6

The Effect of Patenting on New Product Introductions

Table 6 presents the effect of patenting on firms' new product introductions. Columns 1–6 present the OLS results and column 7 reports the IV analysis results (i.e., instrumenting ln(PATS) using AVG_LENIENCY). The dependent variable in all the regressions is the natural logarithm of one plus the number of news articles on product release for a firm in the next year. Industry- and year-fixed effects are included in regressions in columns 1–3; firm- and year-fixed effects are included in regressions in columns 4–6. All variables are defined in detail in Table 1. All standard errors are adjusted for clustering at the firm level and corresponding *p*-values are reported in parentheses below the coefficient estimates. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

	ln(PRODUCT_RELEASE)						
	OLS Results						IV Results
Variables	1	2	3	4	5	6	7
ln(PATS)	0.178***			0.058*			0.512**
	(0.000)			(0.100)			(0.036)
ln(CITES)		0.168***			0.056*		
		(0.000)			(0.068)		
ln(MKV)			0.084***			0.029*	
			(0.000)			(0.079)	
ln(ASSETS)	0.307***	0.316***	0.314***	0.232***	0.232***	0.232***	−0.028
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.696)
MB	0.122***	0.120***	0.100***	0.056***	0.055***	0.053***	0.038**
	(0.000)	(0.000)	(0.000)	(0.002)	(0.003)	(0.003)	(0.050)
RD	5.215***	5.227***	5.141***	0.806	0.773	0.878	1.132*
	(0.000)	(0.000)	(0.000)	(0.152)	(0.171)	(0.117)	(0.063)
AD	0.818**	0.841**	0.925**	−0.377	−0.370	−0.340	−0.625
	(0.037)	(0.031)	(0.019)	(0.312)	(0.320)	(0.350)	(0.336)
ROA	−0.201	−0.206	−0.235	0.192	0.193	0.200	0.042
	(0.427)	(0.417)	(0.356)	(0.389)	(0.391)	(0.375)	(0.812)
HHI	−1.503***	−1.552***	−1.446***	−0.875*	−0.887*	−0.875*	−0.001
	(0.004)	(0.003)	(0.003)	(0.069)	(0.065)	(0.064)	(0.999)
BHR	−0.011	−0.011	−0.012	−0.005	−0.005	−0.006	0.007
	(0.395)	(0.420)	(0.355)	(0.567)	(0.595)	(0.564)	(0.391)
STD_DEV	0.399***	0.397***	0.368***	0.058	0.058	0.051	0.034
	(0.006)	(0.006)	(0.006)	(0.243)	(0.249)	(0.298)	(0.350)
ln(APPS)							−0.305**
							(0.048)
No. of obs.	3,581	3,581	3,581	3,581	3,581	3,581	1,330
R^2	0.683	0.683	0.684	0.509	0.509	0.509	
Industry and year FE	Yes	Yes	Yes	No	No	No	No
Firm and year FE	No	No	No	Yes	Yes	Yes	Yes

https://doi.org/10.1017/S0022109023000194 Published online by Cambridge University Press

regressions and report these results in columns 1–3. We find that the coefficients on the adjusted number of patents, adjusted number of citations, and market value of patents are all positive and statistically significant at the 1% level. In columns 4–6, we replace industry-fixed effects with firm-fixed effects in our regressions and continue to find positive and significant coefficients on all these patenting measures, although the significance levels decrease due to limited time-series variation within a firm. In column 7, we report the IV regression results, which continue to show a positive causal impact of patenting on new product introductions.[22]

In addition to the IV analysis, we conduct two robustness tests to show that patenting indeed leads to a greater extent of new product introduction (reported in Table IA10 in the Supplementary Material). In the first test (shown in column 1 of Table IA10 in the Supplementary Material), we regress ln(PRODUCT_RELEASE) on the number of patent applications but do not find a significant association between the two. This result indicates that patent grants (rather than patent applications) lead to a greater extent of new product introduction. In the second test (shown in column 2 of Table IA10 in the Supplementary Material), we regress the adjusted number of patent grants on lagged new product introduction and do not find a significant relationship. Thus, we do not see higher patenting activity in firms that have a higher intensity of new product introduction, which alleviates the potential reverse causality concerns that firms with a greater extent of new product introductions patent more.

To delve deeper into the hypothesis that patenting leads to new product introduction which in turn enhances customer capital, we also analyze whether patenting has a greater impact on customer capital for firms with more R&D spending. To the extent that R&D spending captures a firm's innovation input, we would expect patenting to have a greater impact on customer capital for firms with more R&D spending (compared to those with less R&D spending) if patent protection encourages firms to commercialize their innovations (as reflected in their R&D spending) by embedding such innovations in their products. Consistent with our expectation, we find in Table 7 that the interactions between the patenting variables and R&D spending load positively and significantly in all the regressions.

Collectively, our results demonstrate that patenting enhances customer capital through encouraging firms to commercialize their inventions, providing strong support for our Hypothesis 4.

3. Inventor Mobility

We conjecture that patenting helps to attract and retain key employees such as inventors. Since inventors' skills, knowledge, and reputation are key to offering novel and high-quality products, a continuous net inflow of inventors can also certify the ability of the firm to continue conducting high-quality research and offering novel and high-quality products, thereby enhancing customer capital (corresponding to Hypothesis 5). To empirically test this hypothesis, we analyze

[22]To further support the hypothesis that patenting enhances customer capital through introducing a greater number of new products to the market, we show that new product introduction predicted by patenting is significantly associated with enhanced customer capital. We report these results in Table IA9 in the Supplementary Material due to space constraints.

TABLE 7

R&D Spending, Patenting, and Customer Capital

Table 7 presents the OLS regression results of customer capital on the interaction of R&D spending and various measures of patenting activities. The same set of control variables as in Table 2 are included in all regressions but the coefficients are not reported in order to conserve space. Firm- and year-fixed effects are included in all regressions. All variables are defined in detail in Table 1. All standard errors are adjusted for clustering at the firm level and corresponding *p*-values are reported in parentheses below the coefficient estimates. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

	NOVELTY	QUALITY	NOVELTY	QUALITY	NOVELTY	QUALITY
Variables	1	2	3	4	5	6
ln(PATS) × R&D	2.462***	4.412***				
	(0.005)	(0.002)				
ln(PATS)	0.078	0.163				
	(0.359)	(0.311)				
ln(CITES) × R&D			2.253**	3.263**		
			(0.010)	(0.015)		
ln(CITES)			0.075	0.191		
			(0.287)	(0.148)		
ln(MKV) × R&D					1.464**	1.504*
					(0.016)	(0.053)
ln(MKV)					0.058*	0.013
					(0.092)	(0.853)
R&D	0.998	−8.261**	1.489	−5.733	−1.895	−6.558
	(0.679)	(0.036)	(0.507)	(0.114)	(0.627)	(0.119)
No. of obs.	3,581	3,581	3,581	3,581	3,581	3,581
R^2	0.247	0.457	0.247	0.455	0.248	0.451
Controls, firm, and year FE	Yes	Yes	Yes	Yes	Yes	Yes

whether a greater number of inventors moving into a firm is associated with greater customer capital. The results presented in Table 8 show that a greater net inflow of inventors is associated with enhanced customer capital. In particular, the net inflow of inventors is positively and significantly related to all the perceived novelty measures and certain perceived quality component.

V. Robustness Tests

A. Alternative Measures of Customer Capital

For robustness, we consider various alternative measures of customer capital and show that our results continue to hold using these alternative measures. First, we use principal component analysis (PCA) to create alternative composite measures of customer capital. We rerun our baseline regressions with these alternative measures as the dependent variables and report the results in Table IA11 in the Supplementary Material. Consistent with the results reported in Table 2, we continue to document a positive and significant relation between corporate patenting and these PCA-based measures of customer capital. Second, we use the 4 pillars of BAV as well as the average of all the individual components that are used to create the 4 BAV pillars as alternative measures of customer capital. As reported in Table IA12 in the Supplementary Material, we find a positive and significant relation between patenting and these BAV pillar-related customer capital measures. Finally, we construct an accounting-based measure of customer capital using the cumulative advertising expenses, following the literature on intangible capital (e.g., Eisfeldt and

TABLE 8

The Effect of Inventor Mobility on Customer Capital

Table 8 presents the OLS regression results of customer capital on the net inflow of inventors (NET_INFLOW). All dependent variables are leading 1-year. All variables are defined in detail in Table 1. Firm- and year-fixed effects are included in all regressions. All standard errors are adjusted for clustering at the firm level and corresponding *p*-values are reported in parentheses below the coefficient estimates. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

		NOVELTY_COMPONENTS					QUALITY_COMPONENTS				
	NOVELTY	INNOVATIVE	DYNAMIC	INTELLIGENT	PROGRESSIVE	QUALITY	LEADER	RELIABLE	HIGH_QUALITY	HIGH_PERFORMANCE	TRUSTWORTHY
Variables	1	2	3	4	5	6	7	8	9	10	11
NET_INFLOW	0.161***	0.114**	0.117***	0.286***	0.127***	0.051	0.128	0.042	−0.027	0.231***	−0.118
	(0.000)	(0.039)	(0.004)	(0.000)	(0.008)	(0.524)	(0.143)	(0.668)	(0.788)	(0.002)	(0.273)
ln(ASSETS)	0.811***	0.752***	0.493***	1.238***	0.761***	1.598***	1.870***	1.437***	1.916***	1.233***	1.535***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MB	0.227***	0.227***	0.196***	0.215***	0.271***	0.022	0.261***	−0.140*	0.058	0.067	−0.134
	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)	(0.783)	(0.004)	(0.099)	(0.585)	(0.417)	(0.175)
AD	2.079	3.745*	1.912	−0.285	2.944*	3.127	−0.126	2.440	6.244	2.987	4.090
	(0.167)	(0.053)	(0.219)	(0.913)	(0.093)	(0.369)	(0.967)	(0.570)	(0.199)	(0.288)	(0.374)
RD	6.136***	5.450***	−0.064	13.312***	5.844***	2.087	4.200	0.976	−1.674	4.654*	2.278
	(0.000)	(0.005)	(0.965)	(0.000)	(0.007)	(0.476)	(0.178)	(0.759)	(0.658)	(0.074)	(0.575)
ROA	0.245	−0.286	0.800	0.372	0.095	2.608**	1.516	2.365	3.561**	2.390***	3.209**
	(0.697)	(0.707)	(0.165)	(0.687)	(0.897)	(0.031)	(0.191)	(0.102)	(0.034)	(0.010)	(0.020)
HHI	0.410	−0.194	−1.120	2.338	0.616	−0.285	1.238	−0.298	−2.900	2.330	−1.797
	(0.746)	(0.893)	(0.418)	(0.273)	(0.608)	(0.915)	(0.668)	(0.924)	(0.372)	(0.260)	(0.636)
BHR	−0.078	−0.064	−0.054	−0.076	−0.119**	0.102	−0.020	0.175*	0.111	0.027	0.217*
	(0.128)	(0.329)	(0.302)	(0.351)	(0.031)	(0.236)	(0.833)	(0.081)	(0.322)	(0.745)	(0.050)
STD_DEV	0.690*	0.757	0.426	0.820	0.758**	−1.400**	0.065	−2.029**	−1.420	−0.904	−2.712***
	(0.074)	(0.117)	(0.267)	(0.229)	(0.048)	(0.039)	(0.933)	(0.029)	(0.118)	(0.111)	(0.002)
No. of obs.	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581	3,581
R^2	0.245	0.189	0.157	0.193	0.250	0.450	0.280	0.360	0.528	0.317	0.340
Firm and year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Papanikolaou (2013), Belo, Lin, and Vitorino (2014)). As reported in Table IA13 in the Supplementary Material, we find a positive and significant relation between patenting and this accounting-based measure of customer capital using advertising expenses.

B. Validity of the Instrumental Variable

As discussed in Section IV.B, the random assignment of patent applications to examiners is central to our identification strategy. Although both institutional details and the existing literature suggest that the assignment is random, we conduct two empirical tests to provide further support for the validity of our instrument. In our first validation test, we empirically show that the assignment of patent applications to examiners is effectively random, irrespective of application or applicant characteristics (quality). As noted by Righi and Simcoe (2019), under the assumption of random assignment of applications to examiners, the first-stage coefficient on average examiner leniency should be invariant to the inclusion of application or applicant quality/characteristics. We use the average number of independent claims (which are standalone patent claims that contain all the boundaries necessary to define an invention) as the proxy for the average application quality, following Marco, Sarnoff, and deGrazia (2019) and Farre-Mensa et al. (2020). We consider a set of firm characteristics to assess the applicant's quality (including firm size, market valuation, R&D ratio, advertising expense, profitability, stock returns, firm age, and sales growth). As reported in Table IA14 in the Supplementary Material, we find that the inclusion of application and/or applicant characteristics does not change the magnitude of the first-stage coefficient on average examiner leniency. These results thus lend strong support to the random assignment of patent applications to examiners, validating the use of average examiner leniency as an instrument for patent grants.

In the second validation test, we test whether the instrument is correlated with any observed application or applicant characteristics (which may be related to firm performance). If average examiner leniency is indeed a valid instrument, we would expect the average examiner leniency to be uncorrelated with the observed application or applicant characteristics. In Table IA15 in the Supplementary Material, we regress the average examiner leniency on the logged number of applications, the average application quality (measured by the average number of independent claims for a firm's patents), and various applicant (firm) characteristics (including firm size, market valuation, R&D ratio, advertising expense, profitability, stock returns, firm age, sales growth, and total number of applications filed). We include firm and year-fixed effects in our regressions as well. We find that average examiner leniency (i.e., our instrument) is not correlated with the application quality (i.e., average independent claims) or the applicant quality (as captured by various firm characteristics). Further, we find that the coefficients of firm fixed effects are not jointly significant. Collectively, these results demonstrate that our instrument is not correlated with application or applicant quality, thus providing further support for the validity of our instrument.

C. Reapplications and Firm Performance

Although our instrument is effective in establishing the causal relationship between patenting and firm outcomes as discussed earlier, one may be concerned that certain firms (e.g., better-performing firms) are more persistent in reapplying and responding to the examiners' rejections than others, which may contaminate the results of our analyses. To mitigate such concerns, we investigate whether the likelihood of reapplication and its eventual success are correlated with firm performance. Empirically, we measure the likelihood of reapplication and its eventual success using the fraction of patent applications and the fraction of eventual patent grants that went through multiple (i.e., two or more) rounds of revisions, respectively. To achieve this, we link all the patent applications in our sample with the patent transaction history file in the Patent Examination Research Data set of the USPTO, so that we can identify how many rounds of revisions an application or a granted patent has gone through in response to examiners' rejections (i.e., office actions).

We report the results in Table IA16 in the Supplementary Material. We find that neither the fraction of applications with multiple revisions nor the fraction of patent grants with multiple revisions is significantly correlated with any observables related to firm performance (including firm size, market-to-book, R&D-to-assets ratio, advertising-to-assets ratio, profitability, annual returns, age, and sales growth). Collectively, these results provide reassuring evidence that neither the likelihood of reapplication nor its eventual success is correlated with firm performance.

D. Exploratory Versus Exploitative Patents

We also examine how different patenting strategies (i.e., exploratory vs. exploitative patents) may impact customer capital. Following Chemmanur et al. (2019), we construct measures of exploratory and exploitative patents. As reported in Table IA17 in the Supplementary Material, we find that the positive relation between patenting activity and customer capital is primarily driven by exploratory patents (i.e., patents in areas that a firm is less familiar with, thus representing a bigger leap in actual innovation) rather than exploitative patents (i.e., patents in areas that a firm is more familiar with and thus more likely to be incremental). In particular, we find a positive and statistically significant association between exploratory patents and customer capital. In contrast, we find no consistent relation between exploitative patents and customer capital. These results indicate that patenting of exploratory and novel innovations, which push firms' knowledge boundaries outward and are likely to generate novel and high-quality products, plays an important role in enhancing customer capital.

VI. Conclusion

Using data on customer perceptions of corporate brands, we examine how corporate patenting affects customer capital, which in turn creates financial market value, in a product market characterized by information asymmetry between firm insiders and customers. Our empirical results show that firms with a greater extent of patenting activities have greater customer capital, as reflected by higher customer-perceived product novelty and quality. To establish causality and disentangle the effect of patenting on customer capital from that of certain unobserved firm characteristics or the value of the underlying invention, we exploit the exogenous variation in the random assignment of patent examiners to review patent applications and use the average examiner leniency as an instrument for patent grants. Using mediation analysis, we show that firms' patenting activities have a significant and positive impact on firm performance and valuation through enhanced customer capital.

In summary, this study is the first to show how corporate patenting affects a firm's customer capital, which in turn creates value in the financial market. We establish a causal relationship between patenting activity and customer capital, unveiling a novel and important channel through which patenting creates value even for large, established firms.

Supplementary Material

To view supplementary material for this article, please visit http://doi.org/10.1017/S0022109023000194.

References

Atanassov, J. "Do Hostile Takeovers Stifle Innovation? Evidence from Antitakeover Legislation and Corporate Patenting." *Journal of Finance*, 68 (2013), 1097–1131.

Balasubramanian, N., and J. Sivadasan. "What Happens When Firms Patent? New Evidence from U.S. Economic Census Data." *Review of Economics and Statistics*, 93 (2011), 126–146.

Balsmeier, B.; L. Fleming; and G. Manso. "Independent Boards and Innovation." *Journal of Financial Economics*, 123 (2017), 536–557.

Barello, S. H. "Consumer Spending and US Employment from the 2007–2009 Recession Through 2022." *Monthly Labor Review*, 137 (2014), 1–32.

Belo, F.; X. Lin; and M. A. Vitorino. "Brand Capital and Firm Value." *Review of Economic Dynamics*, 17 (2014), 150–169.

Borkovsky, R. N.; A. Goldfarb; A. M. Haviv; and S. Moorthy. "Measuring and Understanding Brand Value in a Dynamic Model of Brand Management." *Marketing Science*, 36 (2017), 471–499.

Carley, M.; D. Hedge; and A. Marco. "What is the Probability of Receiving a U.S. Patent?" *Yale Journal of Law & Technology*, 17 (2015), 203–223.

Chemmanur, T. J.; L. Kong; K. Krishnan; and Q. Yu. "Top Management Human Capital, Inventor Mobility, and Corporate Innovation." *Journal of Financial and Quantitative Analysis*, 54 (2019), 2383–2422.

Chemmanur, T. J.; K. Krishnan; and D. K. Nandy. "How Does Venture Capital Financing Improve Efficiency in Private Firms? A Look Beneath the Surface." *Review of Financial Studies*, 24 (2011), 4037–4090.

Cockburn, I. M.; S. Kortum; and S. Stern. "Are All Patent Examiners Equal? The Impact of Examiner Characteristics." NBER Working Paper No. 8980 (2002).

Cohen, L.; K. Diether; and C. Malloy. "Misvaluing Innovation." *Review of Financial Studies*, 26 (2013), 635–666.

Cohen, W. M.; R. R. Nelson; and J. P. Walsh. "Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not)." NBER Working Paper No. 7552 (2000).

Conti, A.; J. Thursby; and M. Thursby. "Patents as Signals for Startup Financing." *Journal of Industrial Economics*, 61 (2013), 592–622.

Cronqvist, H.; A. Previtero; S. Siegel; and R. E. White. "The Fetal Origins Hypothesis in Finance: Prenatal Environment, the Gender Gap, and Investor Behavior." *Review of Financial Studies*, 29 (2016), 739–786.

Dou, W. W.; Y. Ji; D. Reibstein; and W. Wu. "Inalienable Customer Capital, Corporate Liquidity, and Stock Returns." *Journal of Finance*, 76 (2021), 211–265.
Eberhart, A. C.; W. F. Maxwell; and A. R. Siddique. "An Examination of Long-Term Abnormal Stock Returns and Operating Performance Following R&D Increases." *Journal of Finance*, 59 (2004), 623–650.
Eisfeldt, A. L., and D. Papanikolaou. "Organization Capital and the Cross-Section of Expected Returns." *Journal of Finance*, 68 (2013), 1365–1406.
Farre-Mensa, J.; D. Hegde; and A. Ljungqvist. "What Is a Patent Worth? Evidence from the U.S. Patent 'Lottery'." *Journal of Finance*, 75 (2020), 639–682.
Fitzgerald, T.; B. Balsmeier; L. Fleming; and G. Manso. "Innovation Search Strategy and Predictable Returns." *Management Science*, 67 (2021), 1109–1137.
Fornell, C.; M. D. Johnson; E. W. Anderson; J. Cha; and B. E. Bryant. "The American Customer Satisfaction Index: Nature, Purpose, and Findings." *Journal of Marketing*, 60 (1996), 7–18.
Frésard, L. "Financial Strength and Product Market Behavior: The Real Effects of Corporate Cash Holdings." *Journal of Finance*, 65 (2010), 1097–1122.
Gaulé, P. "Patents and the Success of Venture-Capital Backed Startups: Using Examiner Assignment to Estimate Causal Effects." *Journal of Industrial Economics*, 66 (2018), 350–376.
Gilbert, R. J., and D. M. Newbery. "Preemptive Patenting and the Persistence of Monopoly." *American Economic Review*, (1982), 514–526.
Goldfarb, A.; Q. Lu; and S. Moorthy. "Measuring Brand Value in an Equilibrium Framework." *Marketing Science*, 28 (2009), 69–86.
Gourio, F., and L. Rudanko. "Customer Capital." *Review of Economic Studies*, 81 (2014), 1102–1136.
Griliches, Z. "Patent Statistics as Economic Indicators: A Survey." *Journal of Economic Literature*, 28 (1990), 1661–1707.
Hall, B. H. "Is There a Role for Patents in the Financing of New Innovative Firms?" *Industrial and Corporate Change*, 28 (2019), 657–680.
Helmers, C., and M. Rogers. "Does Patenting Help High-Tech Start-Ups?" *Research Policy*, 40 (2011), 1016–1027.
Henard, D. H., and P. A. Dacin. "Reputation for Product Innovation: Its Impact on Consumers." *Journal of Product Innovation Management*, 27 (2010), 321–335.
Hirshleifer, D.; P.-H. Hsu; and D. Li. "Innovative Efficiency and Stock Returns." *Journal of Financial Economics*, 107 (2013), 632–654.
Hirshleifer, D.; A. Low; and S. H. Teoh. "Are Overconfident CEOs Better Innovators?" *Journal of Finance*, 67 (2012), 1457–1498.
Hoberg, G., and G. Phillips. "Text-Based Network Industries and Endogenous Product Differentiation." *Journal of Political Economy*, 124 (2016), 1423–1465.
Hsu, D. H., and R. H. Ziedonis. "Resources as Dual Sources of Advantage: Implications for Valuing Entrepreneurial-Firm Patents." *Strategic Management Journal*, 34 (2013), 761–781.
Hussinger, K., and S. Pacher. "Information Ambiguity, Patents and the Market Value of Innovative Assets." *Research Policy*, 48 (2019), 665–675.
Jiang, W. "Have Instrumental Variables Brought Us Closer to the Truth." *Review of Corporate Finance Studies*, 6 (2017), 127–140.
Keller, K. L. *Strategic Brand Management*, 3rd ed. Englewood Cliffs, NJ: Prentice Hall (2007).
Klein, B., and K. B. Leffler. "The Role of Market Forces in Assuring Contractual Performance." *Journal of Political Economy*, 89 (1981), 615–641.
Kogan, L.; D. Papanikolaou; A. Seru; and N. Stoffman. "Technological Innovation, Resource Allocation, and Growth." *Quarterly Journal of Economics*, 132 (2017), 665–712.
Kunz, W.; B. Schmitt; and A. Meyer. "How Does Perceived Firm Innovativeness Affect the Consumer?" *Journal of Business Research*, 64 (2011), 816–822.
Lanjouw, J. O., and M. Schankerman. "Patent Quality and Research Productivity: Measuring Innovation with Multiple Indicators." *Economic Journal*, 114 (2004), 441–465.
Larkin, Y. "Brand Perception, Cash Flow Stability, and Financial Policy." *Journal of Financial Economics*, 110 (2013), 232–253.
Lemley, M. A., and B. Sampat. "Examiner Characteristics and Patent Office Outcomes." *Review of Economics and Statistics*, 94 (2012), 817–827.
Lerner, J. "The Importance of Patent Scope: An Empirical Analysis." *RAND Journal of Economics*, 25 (1994), 319–333.
Long, C. "Patent Signals." *University of Chicago Law Review*, 69 (2002), 625–679.
Mann, R. J., and T. W. Sager. "Patents, Venture Capital, and Software Start-Ups." *Research Policy*, 36 (2007), 193–208.
Manso, G. "Motivating Innovation." *Journal of Finance*, 66 (2011), 1823–1860.

Marco, A. C.; J. D. Sarnoff; and C. A. deGrazia. "Patent Claims and Patent Scope." *Research Policy*, 48 (2019), 103,790.

Marx, M.; D. Strumsky; and L. Fleming. "Mobility, Skills, and the Michigan Non-Compete Experiment." *Management Science*, 55 (2009), 875–889.

Melero, E.; N. Palomeras; and D. Wehrheim. "The Effect of Patent Protection on Inventor Mobility." *Management Science*, 66 (2020), 5485–5504.

Mukherjee, A.; M. Singh; and A. Žaldokas. "Do Corporate Taxes Hinder Innovation?" *Journal of Financial Economics*, 124 (2017), 195–221.

Palacios Fenech, J., and G. J. Tellis. "The Dive and Disruption of Successful Current Products: Measures, Global Patterns, and Predictive Model." *Journal of Product Innovation Management*, 33 (2016), 53–68.

Righi, C., and T. Simcoe. "Patent Examiner Specialization." *Research Policy*, 48 (2019), 137–148.

Rudanko, L. "The Value of Loyal Customers." *FRB Philadelphia Economic Insights*, 2 (2017), 11–17.

Sampat, B., and H. L. Williams. "How Do Patents Affect Follow-On Innovation? Evidence from the Human Genome." *American Economic Review*, 109 (2019), 203–236.

Seru, A. "Firm Boundaries Matter: Evidence from Conglomerates and R&D Activity." *Journal of Financial Economics*, 111 (2014), 381–405.

Stahl, F.; M. Heitmann; D. R. Lehmann; and S. A. Neslin. "The Impact of Brand Equity on Customer Acquisition, Retention, and Profit Margin." *Journal of Marketing*, 76 (2012), 44–63.

Stock, J., and M. Yogo. *Testing for Weak Instruments in Linear IV Regression*. New York: Cambridge University Press (2005), 80–108.

Tian, X., and T. Y. Wang. "Tolerance for Failure and Corporate Innovation." *Review of Financial Studies*, 27 (2014), 211–255.

Tsiotsou, R. "The Role of Perceived Product Quality and Overall Satisfaction on Purchase Intentions." *International Journal of Consumer Studies*, 30 (2006), 207–217.

Webster, E., and P. H. Jensen. "Do Patents Matter for Commercialization?" *Journal of Law and Economics*, 54 (2011), 431–453.

Zeithaml, V. A.; L. L. Berry; and A. Parasuraman. "The Behavioral Consequences of Service Quality." *Journal of Marketing*, 60 (1996), 31–46.

Zellner, A. "Estimators for Seemingly Unrelated Regression Equations: Some Exact Finite Sample Results." *Journal of the American Statistical Association*, 58 (1963), 977–992.