Intellectual Property Among Incorporated and Unincorporated Entrepreneurs

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Abstract: We classify entrepreneurs as incorporated or unincorporated business owners. We contribute to this literature in two ways. First, we document several important stylized facts about incorporated and unincorporated entrepreneurs. Second, we examine differences in intellectual property (IP) between incorporated and unincorporated entrepreneurs. We use confidential data from the Kauffman Firm Survey, comprising a sample of 4,762 U.S. firms founded in 2004 and followed annually until 2011 to document these findings and test our hypotheses. Our univariate analysis reveals that IP is surprisingly common among unincorporated entrepreneurs, accounting for more than 22 percent of firms with IP. Our multivariate analysis shows that, compared to unincorporated entrepreneurs, incorporated entrepreneurs are more likely to have IP and have a higher number of patents and trademarks but not copyrights. Within the group of incorporated entrepreneurs, C-corporations are more likely to have IP and have a higher number of patents and S-corporations. We use various matching, instrumental variable, and selection methods to control for endogeneity related concerns. Our findings reveal another difference between incorporated and unincorporated entrepreneurs—the use of IP.

Keywords: Entrepreneurship, Incorporated, Innovation, Intellectual Property, Legal Form of Organization, Unincorporated

1. Introduction

A substantial body of research demonstrates entrepreneurship is good for economic growth (Acs, 2006; Acs and Szerb, 2007; Audretsch et al., 2006; Baumol, 1986; Baumol and Strom, 2007; Holcombe, 1998). Entrepreneurs introduce new products, processes, manufacturing methods, and other sources of

innovation to displace incumbent businesses with fresh new ones (Schumpeter, 1942). Entrepreneurs are alert to new opportunities (Kirzner, 1973) and often create their own (Alvarez and Barney, 2007), facing considerable uncertainty in the process (Schultz, 1975).

Yet, a growing body of literature reveals substantial heterogeneity in entrepreneurship. It is often questioned, for instance, if self-employment is an appropriate measure of entrepreneurship (Levine and Rubinstein, 2018, 2017; Shane, 2008). The self-employed, on average, earn less than their salaried counterparts (Evans and Leighton, 1989; Hamilton, 2000; Parker, 2018), suggesting that self-employment is pursued for reasons other than risk-taking and growth-creation, such as autonomy and flexibility (Hurst and Pugsley, 2011; Shane, 2008). Whereas self-employment is often a poor proxy for entrepreneurship, the literature has identified important key differences between entrepreneurs and other business owners by distinguishing between those who possess high-growth aspirations and those who do not (Coad and Srhoj, 2020; Estrin et al., 2013; Henrekson and Johansson, 2010). Levine and Rubinstein (2017) argue it is important to distinguish the incorporated self-employed from the unincorporated self-employed for purposes of defining an entrepreneur. The former earns more than, while the latter earn less than, their salaried counterparts. Moreover, incorporated self-employed perform tasks that require greater cognitive and less manual skills than their unincorporated counterparts. The literature also documents that entrepreneurs seldom change their legal form of organization once established (Cole and Sokolyk, 2018a; Levine and Rubinstein, 2017), thereby casting doubt on the conventional wisdom that entrepreneurs begin small and simple but then mature into more highly-complex legal forms of organization like C-Corporations (i.e., the "life-cycle of the firm" hypothesis)¹. One takeaway lesson from this strand of the literature is that high-growth entrepreneurs are *fundamentally* different from others, with incorporation appearing to be an important distinguishing factor.

¹ One exception to this is with tax law changes. For instance, the Tax Cuts and Jobs Creation Act changed the corporate tax rate from 35 percent to 21 percent in the US. This is likely to incentivize some entrepreneurs to incorporate due to the tax savings of switching if their marginal tax rate exceeds the corporate tax rate.

Despite the importance of these studies, we still know little about key differences between incorporated and unincorporated entrepreneurs, which has important implications for both innovation and entrepreneurship (Lerner, 2009; Mason and Brown, 2013; Shane, 2009). Although these studies shed light on the ways incorporated entrepreneurs differ from unincorporated ones, the literature has not fully explored *how* they are different. A recent attempt to do this is by Levine & Rubinstein (2017), who document a number of important distinctions between the incorporated and unincorporated self-employed. These researchers, however, have only scratched the surface in this area, leaving several remaining questions. For instance, if incorporated entrepreneurs are more involved in nonroutine cognitive tasks, then what are these types of tasks? Moreover, are there additional ways to differentiate high-growth entrepreneurs from other business owners, besides incorporated and unincorporated? We contend these and other related questions require more work to fully address and to explore their implications.

The objective of our study is to examine whether incorporated and unincorporated entrepreneurs differ as they relate to innovation and the use of intellectual property (IP), and, if so, how they differ. Innovation fits the mold of Levine and Rubinstein (2017) because it requires nonroutine cognitive abilities. As such, we should expect incorporated entrepreneurs to be more involved in innovation activity and the creation of IP. Moreover, we extend the literature by examining not just incorporated and unincorporated entrepreneurs, but also by decomposing incorporated entrepreneurs into a variety of increasingly complex legal forms of organization (LFO)—limited-liability companies (LLCs), S-Corporations and C-Corporations.² We note a paucity of research exists on the effects of legal form of organization on firm outcomes such as innovation and other high-growth entrepreneurship measures (Cole and Sokolyk, 2018a).³

² Our study examines legal forms of organization in the U.S. and may not be generalizable to entrepreneurs in other countries that do not have the same classifications.

³ One exception is a study by Cole and Sokolyk (2018a), but they only explore the choice of LFO and not the effects on innovation and other firm-level outcomes.

entrepreneurs, allows us to develop a more nuanced understanding of the ways in which heterogeneous entrepreneurs pursue innovation and IP. Using confidential data from the Kauffman Firm Survey of U.S. start-up firms, we first document that IP is surprisingly common among unincorporated firms, which account for more than 22% of firms with IP, 17% of firms with copyrights, 28% of firms with trademarks, and 13% of firms with patents. In multivariate tests of our hypotheses, we first find that incorporated entrepreneurs are more likely to use innovation and use it to a greater extent as compared to unincorporated entrepreneurs. Specifically, compared to unincorporated entrepreneurs, incorporated entrepreneurs are more likely to use IP and to have a higher number of patents, copyrights, and trademarks. We use a battery of matching, instrumental variable, and selection methods to address and mitigate concerns about endogeneity. Next, we decompose incorporated entrepreneurs into subsamples of LLCs, S-Corporations and C-Corporations, which are increasingly complex forms of ownership with different advantages and disadvantages. We find that both the likelihood of using IP and the number of patents, copyrights and trademarks increase with the complexity of incorporation. C-Corporations are significantly more likely to use IP and to have a greater number of patents and trademarks than either S-Corporations or LLCs. Hence, even within the group of incorporated firms, there are significant differences in the incidence and number of IP.

Our findings make several contributions to the literature. First, we extend the literature on the traits and characteristics differentiating high-growth entrepreneurs from other businesses (Åstebro and Tåg, 2017; Henrekson and Johansson, 2010). Although studies analyzed incorporated entrepreneurs (Levine and Rubinstein, 2018, 2017), we still know little about *how* they are different from other entrepreneurs. Our findings speak to this literature by revealing another difference—the use of IP (Goldfarb and Henrekson, 2003) such as patents, copyrights, and trademarks. We find that incorporated entrepreneurs are more likely to have patents and trademarks but not copyrights.

Second, our study contributes to the literature on IP and the choice of a firm's legal form of organization (Guzman and Stern, 2020). To our knowledge, no studies have examined how a firm's choice of legal form of organization affects innovation and IP activity. Cole and Sokolyk (2018a) is the only study of which we are aware that examines determinants of a firm's LFO. However, they focus on the antecedents rather than the consequences and do not consider any implications for innovation and IP. Our study also speaks to the "dilemma of patenting" literature (Baldini et al., 2007; Chirico et al., 2020; Cohen et al., 2000; Cooper, 2011; Horstmann et al., 1985) where entrepreneurs must decide between patenting—and exposing the IP to imitation—or not (Doha et al., 2018). Our study examines the patenting behavior of incorporated and unincorporated entrepreneurs, which extends this literature. Thus, we speak to this literature by examining how the LFO influences innovation and IP, which the literature has overlooked. Our study reveals that incorporated entrepreneurs, and especially C-Corporations, are more likely to use IP and use it to a greater extent than other legal forms of organization. Our findings reveal, however, that other legal forms of organization such as S-Corporations and LLCs also use IP, though they use it less relative to C-Corporations but more relative to unincorporated entrepreneurs and partnerships (both general and limited partnerships). Therefore, our findings reveal it is not only C-Corporations that use IP, but other legal forms of organization, which provides a more nuanced picture than incorporated versus unincorporated.

Lastly, our study makes important contributions to entrepreneurship and innovation policy. Policymakers often target entrepreneurs who have the highest prospects for employment and net business creation (Holtz-Eakin, 2000; Lucas and Boudreaux, 2020; Shane, 2009). Scholars have noted that policies targeting high-growth aspiring entrepreneurs often fall short, due to the substantial heterogeneity in entrepreneurship (Mason and Brown, 2013). Our study informs this debate by documenting that incorporated entrepreneurs are different from the unincorporated when it comes to IP. Thus, rather than focusing on innovation activity, which is riddled with endogeneity problems (Buddelmeyer et al., 2010; Jia and Tian,

2018; Lerner and Seru, 2022), policymakers can identify firms based on their LFO and use this as an alternative identification strategy. Firms rarely change their legal form of organization once established, which lessens endogeneity concerns (Cole and Sokolyk, 2018a). As such, our findings reveal that incorporated entrepreneurs use IP more often and to a larger extent than unincorporated entrepreneurs, and that C-Corporations use IP more often and to a larger extent than other incorporated LFOs. Policymakers could focus on incorporated entrepreneurs, especially C-Corporations, as having more high-growth potential.

2. Theoretical Framework

2.1. Background

Organizational theories began with Knight (1921) and Coase (1937) who discuss the importance of firms to solve problems with risk sharing and transactions costs. Demsetz (1988, p. 141) explains that economists' preoccupation with the price system and Alfred Marshall's representative firm, "undermines serious consideration of the firm as a problem solving institution." Demsetz (1988) urges scholars to consider the importance of information and information costs to the theory of the firm. Other scholars like Fama (1980) and Fama and Jensen (1983) extend the ideas of Alchian and Demsetz (1972) and Jensen and Meckling (1976) to separate risk-bearers and managers thereby introducing the concept of the agency problem to the firm (i.e., Agency Theory).

Since then, organization scholars have considered how the legal form of an organization encourages diversification, especially as it relates to subsidiaries (Bethel and Liebeskind, 1998). Others have found that the LFO is an important factor for resource-dependency, affecting the "liability of adolescence" (Bruderl and Schussler, 1990). Although some studies have considered the role of the LFO (Cole and Sokolyk, 2018a; Levine and Rubinstein, 2017), we still know little about how a founder's LFO relates to IP. We contend this is an oversight, and addressing this gap helps shed light on crucial differences between entrepreneurs.

Incorporation has several different definitions in the literature. Typically, what is meant by incorporation, at least in the U.S.⁴, is that the firm registers as a C-Corporation, which is a legal means to structure the organization. Named for the subchapter of the Internal Revenue Code (subchapter C), organizations structured as a C-Corporation pay taxes separately from shareholders. This situation can create double taxation, in which a firm pays taxes on profits at the corporate level and individual level. Alternatives to C-Corporations include S-Corporations and Limited Liability Companies (LLCs). Like C-Corporations, S-Corporations and LLCs also create a separation of assets between owners and entity, but they have different legal structures and avoid double taxation.

In this study, we define incorporation as either a C-Corporation, S-Corporation, or LLC because they all have limited liability in common. In an additional analysis, we also treat incorporation as C-Corporations only. The reason we make a distinction between C-Corporations, S-Corporations, and LLCs is to compare and contrast between these LFOs. This additional analysis allows us to gain a more granular picture of LFO's effects on IP.

2.2. Agency Theory

Agency Theory (Fama, 1980; Fama and Jensen, 1983) is a theory about conflicting incentives between principals and agents. At the core of agency theory are problems arising from incomplete information—one party has more information than the other. Agency theory thus encompasses adverse selection (i.e., ex-ante problems of hidden types) and moral hazard (i.e., ex-post problem of hidden actions) problems. In our study, we use agency theory to examine the adverse selection problem of identifying a startup's 'type' to stakeholders. To avoid this problem, start-ups with more high-growth potential will seek to separate from others by signaling their type (Spence, 1973). One way of doing so, we contend, is by choosing

⁴ In other countries such as Sweden, all firms are considered corporations and there is no such distinction.

an incorporated LFO such as an LLC, s-corporation, and especially c-corporation. We use agency theory to explain why start-ups might choose specific LFOs and the implications for IP.

2.3. Incorporation and IP

We contend that incorporation has a positive and direct effect on IP. That is, firms that incorporate are more likely to invest in IP and make larger IP investments. Drawing on agency theory (Fama, 1980; Fama and Jensen, 1983) and insights from legal theories about the firm (Easterbrook and Fischel, 1985; Manne, 1967), we base this argument on four distinctions among unincorporated and incorporated entrepreneurs. The first is that incorporation provides limited liability protection, which means that the firm's owners are only liable for the amount of their investment in the firm (Easterbrook and Fischel, 1985; Manne, 1967).⁵ The second is that incorporation, and in particular organizing as a C-Corporation, has important signaling mechanisms (Guzman and Stern, 2020; Spence, 1973). The third is that incorporation facilitates raising capital from outside investors. The fourth is that incorporated entrepreneurs have a legal life that is independent from the firm's owner(s). We discuss these four distinctions in the following subsections.

2.3.1. Incorporation provides limited-liability protection

Experimentation with new products, processes, and recombinations of existing resources are all important and necessary parts of the innovation process (Schumpeter, 1942). However, this experimentation by entrepreneurs is inherently risky. Innovation is characterized by failures and unpredictable breakthroughs (Aldrich, 1999). New ventures have a high failure rate (Lee et al., 2022) and are fraught with uncertainty (Knight, 1921; Koudstaal et al., 2016). In the event of business failure, debtors can make claims against an entrepreneur's business and personal assets, unless the business is organized as an entity with limited liability protection.⁶ In that case, debtors can only make claims against business assets and not personal ones

⁵ See, e.g., https://www.law.cornell.edu/wex/limited_liability.

⁶ C-Corporations, S-Corporations, LLCs, and limited partnerships all provide limited liability protection to firm owners.

(Easterbrook and Fischel, 1985). Incorporation, therefore, provides limited-liability protection, which is a useful tool for innovators. Incorporated entrepreneurs have limited liability in the event their venture fails or faces another risk such as a legal dispute. This protection allows for the entrepreneur to focus on innovation without the fear that they will be personally liable for the decisions they make in managing their businesses. Consequently, we anticipate a positive effect of incorporation on IP.

2.3.2. Incorporation as signaling mechanism

In addition to the benefits of limited liability, incorporation serves as an important signal of the firm's quality. Signaling is useful in situations of incomplete information, where one party has more information than the other (Francis et al., 2010; Spence, 1973; Talmor, 1981). Entrepreneurs will desire legitimacy (Suchman, 1995) to attract positive attention from consumers, investors, and government regulators. Recent entrepreneurship research suggests the use of business debt serves as a credible signal of firm quality to outside investors (Epure and Guasch, 2020) and is associated with greater future revenues and lower failure rates (Cole and Sokolyk, 2018b). Moreover, paying voluntary taxes provides another useful signal concerning firm quality (Satterthwaite, 2020). We argue incorporation provides similar signaling benefits.

In the case of IP, incorporation provides a useful signal to lenders, outside investors and government regulators that the entrepreneur is serious about the venture. Although incorporation provides a useful signal to establish legitimacy, a signal must establish a separating equilibrium to be credible (Spence, 1973). That is, while incorporation can be a useful way to signal "high effort," it is only useful if others (i.e., the "low effort" group) must not find it worthwhile to incorporate.

There are several reasons why only some entrepreneurs might find it worthwhile to incorporate, thus providing a credible signal. First, there are costs associated with incorporation that include both annual and initial filing fees. These fees can be as little as \$100 and as much as \$500 for LLCs, but they are greater for S-and C-Corporations. In addition, some states like California have corporate taxes assessed as a percentage of

an LLCs' net income, although many other states only have a flat annual fee.⁷ C-Corporations differ from other LFOs—they are subject to double taxation. A C-Corporation pays taxes on earnings first at the corporate level, both by the Federal government and by many state governments. If the C-Corporation distributes any remaining income to shareholders in the form of dividends, investors owe taxes at the marginal tax rate of the investor receiving the dividend. Combined, these taxes can be quite substantial. In contrast, income earned by the S-Corporation and LLC is "passed through" to the shareholders and avoids corporate taxes. Consequently, this differential tax treatment influences an entrepreneur's choice of LFO (Gordon and MacKie-Mason, 1994; Gravelle and Kotlikoff, 1993, 1989; Mackie-Mason and Gordon, 1997). For C-Corporations, corporate tax rates can be lower than an individual's marginal tax rate, which is the appropriate comparable tax rate since all other entities are pass-through entities for taxation. This is a potential benefit of a C-Corporation; however, C-Corporations have additional costs and complexity to consider.

Second, aside from the fees, entrepreneurs must file annual paperwork with their state governments, which increases complexity. Some states like Florida provide templates that simplify the process, but the burden can be more complicated in other states. Many entrepreneurs hire lawyers or legal services to file the paperwork for them, significantly increasing the costs of incorporation. Regulations require Corporations to have a board of directors and to hold annual shareholder meetings, whereas a single managing member can manage LLCs informally and have no requirement to hold annual meetings.⁸

Lastly, in addition to the costs and added complexity, many entrepreneurs will not find it worthwhile to incorporate. One reason is that less educated and less experienced entrepreneurs are likely to underestimate the value of limited liability. Another reason is that it is also possible to purchase business-liability insurance, which provides a similar level of protection of personal assets but without the need to incorporate.

⁷ https://smallbusiness.chron.com/disadvantages-forming-llc-72959.html. Accessed May 30, 2022.

⁸ https://www.wolterskluwer.com/en/expert-insights/ten-differences-llcs-or-corporations-consider-nontax-differences . Accessed June 10, 2022.

2.3.3. Incorporation facilitates raising equity capital

One of the key advantages of incorporation is that incorporated entrepreneurs can raise additional capital by selling new shares of equity to outside investors (Manne, 1967). In contrast, the wealth of a proprietor or partnership limits the equity capital available to the proprietorship or its partners. S-Corporations also limit the amount of equity capital available to the firm due to a cap on the number of shareholders in an S-Corporation. This makes the LLC and the C-Corporation the most appropriate LFOs for a firm needing to raise capital from a large number of outside investors. Moreover, limited liability afforded by incorporation protects the personal assets of new investors, limiting any losses to the amount of their investment in the firm. This makes such investments more attractive (Manne, 1967). The share structure of incorporated entrepreneurs also facilitates both the issuance of new shares and the sale of existing shares. Because the creation of IP typically requires considerable investments, incorporation facilitates the creation of IP.

2.3.4. Incorporated entrepreneurs have independent legal lives

Incorporation creates a legal entity separate from its owners. If an incorporated entrepreneur dies or sell her stake, then the firm continues to do business as usual. In contrast, an entrepreneur organizing her firm as a proprietorship ceases to exist when the proprietor dies or sells the firm's assets. Because incorporation provides greater certainty about the firm's survival, incorporation reduces the riskiness of investing in IP.

2.3.5. Summary and hypothesis

In sum, entrepreneurs can use incorporation to help them increase investments in IP. Because innovation is risky and characterized by failures and unpredictable breakthroughs (Aldrich, 1999), incorporation provides the benefit of limited liability. In addition, incorporation provides a useful signal to government regulators, investors, and consumers alike. Entrepreneurs who incorporate attain enhanced legitimacy, which helps with their IP endeavors. Overall, then, we develop our first hypothesis as follows:

Hypothesis 1: There is a positive and direct effect of incorporation on IP.

2.4. Conceptualization by Legal Form of Organization

There are several different LFOs. Some of them—C-Corporations, S-Corporations, LLCs, and Limited Partnerships—provide the benefit of limited liability. Do they all exert the same signal to regulators, investors, and consumers? If so, we should expect similar effects upon IP. However, if some LFOs have stronger or weaker signals, their effects will differ. We discuss these aspects in this section.

Although LLCs, C-Corporations, and S-Corporations provide limited liability protection, we expect C-Corporations to provide a more credible signal about the firm's quality and effort type. First, it is worth noting the organizing costs as a C-Corporation and even S-Corporation are more substantial than an LLC. This includes both pecuniary and non-pecuniary costs such as time and effort. It is unlikely that lifestyle businesses will find it worthwhile to organize as a C-Corporation, due to the added costs, complexity, and limited benefits they can derive. Consequently, incorporating as a C-Corporation provides the strongest signal to consumers and regulators.

Among the LFOs that provide limited liability, there also are differences in their suitability for raising equity capital. In particular, S-Corporations have a cap on the number of shareholders at 100. Hence, for firms that would like to raise capital from a larger number of shareholders, either now or in the future, organizing as an LLC or C-Corporation would be preferable.

There also are differences in the legal environments facing different LFOs. In particular, the laws of each individual state determine the organization of LLCs. This creates uncertainty about the legal environment for an LLC should it decide to move from one state to another. An LLC also must choose a different LFO for tax purposes, as the IRS does not recognize an LLC as a distinct entity; instead, it must choose between a proprietorship, partnership, S-Corporation or C-Corporation for tax purposes. If it chooses a C-Corporation for tax purposes, the firm would be better off organized as a C-Corporation. Finally, if a firm desires a publicly traded company to acquire it, it will prefer to organize as a C-Corporation.

As a result of these differences, we develop our second hypothesis as follows:

Hypothesis 2: Among organizational forms that provide limited liability, the effect of incorporation on IP is greatest for C-Corporations.

3. Data and Methods

3.1. Sample and data description

We use data from the confidential versions of the Kauffman Firm Survey (KFS) to test our hypotheses. The KFS provides individual and organizational data and uses a multi-mode survey design (Ballou et al., 2008). This design includes an internet survey and computer assisted telephone-interviewing follow-up. Our sample begins with 4,924 new U.S. businesses (i.e., start-ups) founded in 2004 and followed annually through 2011. The KFS includes sampling weights to adjust for the overrepresentation of female and high-tech firms in the survey. Our results are qualitatively similar to the use of these weights. After casewise deletion of missing values, our sample decreases to 4,762 start-ups for a total of 23,184 firm-year observations. Our sample firms are comprised of small businesses in the US and come from each of the 50 states. The three largest states (California, Texas, and Michigan) comprise 23.11 percent of all observations in the sample, and 23 states each comprise less than one percent.

The initial survey response rate was 43 percent with a follow-up response rate of over 80 percent (Boudreaux, 2021). There are both public and confidential versions of the KFS. The public versions provide less detailed information, such as ranges for numeric variables rather than actual values and provides much more limited geographic information about each firm. Following previous work (Robb and Robinson (2014), Cole and Sokolyk (2018b), and Dudley (2021)), we rely upon the confidential versions of the surveys.

In addition to the KFS, we also gather data from other sources. Following Boudreaux (2021), we gather data on the intensity of competition at the three-digit level (NAICS) as our measure of competitive

density (Hannan and Freeman, 1988). The US County Business Patterns provides these data.⁹ We also collect income data from the US Census' Bureau of Economic Analysis.¹⁰ Appendix Table A1 defines our variables.

3.2. Variables

3.2.1. Dependent Variables

For each firm in each year of the survey, the KFS provides information on three types of IP—the number of copyrights, patents, and trademarks. We use this information to create eight different dependent variables. The first four measure IP at the extensive margins:

- (1) *Have IP*: is equal to one if the firm has any copyrights, patents, or trademarks and equal to zero otherwise;
- (2) Have Copyright: is equal to one if the firm has any copyrights and equal to zero otherwise;
- (3) Have Patent: is equal to one if the firm has any patents and equal to zero otherwise; and
- (4) Have Trademark: is equal to one if the firm has and trademarks and equal to zero otherwise.

The second four of our dependent variables measure IP at the intensive margins:

- (5) Number IP: is equal to the total number of the firm's copyrights, patents and trademarks;
- (6) Number Copyrights: is equal to the number of the firm's copyrights;
- (7) Number Patents: is equal to the number of the firm's patents; and
- (8) Number Trademarks: is equal to the number of the firm's trademarks.

Because of the skewness of these intensive measures, we winsorize each at its 95th percentile value.

⁹ As of February 22, 2023, these data were publicly available for download from the website of the U.S. Census Bureau at: https://www.census.gov/programs-surveys/cbp.html

¹⁰ As of February 22, 2023, these data were publicly available for download from the website of the U.S. Census Bureau at: https://apps.bea.gov/regional/downloadzip.cfm

3.2.2. Independent Variables

Our focal variables are indicators for legal form of organization (LFO). The KFS classifies each firm in each year by LFO—Proprietorship, General Partnership, Limited Partnership, Limited Liability Company (LLC), S-Corporation, or C-Corporation. We create binary indicator variables for each of these LFOs. We also create the variable *Incorporated* that is equal to one if the firm is an LLC, S-Corporation or C-Corporation and equal to zero otherwise.

3.2.3. Control Variables

The KFS provides many relevant control variables, which we classify into two categories-firm characteristics and founder characteristics. We include the natural logarithm of the number of employees (*Employees*) as a measure of firm size. We expect that larger firms are more likely to have IP. We include an indicator for home-based businesses (Home Based), which is equal to one if the firm operates at the residence of the founder and equal to zero otherwise. We expect that home-based businesses are less likely to have IP. We include an indicator for whether the firm reports that it has a "comparative advantage" (Comp. Advantage) over its competitors. Reported reasons for comparative advantage include speed, reputation, price, marketing, expertise, design, and cost. We expect that firms reporting a competitive advantage are more likely to have IP. We include an indicator for firms that provide services (*Provide Service*) and an indicator for firms that provide products (*Provide Product*). We expect that firms that provide products are more likely to have IP while firms that provide services are less likely to have IP. We include an indicator for firms that own land or a building (Has Land or Building) and an indicator for firms that have equipment (Has Equipment). We expect that firms that have real estate or equipment to be more likely to have IP. We include variables for the number of owners and for the number of owner-operators. We expect firms with more owners and firms with more owner-operators are more likely to have IP. We include an indicator for firms that are in high-tech industries (High Tech) and expect such firms to be more likely to have IP. Because studies have found that access to credit is important for entrepreneurship (Cumming et al., 2022; Moro et al., 2020; Herkenhoff et al., 2021), we include the variable *Credit Risk*, which reports the firm's credit score ranging from one (least risky) to five (most risky).

We also include a number of founder characteristics. The KFS reports information on up to ten owners for each firm in each year. *Founder Education* is equal to one if the average of the owners' reported highest level of education is above the median and equal to zero otherwise. We expect that more educated owners are more likely to have IP. *Founder Gender* is equal to the percentage of male owners of the firm. Due to the gender gap in entrepreneurship and obtaining external finance (Coleman, 2000; Coleman and Robb, 2009; Howell and Nanda, 2023), we expect that firms with a larger percentage of male owners are more likely to have IP. *Founder Work Experience* is the average number of years of work experience of the owners. We expect that firms where owners have more work experience are more likely to have IP. *Founder Age* is the average age of the owners. We expect that firms with older owners are more likely to have IP. *Founder formation of the percentage age of the owners*. We expect that firms with older owners are more likely to have IP. *Founder Age* is the average number of hours worked per week by the owners. We expect that firms where owners work more hours per week are more likely to have IP. *Founder Race* is the proportion of owners that are Caucasian. Because studies have found that minority founders face obstacles to credit and are discouraged from entrepreneurship (Fairlie and Robb, 2007; Cole and Sokolyk, 2016; Fairlie et al., 2022), we expect that firms where a higher percentage of owners are Caucasian are more likely to have IP.

We also include two regional characteristics as control variables. *GDP Per Capita* is the natural logarithm of GDP per capita measured at the county level. We expect firms located in counties with higher GDP per capita are more likely to have IP. *Competitive Density* is the number of establishments in the firm's county in the focal firm's industry, as measured by three-digit NAICS code. We divide by 1,000 to rescale this measure. We expect firms located in a county with greater competitive density are more likely to have IP.

3.3. Methods

To test our hypotheses, we employ a number of different methods. First, we test for statistically significant differences in group means between firms that have IP and firms that do not. Second, we calculate pair-wise correlation coefficients for our variables. Third, we estimate a series of logistic regression models for each of our four extensive-margin measures of IP. We include industry fixed effects to control for time-invariant heterogeneity and year fixed effects to control for time-variant economic shocks. The latter are especially important because our sample includes the global financial crisis years 2008-2010, which were especially problematic for small businesses.

$$IP_{I,t} = \beta_0 + \beta_1 Incorporated_{i,t} + \delta Controls_{i,t} + I_i + Y_t + \varepsilon_{i,t}$$
(1)

Where:

*IP*_{*i,t*} is one of our four extensive-margin measures of IP (*Have IP*, *Have Copyright*, *Have Patent*, *Have Trademark*) for firm *i* in year *t*;

Incorporated $_{i,t}$ is an indicator for incorporated entrepreneurs (*LLC*, *S*-Corporation, or *C*-Corporation) for firm *i* in year *t*.

*Controls*_{*i*,*t*} is a vector of control variables for firm *i* in year *t*;

 I_i is a vector of industry fixed effects;

 Y_t is a vector of year fixed effects; and

 $\varepsilon_{i,t}$ is an i.i.d error term.

We also estimate a series of logistic regression models where we replace the indicator variable *Incorporated* with a set of five indicators for different LFOs—*LLC*, *S-Corporation*, *C-Corporation*, *General Partnership* and *Limited Partnership*. In these models, *Proprietorship* is the omitted category, so these indicators measure the effect of each LFO on having IP relative to the effect of the omitted proprietorship classification.

Fourth, we estimate a series of Poisson regression models for each of our four intensive-margin measures of IP.

$$IP_{i,t} = \beta_0 + \beta_1 Incorporated_{i,t} + \delta Controls_{i,t} + I_i + Y_t + \varepsilon_{i,t}$$
(2)

Where:

*IP*_{*i,t*} is one of our four intensive-margin measures of IP (*Number IP*, *Number Copyrights*, *Number Patents*, *Number Trademarks*) for firm *i* in year *t*.

Other terms in equation (2) are the same as in equation (1).

We also estimate a series of Poisson regression models where we replace the indicator variable *Incorporated* with a set of five indicators for different LFOs. In all Poisson models, we use robust-standard errors to adjust for overdispersion (Cameron and Trivedi, 2010). In robustness checks, we use Tobit regression to account for the "corner solution" of zeros and non-zeros in the outcome. Our results are similar using Tobit.

4. Results

4.1. Main Results

4.1.1. Univariate Results.

Panel A of Table 1 shows the number of firms that have IP by year and LFO. IP is distributed across all six LFOs, including unincorporated proprietorships. In the initial survey year of 2004, 1,013 of the 4,762 firms report having IP, 354 of which are LLCs, 249 are unincorporated proprietorships, 226 are S-corporations, and 143 are C-corporations.

Panel B of Table 1 is similar to Panel A but shows the number of firms that have patents by year and legal form of organization. Importantly, patents are distributed across all six LFOs, including unincorporated proprietorships. In the initial survey year of 2004, 184 of the firms report having patents, 66 of which are LLCs, 49 are C-corporations, 30 are unincorporated proprietorships, and 33 are S-corporations.

Panels C and D of Table 1 show the number of firms that have trademarks and copyrights, respectively, by year and legal form of organization. This panels document findings similar to Panels A and B, that all three types of IP are broadly distributed across LFOs, including unincorporated proprietorships. In summary, the results in Table 1 establish that IP of all three types is found in both incorporated and unincorporated firms.

Table 2 presents means and standard deviations for our full sample and for the groups of firms that do and do not have IP, along with a *t*-test for assessing the statistical significance of the difference in means. Among our full sample, 21.6 percent of firms have at least one type of IP, but only 4.4 percent of firms have a patent, 15.2 percent have a trademark, and 10.5 percent have a copyright. The average firm has approximately 1.5 IP, but there is substantial heterogeneity, as indicated by a 6.7 standard deviation. We observe considerable skewness in IP—78 percent of firms have zero IP while only 8.5 percent, 3.9 percent, and 1.8 percent have 1, 2, and 3 IP, respectively. As discussed in the methods section, this is one reason for choosing the Poisson regression when the dependent variable is the distribution of the number of IP. Conditional on having IP, the average firm has 0.44 patents, 1.2 trademarks, and 4.7 copyrights.

LLCs comprise the largest percentage (32.6%) of businesses by LFO followed closely by sole proprietorships (31.5%) and S-Corporations (23.9%). C-Corporations comprise only 7.9 percent of the sample and partnerships comprise only 4 percent of the sample.

On average, a firm's primary owner is 47 years old, has 13 years of experience, and works 40 hours per week. Approximately 74 percent of primary owners are male, and approximately 84 percent are Caucasian. On average, there are about two firm owners. Half of our firms are home-based, and 60 percent report having a comparative advantage. About 86 percent of our firms provide a service, while 49 percent provide a product. About 68 percent of firms have equipment, but only 11 percent have land or buildings. About 13 percent of our firms are high tech.

We observe significant differences when comparing the groups of firms that do and do not have IP. Firms with IP are significantly more likely to be an LLC, S-Corporations, and C-Corporations and are less likely to be Proprietorships or General Partnerships.

[Insert Table 1 here]

Among our firm characteristics, we observe that firms with IP have more employees, are more likely to report having a comparative advantage, are more likely to provide a product, are more likely to have equipment, have more owners and more owner-operators, and are more likely to be high-tech. On the other hand, they are less likely to be home-based, less likely to provide a service, less likely to have land/building, and have a lower credit risk.

Among our founder characteristics, we observe that firms with IP have more educated owners, are older, have a greater percentage of male owners, and have owners who work more hours per week. We find no significant differences by owner's work experience or race.

Among our regional characteristics, we find that firms with IP are more likely to be located in a county with higher GDP per capita and higher competitive density.

4.1.2. Correlations

Table 3 presents the pairwise correlations for our dependent and independent variables. We observe positive correlations between our IP measures and indicators for LLCs, S-Corporations, and C-Corporations and negative correlations between our IP measures and Proprietorships and General Partnerships.

[Insert Table 3 here]

4.1.3. Logit and Poisson Regression Results for Incorporated Status

Panel A of Table 4 presents the results from a series of logistic regression models where the dependent variables are our four extensive measures of IP. For ease of interpretation, Panel A presents odds ratios rather than coefficients. An odds ratio greater than one indicates a positive relationship while an odds ratio of less

than one indicates a negative relationship. Our focal variable in these models is the variable *Incorporated* which takes on a value of one if the firm is an LLC, an S-Corporation, or a C-Corporation and zero otherwise.

[Insert Table 4 here]

Model 1 of Table 4 reports the effect of *incorporated* on the odds of having IP. The odds ratio for *Incorporated* in model 1 (1.361) indicates that incorporated entrepreneurs are 36.1 percent (1.361-1.00; p = 0.000) more likely to have IP than unincorporated entrepreneurs. Model 2 reports the effect of *incorporated* on the odds of having a patent. The odds ratio for *Incorporated* in model 2 (1.385) indicates that incorporated entrepreneurs are 38.5 percent (1.385-1.00; p = 0.001) more likely to have a patent than unincorporated entrepreneurs. Model 3 reports the effect of *incorporated* on the odds of having a trademark. The odds ratio for *Incorporated* on the odds of having a trademark. The odds ratio for *Incorporated* in model 3 (1.694) indicates that incorporated entrepreneurs are 69.4 percent (1.694-1.00; p = 0.000) more likely to have a trademark than unincorporated entrepreneurs. Model 4 reports the effect of *incorporated* on the odds of having a copyright. The odds ratio for *Incorporated* in model 4 (1.073) indicates that incorporated entrepreneurs are only 7.3 percent (1.073-1.00; p = 0.192) more likely to have a copyright than unincorporated entrepreneurs. In summary, our logistic regression results in Panel A of Table 4 provide evidence that incorporated entrepreneurs are significantly more likely to have IP as measured on the extensive margins. These findings provide support for hypothesis 1.

Panel B of Table 4 presents the results from a series of Poisson regression models where the dependent variables are the number of IP¹¹. Like Panel A, our focal variable in these models is *Incorporated*. Model 5 reports the effect of *Incorporated* on the number of IP. The coefficient for *Incorporated* in model 5 $(\beta = -0.105; p = 0.121)$ indicates that incorporated entrepreneurs have 10.5% less IP, on average, relative to unincorporated entrepreneurs¹². Model 6 reports the effect of *Incorporated* on the number of *Incorporated* on the number of *Incorporated* on the number of *Incorporated*.

¹¹ We also estimated the model using Tobit regression to account for the "corner-solution" (i.e., zeros and non-zeros in the distribution). Results are similar using either approach.

¹² An alternative method to calculate the marginal effect is to take the exponential of the coefficient and subtract from 1 (i.e., $1-e^{\beta}$). For Incorporated's coefficient in model 5 of Table 4, the marginal effect is thus 0.10 = [1-exp(-0.105)].

coefficient for *Incorporated* in model 6 ($\beta = 0.525$; p = 0.000) indicates that incorporated entrepreneurs have 52.5% more patents, on average, relative to unincorporated entrepreneurs. Model 7 reports the effect of *Incorporated* on the number of trademarks. The coefficient for *Incorporated* in model 7 ($\beta = 0.481$; p = 0.000) indicates that incorporated entrepreneurs have 48.1% more trademarks, on average, relative to unincorporated entrepreneurs. Model 8 reports the effect of *incorporated* on the number of copyrights. The coefficient for *Incorporated* in model 8 ($\beta = -0.237$; p = 0.004) indicates that incorporated entrepreneurs have 23.7% less copyrights, on average, relative to unincorporated entrepreneurs. In summary, our Poisson regression results in Panel B of Table 4 indicate incorporated entrepreneurs have more patents and trademarks but not copyrights. These findings provide support for hypothesis 1.

4.1.4. Logit and Poisson Results for Different Legal Forms of Organization

Table 5 repeats the analysis reported in Table 4 but replaces our focal variable *Incorporated* with a set of five focal indicator variables for different legal forms of organization—*LLC*, *S-Corporation*, *C-Corporation*, *General Partnership*, and *Limited Partnership*. Our omitted category of LFO is sole proprietorship, so the odds ratio shown in Panel A of Table 5 for each of the included focal variables indicates the odds of having IP relative to a sole proprietorship. For brevity, we suppress the results for the control variables. Each model also includes both industry and year fixed effects.

[Insert Table 5 here]

Model 1 of Table 5 reports the effect of each LFO on the odds of having IP. The odds ratios indicate that LLCs are 35.6 percent (1.356-1.00; p = 0.000) more likely to have IP, S-Corporations are 29.1 percent (1.291-1.00; p = 0.000) more likely to have IP, and C-Corporations are 81.7 percent (1.817-1.00; p = 0.000) more likely to have IP, relative to a sole-proprietorship.

Model 2 reports the effect of each LFO on the odds of having a patent. The odds ratios indicate that LLCs are 36.7 percent (1.367-1.00; p = 0.006) more likely to have a patent, S-Corporations are 20.5 percent

(1.205-1.00; p = 0.135) more likely to have a patent, and C-Corporations are 177 percent (2.77-1.00; p = 0.000) more likely to have a patent, relative to a sole-proprietorship.

Model 3 reports the effect of each LFO on the odds of having a trademark. The odds ratios indicate that LLCs are 76.8 percent (1.768-1.00; p = 0.000) more likely to have a trademark, S-Corporations are 70.1 percent (1.701-1.00; p = 0.000) more likely to have a trademark, and C-Corporations are 103.1 percent (2.031-1.00; p = 0.000) more likely to have a trademark, relative to a sole-proprietorship.

Model 4 reports each LFO's effect on the odds of having a copyright. The odds ratios indicate that LLCs are 7.3 percent (1.073-1.00; p = 0.258) more likely to have a copyright, S-Corporations are 2 percent (0.98-1.00; p = 0.771) less likely to have a copyright, and C-Corporations are 28.9 percent (1.289-1.00; p = 0.006) more likely to have a copyright, relative to a sole-proprietorship. We find no evidence that general and limited partnerships have significantly greater odds of having IP than sole-proprietorships.

In summary, our logistic regression results in Panel A of Table 5 provide evidence that, relative to unincorporated entrepreneurs, incorporated entrepreneurs are more likely to have IP as measured on the extensive margins. These findings provide additional support of hypothesis 1. Moreover, our evidence indicates this relationship is strongest for C-Corporations; in each of the four models, the odds ratio is largest for C-Corporations. This is especially the case in the model for patents. We also report the Wald test in Table 5. This test reports a chi-squared statistic indicating whether there is a statistically significant difference in coefficients between C-Corporations and either LLC or S-Corporations. The results reveal a statistically significant difference between C-Corporations and both LLCs and S-Corporations for each IP. Hence, these findings provide support for hypothesis 2. In an additional analysis in model 11 of Table 6, we further test whether C-Corporations have more IP than S-Corporations and LLCs by omitting proprietorships and partnerships from the analysis.

Panel B of Table 5 is similar to Panel B of Table 4, presenting the results from a series of Poisson regression models where the dependent variables are our four intensive measures of IP. Like Panel A, we replace our focal variable, *Incorporated*, with a set of five focal indicator variables for different LFOs—*LLC*, *S-Corporation*, *C-Corporation*, *General Partnership* and *Limited Partnership*. Our omitted category of LFO is sole proprietorship, so the coefficient for each of the included focal variables indicates if each of these LFOs has a greater number of trademarks, patents, and copyrights compared to a sole proprietorship.

Model 5 of Table 5 reports the effect of each LFO on the number of IP. The coefficients indicate that, relative to a sole-proprietorship, LLCs have 11.1% less IP (β = -0.111; p = 0.164), S-Corporations have 17.5% less IP (β = -0.175; p = 0.037), and C-Corporations have 2.4% less IP (β = -0.024; p = 0.814). Although these estimates are negative, they are masked by the heterogeneity in the types of IP. Model 6 reports the effect of each LFO on the number of patents. The coefficients indicate that, relative to a sole-proprietorship, LLCs have 51.4% more patents (β = 0.514; p = 0.000), S-Corporations have 27.1% more patents (β = 0.271; p = 0.030, and C-Corporations have 107.4% more patents (β = 1.074; p = 0.000).

Model 7 reports the effect of each LFO on the number of trademarks. LLCs have 55.4% ($\beta = 0.554$; p = 0.000), S-Corporations have 55.2% ($\beta = 0.552$; p = 0.000), and C-Corporations have 63.5% ($\beta = 0.635$; p = 0.000) more trademarks relative to a sole-proprietorship.

Model 8 reports the effect of each LFO on the number of copyrights. The coefficients indicate that, relative to a sole-proprietorship, LLCs have 24.5% less copyrights ($\beta = -0.245$; p = 0.012), S-Corporations have 27% less copyrights ($\beta = -0.27$; p = 0.009), and C-Corporations have 32.4% less copyrights ($\beta = -0.324$; p = 0.035). In none of models do we find evidence that general and limited partnerships have significantly more IP than sole-proprietorships.

In summary, our Poisson regression results in Panel B of Table 5 provide evidence that, relative to unincorporated entrepreneurs, incorporated entrepreneurs have more IP as measured on the intensive margins,

and this relationship is strongest for C-Corporations. We also report the F-test in Table 5. This reports a test statistic indicating whether there is a statistically significant difference in coefficients between C-Corporations and either LLC or S-Corporations. The results reveal a statistically significant difference between C-Corporations and both LLCs and S-Corporations for the overall measure of IP and patents. The test reveals no statistical difference between coefficients for trademarks and copyrights in Panel B of Table 5. Hence, our findings provide additional support for both hypothesis 1 and hypothesis 2, with the caveat that hypothesis 2 only applies to patents.

To gain a better understanding of the magnitude of these effects, we report effect sizes in the appendix Figures A1-A4. We generated these results by reporting the predicted effects of each dependent variable, following the regression models reported in Table 5. Figure A1 reports firms' predicted probability of having IP (Panel A) and the predicted number of IP (Panel B) for each LFO. On the extensive margin in panel a, the results indicate C-Corporations are the most likely to have IP followed by S-Corporations and LLCs, which are indistinguishable. In turn, each of these LFOs are more likely to have IP compared to sole-proprietorships. On the intensive margin in panel b, there is little difference in the number of IP between C-corporations, S-Corporations, LLCs, and sole-proprietorships. Figure A2 reports firms' predicted probability of having a patent (Panel A) and the predicted number of patents (Panel B) for each LFO. These results are similar except that S-Corporations and LLCs do not have a higher likelihood of having patents or a higher predicted number of patents compared to sole-proprietorships. Also, C-Corporations have the most patents. Figure A3 reports firms' predicted probability of having a trademark (Panel A) and the predicted number of trademarks (Panel B). The results are similar to the results presented earlier with a few differences—C-Corporations, S-Corporations, and LLCs are more likely to have trademarks and have more of them compared to soleproprietorships. The differences between these LFOs, however, is not statistically significant. Lastly, figure A4 reports firms' predicted probability of having copyrights (Panel A) and the predicted number of copyrights

(Panel B) for each LFO. These results are similar to those reported in Figure A2. One difference is that, although C-Corporations are more likely to have copyrights relative to sole-proprietorships, there is little difference between LFOs when it comes to the predicted number of copyrights. Another difference is there is a much higher variance for limited partnerships.

[Insert Table 5 here]

4.2. Robustness Checks

4.2.1. Subsample Analyses

One concern is that various outliers might influence our findings. In particular, we consider whether the inclusion of "life-style" firms in our sample affects our findings. "Lifestyle" firms are undoubtedly different from firms focused on innovation and IP. To address this issue, we examine a number of sub-samples in our data to assess the robustness of our findings.

First, in Model 1 of Tables A9 and A10 in the appendix, we restrict our sample to include only firms with international sales. We exclude firms without international sales from the analysis, which reduces the number of firm-year observations by more than 90 percent. We observe a positive but statistically insignificant relationship between incorporation and the incidence of IP in Table A9 and a positive and statistically significant relationship between incorporation and the number of IP in Table A10.

Next, we split our sample into low innovation samples and high innovation samples in models 2 and 3 of Tables A9 and A10. The results reveal a positive and statistically significant relationship between incorporation and both the incidence and number of IP for firms from lower innovation industries only.

Next, we exclude firms that do not have employees and examine the relationship between innovation and IP only for firms that have at least one employee, which reduces the number of firm-year observations by about half. The results, reported in model 4 of Tables A9 and A10, reveal a positive and statistically significant relationship between incorporation and both the incidence and number of IP. In model 5 of Tables A9 and A10, we restrict our sample to exclude home based firms, which also reduces the number of firm-year observations by about half. Once again, our results reveal a positive and statistically significant relationship between incorporation and both the incidence and number of IP. Lastly, in model 6 of Tables A9 and A10, we exclude firms that changed LFO during the sample period, which is about ten percent of the sample firms. Again, we find a positive and statistically significant relationship between incorporation and both the incidence and number of IP.

In summary, our subsample analyses indicate that our results regarding incorporation and both the incidence and number of IP are not driven by the inclusion of "lifestyle" firms in our main analysis.

4.2.2. Instrumental Variables, Matching, and Selection

In this section, we address potential concerns about endogeneity. That is, it is possible we have omitted variables that partly explain IP but are correlated with our potentially endogenous incorporation variable, such that a significant coefficient on *Incorporated* reflects the impact of the omitted variable(s). Reverse causality presents another potential problem—an entrepreneur's decision to incorporate is likely to influence having IP, but having IP might also influence a firm's incorporation choice.

To address these concerns, we estimate instrumental variable (IV) models using a series of two-stage least squares model (2SLS). The first stage is a logit model where *Incorporated* is the dependent variable and where the set of explanatory variables include our instrument, which must be correlated with incorporation but not with the IP dependent variable in our second stage model (Wooldridge, 2010).

We use two alternative identification strategies. The first strategy uses as its instrument the incorporation rate for firms in the focal firm's MSA, excluding the focal firm. This identification strategy is similar to those used by Xu et al. (2014), Jha and Cox (2015), Adhikari and Agrawal (2018), Boudreaux (2021, 2020), and Liu et al. (2021). The industry incorporation rate (minus the focal firm) is highly correlated with incorporation of the focal firm but should only affect the firm's IP through the incorporation status of the

firm. Our second identification strategy makes use of two instruments—the percentage of sales to other businesses (i.e., B2B) and the percentage of sales to individuals. We contend these two instruments are correlated with a firm's incorporation status because incorporated entrepreneurs are more likely to sell directly to other businesses whereas unincorporated entrepreneurs are more likely to sell directly to customers. We also contend that to whom the entrepreneur sells is not correlated with IP except through incorporation status.

The results of our IV analysis are shown in Panel B of Tables A9 and A10 and indicate that incorporated entrepreneurs have both a higher incidence and number of IP, even after addressing endogeneity through IV analysis.¹³ We also assess instrument strength, the exclusion restriction, and overidentification using standard tests. To assess the first condition of instrument strength, also known as instrument relevance, we report the first-stage *t*-statistic and first-stage F-statistics. The first-stage *t*-statistic in Model 7 of Table A9 is 17.11^{***} and the first-stage *F*-statistic is 292.7^{***}, both of which indicate the instrument is positively and significantly correlated with our endogenous regressor. The first-stage *t*-statistic in Model 8 of Table A9 is 6.18^{***} and -12.36^{***} for percent sold to businesses and individuals, respectively. The first-stage *F*-statistic for using both instruments is 220.33^{***}. Both of these F-statistics well exceed the suggested threshold of 10 (Staiger and Stock, 1997). The first stage statistics are similar for Model 7 and Model 8 of Table A10. We conclude the instruments satisfy the instrument relevance condition. That is, they are sufficiently correlated with the potentially endogenous variable.

To satisfy the second condition, namely the exclusion restriction, the instrumental variables must be uncorrelated with the error term in the second-stage model. In other words, the instruments must only influence IP through their effect on the endogenous explanatory variable. Our first instrument is based on other firms in the focal firm's MSA, and it is likely this instrument is correlated with the focal firm's incorporation choice. However, because it is based on the average of other firms in the region, which is not

¹³ First stage regression results are available in appendix Table A5.

known to the focal firm, and is not based on the focal firm, it is unlikely this instrument will influence a firm's choice of IP directly. Hence, this instrument should satisfy the exclusion restriction.

Our second identification strategy is two additional instruments—the percentage of sales to businesses and the percentage of sales to individuals. We contend these instruments are correlated with the focal firm's incorporation choice because we observe that incorporated entrepreneurs are more likely to sell to other businesses and unincorporated entrepreneurs are more likely to sell to individuals. Hence, the firm's incorporation choice is related to the customer type. However, we do not expect that the percentage of sales to individuals or other businesses will be related to IP.

Lastly, we present results from the Wald tests of endogeneity and Durbin-Wu-Hausman (DWH) tests. With the exception of model 8 of Table A10, we observe statistically insignificant tests of endogeneity in all models, indicating endogeneity is not a problem. In addition, the over-identification tests, which test the hypothesis that the additional instruments are exogenous, further indicate an appropriate model specification. Model 8 of Table A9 reports the results from this test (p = .907) and Model 8 of Table A10 also reports the results from this test (p = .907) and Model 8 of Table A10 also reports the results from this test (p = .907) and Model 8 of Table A10 also reports the results from this test (p = .809).¹⁴

4.2.3. Matching and Selection

Although we have addressed endogeneity concerns using IV-2SLS methods, we cannot completely rule out endogeneity. We therefore examine a variety of alternative models to ensure a robust relationship between incorporation and IP. One such alternative is through various matching methods; in particular, Coarsened Exact Matching (CEM) (Blackwell et al., 2009; Iacus et al., 2012) and entropy matching (Hainmueller, 2012).

¹⁴ Overidentification refers to situations where there are more instruments than endogenous variables. In our case, Model 8 has two instruments and one variable treated as endogenous. As a result, we can perform an over-identification test in Model 8 but not Model 7, which only has one instrument and one endogenous variable.

CEM coarsens the variables in strata and weights firms depending on their closeness to the treated firms (Gustafsson et al., 2016). To be successful, the matching procedure must reduce the L1 distance. The results from the matching diagnostics reveal a reduced L1 distance, which indicates CEM is appropriate. Model 9 in Tables A9 and A10 reports the results when including CEM weights in the regression. We continue to find a positive and statistically significant relationship between incorporation and IP on both the intensive and extensive margins.

As an alternative to CEM, we use entropy balancing. First, entropy balancing (Hainmueller, 2012) creates a group of statistically identical individuals based on observable characteristics. We then examine a weighted regression model using the entropy balancing weights from the first stage. The results, reported in Model 10 of Tables A9 and A10 continue to show a positive and statistically significant relationship between incorporation and IP on both the intensive and extensive margins.

To address concerns about sample-selection bias when analyzing only the subset of incorporated entrepreneurs, we also estimate a two-step Heckman model. In this procedure, we first estimate a probit selection model where *Incorporated* is the dependent variable. We use the percent of sales to businesses and percent of sales to customers as our exclusion restriction(s). That is, these two variables appear in the selection equation but not the outcome equation,. The logic for including these variables in the selection equation is that incorporated entrepreneurs (LLCs, S-Corporations, C-Corporations) are more likely to sell to other businesses, while unincorporated entrepreneurs are more likely to sell directly to customers. As a result, these variables should help us to predict the selection into incorporation.

Next, we re-estimate equation (1), but limiting the sample to incorporated entrepreneurs (LLCs, S-Corporations and C-Corporations) and including the inverse Mills ratio calculated from results of the selection equation as an additional regressor. In this model, we create a new variable, *Corporation*, equal to one if the firm is a C-Corporation and equal to zero if the firm is an LLC or S-Corporation. This analysis enables us to determine if C-Corporations are more likely to have IP (or have more IP) than LLCs and S-Corporations. In other words, is there a distinction among incorporated entrepreneurs as well as a distinction between unincorporated and incorporated entrepreneurs?

Model 11 of Tables A9 and A10 reports the results from the Heckman selection model. Once again, we find a positive and statistically significant relationship between C-corporation status and IP on both the intensive and extensive margins. Note the magnitude of the coefficient in the Heckman model is smaller than the results from the IV and matching models. The reason is due to the omitted category in the incorporation variable, which includes proprietorships and partnerships. That is, incorporation is recoded as one if the firm is a C-Corporation and zero if LLC or S-Corporation. Hence, although the coefficient is smaller in magnitude, the results reveal a distinction in IP even among incorporated entrepreneurs. Specifically, C-Corporations have a higher likelihood of having IP compared to LLCs and S-Corporations, and this takes into consideration the initial self-selection into limited liability. Hence, the results from Model 11 provide additional support for hypothesis 2. In Table A6 of the online appendix, we present full details of these two Heckman models, as well as Heckman models for patents, trademarks and copyrights. Those additional models suggest that it is the incidence and number of patents that drive the results shown in Model 11 of Tables A9 and A10.

Lastly, we estimate an endogenous switching regression (ESM) model using Stata's "move-stay" maximum likelihood estimator (Lokshin and Sajaia, 2004). This enables us to create a counterfactual analysis asking what would have been the likelihood of having IP had the incorporated entrepreneur been unincorporated or had the unincorporated entrepreneur been incorporated. This is similar to the Heckman analysis, but we sequentially select only the incorporated (unincorporated) firms in the first stage and then estimate the likelihood of having IP for each of these selected subsamples. In the selection model, we include the incorporation rate for firms in the focal firm's MSA, excluding the focal firm, as our exclusion restriction.

We then generate predicted values for each group using the other group's outcome model. Studies have used ESM in a variety of settings to examine advisory fees (Golubov et al., 2012), green innovation (Kunapatarawong and Martínez-Ros, 2016), R&D (Coad et al., 2020), and diversification (Dosi et al., 2020). We present the ESM results in Table A7 of the online appendix, and the results from the counterfactual analysis in Table A11 in the appendix.

The results in Table A11 imply that the percentage of unincorporated entrepreneurs with IP would have risen from the observed percentage of 15.48 up to 19.10, an increase of 3.62 percentage points or 23.4 percent. The results also imply the percentage of incorporated entrepreneurs with IP would have fallen from the observed percentage of 25.77 to 16.69, a decline of 9.08 percentage points or 35.2 percent. This counterfactual analysis provides additional support for hypothesis 1.

4.2.4. Linear Probability Model and Log-Linear Model

One final robustness check concerns alternative estimators to our Logistic, Poisson, and Probit regression models. For our binary dependent variables, we used logistic and probit regression models in our analysis. As an alternative, we use the linear probability model (LPM), which is an OLS estimator applied to a model with a binary dependent variable. For our continuous dependent variables, we used Poisson regression in our analysis. As an alternative to Poisson, we use the log-linear regression model. Log-linear models are of the form, $ln(y) = \alpha + \beta x$, where *y* is the dependent variable and *x* is the explanatory variable. Coefficient estimates from log-linear models are semi-elasticities and interpreted as a one unit increase in *x* associated with a β percentage change in *y*.

Table A2 in the online appendix replicates the results shown in Table 4 of the manuscript but uses LPM instead of logistic regression and log-linear models instead of Poisson regression models. The results are qualitatively similar to those reported in Table 4. Specifically, the results indicate incorporated entrepreneurs are more likely to have IP (β =0.038; *p* = 0.000) and have more of it (β =0.0052; *p* = 0.799).

Table A3 in the online appendix replicates the results but uses LPM instead of logistic regression and log-linear models instead of Poisson regression. The results are qualitatively similar. Specifically, the results indicate that, relative to sole-proprietorships, LLCs (β =0.037; p = 0.002), S-Corporations (β =0.025; p = 0.065), and C-Corporations (β =0.096; p = 0.000) are all more likely to have IP. The results also indicate that, relative to sole-proprietorships, C-Corporations have 10.4 percent more IP (β =0.104; p = 0.002), but LLCs and S-Corporations do not have more IP.

4.2.5. Firm-level fixed effects regression

Although most start-ups do not change their LFO, our analysis reveals that 14 percent of start-ups do change their LFO. One consideration, therefore, is to examine the effect of a start-up changing its LFO on IP. That is, what is the impact on IP when a start-up changes its LFO from unincorporated to incorporated? Table A8 in the online appendix reports the results from this analysis, which uses firm-level fixed effects to capture this transition from unincorporated to incorporated LFO. Another added benefit is that firm-level fixed effects helps control for all idiosyncratic yet unobservable time-invariant heterogeneity specific to the start-up. The results indicate that transitioning to an incorporated LFO from an unincorporated LFO is associated with a 4.3 percentage point increase in the likelihood of having IP (β = 0.043; *p* = 0.004) Although we refrain from making a causal statement (King et al., 2021), these findings suggest that incorporation encourages IP.

In sum, these findings support the results in our main analysis. That is, incorporated entrepreneurs are more likely to have IP and have higher amounts of IP. Moreover, these results are strongest for C-Corporations. These findings provide additional evidence to support hypotheses 1 and 2.

5. Discussion

Our study's objective was to provide theoretical and empirical insights into whether and how incorporated and unincorporated entrepreneurs differ as they relate to innovation and intellectual property (IP). First, we first document that IP is surprisingly common among unincorporated firms, which account for

more than 22% of firms with IP, 17% of firms with copyrights, 28% of firms with trademarks, and 13% of firms with patents. With respect to whether incorporated and unincorporated entrepreneurs differ, our analysis of U.S. startups comprising 23,184 firm-year observations reveals important differential effects on both extensive and intensive margins. On the extensive margin, we find incorporated entrepreneurs are more likely to use IP, particularly with patents and for C-Corporations. On average, incorporated entrepreneurs are 36 percent more likely to have IP compared to unincorporated entrepreneurs. On the intensive margin, we find incorporated entrepreneurs have more patents and trademarks and less copyrights. We also test whether there are differences within the subset of incorporated entrepreneurs and find that C-Corporations have more IP on both the extensive and intensive margins that do LLCs and S-Corporations.

5.1. Contributions to and Implications for the Entrepreneurship Literature

Our results extend the entrepreneurship literature in several ways. First, the literature documents substantial heterogeneity in the types of entrepreneurship (Welter et al., 2017). For instance, entrepreneurs can possess high-growth aspirations (Estrin et al., 2013), but they are often not driven by growth and instead value non-pecuniary benefits such as autonomy and flexibility (Parker, 2018; Shane, 2008). Studies have identified key differences between the incorporated and unincorporated entrepreneurs—incorporated entrepreneurs and their employees tend to engage in tasks involving highly complex and nonroutine cognitive abilities whereas unincorporated entrepreneurs rely more on manual skills (Levine and Rubinstein, 2017).

Building on this literature, our study offers another key distinction between incorporated and unincorporated entrepreneurs—the usage of intellectual property (i.e., patents, copyrights, and trademarks). Our study is also a first step in understanding some of the heterogeneity *within* incorporated entrepreneurs. We document that C-Corporations are the most likely to use intellectual property out of all LFOs, and that C-Corporations are more likely to use intellectual property (extensive margin) and to use more of such property (intensive margin) than either LLCs or S-Corporations. We also document that both LLCs and S- Corporations are more likely to use intellectual property than are unincorporated entrepreneurs. This finding, however, only applies to trademarks and not patents and copyrights. Hence, we conclude that incorporated entrepreneurs are more likely to use IP and use more of it when compared to unincorporated entrepreneurs with C-Corporations having the strongest relationship with IP.

Future work could examine alternative distinctions between incorporated and unincorporated entrepreneurs. One fruitful avenue is to analyze the different suppliers and customers of incorporated and unincorporated entrepreneurs. Our Heckman selection model revealed that incorporated entrepreneurs are more likely to sell business-to-business (B2B). In contrast, unincorporated entrepreneurs are more likely to sell directly to customers and not to other businesses. What explains this distinction? Are incorporated entrepreneurs and unincorporated entrepreneurs fundamentally different, or is it a difference in strategy?

We also extend nascent work on the "life cycle of the firm" hypothesis. Recent studies have documented that, once established, entrepreneurs seldom change their legal form of organization (Cole and Sokolyk, 2018a; Levine and Rubinstein, 2017), thereby casting doubt on the conventional wisdom that entrepreneurs begin small and simple but then mature into more highly-complex legal forms of organization like C-Corporations. One implication is that entrepreneurs are either high-growth oriented or not, and this does not change from inception. Of course, there are likely exceptions to this, as entrepreneurs pivot and use effectuation (Sarasvathy, 2001). Nevertheless, our evidence suggests such changes are rare. Future studies could consider documenting the conditions underlying when entrepreneurs do change their legal form of organization. Are there situations where the life cycle of the firm does hold? Changes to tax law treatment might affect whether entrepreneurs decide to incorporate as a pass-through entity (i.e., LLC, S-Corporation, Sole-Proprietorship) or a C-Corporation. This would not explain, however, the transition from a small and simple legal form into a more highly-complex legal form of organization.

5.2. Contributions to and Implications for the Innovation and Intellectual Property Literature

Our study also extends and possesses implications for innovation research. The literature notes the importance of IP and intellectual property rights protection for innovation and firm growth. Entrepreneurs can use innovation strategically to increase profitability (Pisano, 2006; Teece, 1986), and studies demonstrate that patent protection is important for innovation and economic growth (Kim et al., 2012).

Our study contributes to this literature by identifying incorporated entrepreneurs, and especially C-Corporations, as being the most likely to invest in IP (extensive) and as making the greatest IP investments (intensive). As such, our study suggests that incorporation is another factor for innovation, since incorporation promotes investments in IP, which is an important determinant of firm innovation and economic growth.

We also invite future research to consider the institutional context that influences innovation and entrepreneurship (Boudreaux et al., 2019; Bowen and Clercq, 2008). Our study examines startups in the U.S., but future research could extend our analysis to a cross-country setting, allowing for an examination of how the external environment influences the use of IP and innovation. Studies have found that market-oriented institutions encourage innovation through increased creativity and knowledge investments (Boudreaux, 2017). Although these studies have examined the relationship between institutions and innovation, there is a paucity of research on how institutions influence the choice of legal form of organization. Adopting a Baumol (1990) perspective, we conjecture there will be more highly-complex forms of organization when the institutional environment encourages productive entrepreneurship and more simple forms of organization when it encourages unproductive entrepreneurship. Future research can consider this in more detail.

5.3. Implications for Policy

Our findings also have important policy implications. Policymakers often target entrepreneurs who have the highest prospects for employment and net business creation (Holtz-Eakin, 2000; Lucas and Boudreaux, 2020; Shane, 2009). Scholars have noted that even policies targeting high-growth aspiring entrepreneurs often fall short, since there is substantial heterogeneity in entrepreneurship (Mason and Brown,

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2013). Our study informs this debate by documenting that incorporated entrepreneurs are different from the unincorporated when it comes to IP, and that C-Corporations are different from other incorporated LFOs. Thus, rather than focusing on innovation activity, which is riddled with endogeneity problems (Buddelmeyer et al., 2010), it is better to identify firms based on their legal form of organization since firms rarely change their legal form of organization once established, attenuating endogeneity concerns (Cole and Sokolyk, 2018a). As such, our findings reveal that incorporated entrepreneurs use IP more often and to a larger extent than unincorporated entrepreneurs. Policymakers might therefore consider incorporated entrepreneurs, especially those incorporated as C-Corporations, as having higher potential for high-growth.

A caveat is in order, however. If policymakers begin using C-Corporations as a predictor of whom to fund or support, this creates a moral hazard problem whereby firms seeking to gain government funding will find it beneficial to become a C-Corporation. The incorporation costs remain the same, but the benefits now increase. This is reminiscent of Goodhart's (1981) law, "When a measure becomes a target, it ceases to be a good measure." In such a scenario, policymakers would find it difficult to then predict who has the potential for IP and high growth aspirations, since incorporating as a C-Corporation loses its value. As a result, we do not intend our findings to be prescriptive. Rather, our study offers one indicator—an entrepreneur's incorporation status—that explains differences in IP and innovation. We urge policymakers to consider this as merely one indicator of high-growth entrepreneurship and to continue to look at a variety of other important firm and founder characteristics.

5.4. Limitations and Suggested Directions

Like any study, our findings have limitations that guide future research. One limitation is making causal inferences about LFOs' effect on IP. We observe that incorporated entrepreneurs are more likely to have IP and have more of it when compared to unincorporated entrepreneurs. This, however, does not necessarily mean the LFO *caused* the investments in IP. Sources of endogeneity like omitted variable bias

and reverse causality limit causal claims. We have attempted to address such concerns through the use of various robustness checks—instrumental variables, matching, selection, and endogenous switching regression models—and our results are qualitatively similar in each model. Nevertheless, future research should consider alternative approaches, such as natural experiments, difference in differences, and regression discontinuity models.

Another limitation is that we focus on IP and then discuss its implications on innovation activity. This is a data limitation because our dataset does not include indicators of innovation such as new products, processes, marketing, or organizational methods. Although IP is strongly associated with innovation (Greenhalgh and Rogers, 2006), future research could examine how LFOs influence innovation directly. Further, it might be the case that scholars can model IP as an input to the innovation process, which is the output. As such, future studies could report a mediation model where IP mediates the relationship between LFO and innovation. Likewise, R&D could serve as a mediator in this relationship (Coad et al., 2016).

Finally, we also encourage conducting qualitative, in-depth, or ethnographic studies of *why* entrepreneurs choose different LFO and the implications of IP and innovation. We have proposed several underlying mechanisms that help explain the reasons why—limited liability protection, signaling, raising equity capital, separate legal entities. Future studies using qualitative analyses could, however, probe deeper into these underlying mechanisms and potentially identify new ones. Such a qualitative analysis could also dig deeper into the life-cycle of the firm hypothesis to explore the reasons why entrepreneurs might choose more highly-complex legal forms as they mature or not.

6. Conclusion

Our objective in this study was to examine whether and how incorporated and unincorporated entrepreneurs differ as they relate to innovation and IP. Based on the evidence reported in this study, we conclude that incorporated entrepreneurs have more IP and make greater investments in IP than

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unincorporated entrepreneurs. We also found that out of all forms of incorporation, C-Corporations have the

strongest relationship with IP, particularly through patents. Moreover, our analysis revealed that entrepreneurs

seldom change their legal form of organization once established, rejecting the life-cycle of the firm hypothesis.

7. References

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TABLES AND FIGURES

	IIII WIUI	n by I cai	and Legar I	or organ				
	Total			DV	= Have IP			
Year	Firms	Firms	Prop	LLC	S-Corp	C-Corp	GP	LP
2004	4,762	1,013	249	354	226	143	27	14
2005	3,784	832	184	299	197	125	14	13
2006	3,205	726	164	245	178	109	17	13
2007	2,765	613	141	214	160	81		
2008	2,465	543	110	190	151	74		
2009	2,281	468	96	164	133	62		
2010	2,019	426	87	159	116	52		
2011	1,903	387	76	139	112	48		
All Years	23,184	5,008	1,107	1,764	1,273	694	97	73

Table 1Panel A: Firms with IP by Year and Legal Form of Organization

Panel B: Firms with Patents by Year and Legal Form of Organization

	Total			DV =	Have Patent			
Year	Firms	Firms	Prop	LLC	S-Corp	C-Corp	GP	LP
2004	4,762	184	30	66	33	49		
2005	3,784	170	24	54	36	49		
2006	3,205	155	23	47	31	49		
2007	2,765	134	16	48	31	38		
2008	2,465	102		31	23	35		
2009	2,281	102	12	29	24	35		
2010	2,019	83		28	20	25		
2011	1,903	82	11	21	25	23		
All Years	23,184	1,012	135	324	223	303	12	15

	Total			DV = H	lave Copyright			
Year	Firms	Firms	Prop	LLC	S-Corp	C-Corp	GP	LP
2004	4,762	477	139	167	96	57	11	
2005	3,784	418	110	141	92	62		
2006	3,205	348	93	109	81	48		
2007	2,765	305	79	108	71	38		
2008	2,465	273	76	97	62	30		
2009	2,281	226	67	72	57	26		
2010	2,019	217	65	78	47	23		
2011	1,903	178	48	60	46	17		
All Years	23,184	2,442	677	832	552	301	48	32

Table 1 ContinuedPanel C: Firms with Trademark by Year and Legal Form of Organization

Panel D: Firms with Copyrights by Year and Legal Form of Organization

	Total			DV=	Have Trademark			
Year	Firms	Firms	Prop	LLC	S-Corp	C-Corp	GP	LP
2004	4,762	700	149	253	170	103		
2005	3,784	605	114	231	152	90		
2006	3,205	521	95	188	138	80		
2007	2,765	416	75	151	122	58		
2008	2,465	382	54	136	117	59		
2009	2,281	322	48	117	99	48		
2010	2,019	289	36	115	92	36		
2011	1,903	280	37	105	92	37		
All Years	23,184	3,515	608	1,296	982	511	64	54

^	Panel A: Overall Sample		Panel B: Have IP		Panel C: No IP		
Variable	Mean	SD	Mean	SD	Mean	SD	Diff T-Stat
Have IP	.216	.412	-	-	-	-	-
Have Patent	.044	.204	.202	.402	-	-	-
Have Trademark	.152	.359	.702	.457	-	-	-
Have Copyright	.105	.307	.488	.5	-	-	-
Number of IP	1.541	6.712	7.133	12.987	-	-	-
How many patents	.094	.509	.434	1.025	-	-	-
How many copyrights	1.022	5.805	4.732	11.767	-	-	-
How many trademarks	.262	.776	1.211	1.278	-	-	-
Sole Proprietorship	.315	.465	.221	.415	.341	.474	$t = 16.27^{***}$
C-Corporation	.079	.27	.139	.346	.063	.243	$t = -17.71^{***}$
S-Corporation	.239	.427	.254	.435	.235	.424	$t = -2.81^{***}$
LLC	.326	.469	.352	.478	.319	.466	$t = -4.49^{***}$
General Partner	.027	.163	.019	.138	.03	.169	$t = 3.91^{***}$
Limited Partner	.013	.115	.015	.12	.013	.113	t = -0.87
Employees (ln)	.796	.967	1.022	1.093	.734	.92	$t = -18.79^{***}$
Home Based	.506	.5	.437	.496	.524	.499	$t = 10.97^{***}$
Comparative Advantage	.595	.491	.771	.421	.547	.498	$t = -29.07^{***}$
Provide Service	.862	.345	.759	.428	.89	.313	$t = 24.14^{***}$
Provide Product	.486	.5	.679	.467	.432	.495	$t = -31.59^{***}$
Has Land or Building	.113	.317	.085	.279	.121	.326	$t = 7.13^{***}$
Has Equipment	.679	.467	.711	.453	.67	.47	$t = -5.48^{***}$
Number of Owners	1.994	5.075	3.407	9.648	1.605	2.551	$t = -22.50^{***}$
Number of Owner-Operators	1.392	.862	1.631	1.286	1.326	.688	$t = -22.38^{***}$
High Tech	.129	.335	.207	.405	.107	.309	$t = -18.91^{***}$
Founder's Education	6.403	2.111	7.042	2.018	6.227	2.103	$t = -24.51^{***}$
Founder's Gender	.737	.44	.755	.43	.732	.443	$t = -3.35^{***}$
Founder's Work Experience	13.32	10.756	13.278	10.693	13.332	10.773	t = 0.32
Founder's Age	47.349	10.894	47.652	11.047	47.265	10.851	$t = -2.23^{**}$
Hours Per Week	40.158	22.806	42.803	22.784	39.429	22.759	$t = -9.29^{***}$
Founder's Race	.84	.366	.834	.372	.842	.365	t = 1.27
Credit Risk	3.068	.93	3.026	.919	3.08	.933	$t = 3.62^{***}$
GDP per capita (ln)	10.547	.273	10.584	.274	10.537	.272	$t = -10.75^{***}$
Competitive Density	1.389	3.318	1.502	3.453	1.358	3.28	$t = -2.72^{***}$
		23184		5008		18176	
				(21.6%)		(78.4%)	

Table 2: Descriptive Statistics

Note. We do report minimum and maximum statistics for data confidentiality reasons.

Table 3: Correlation Matrix

Variables	(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30)
(1) Have IP	1
(2) Have Patent	0.41 1
(3) Have Trademark	0.81 0.26 1
(4) Have Copyright	0.65 0.20 0.36 1
(5) Number of IP	0.44 0.21 0.27 0.53 1
(6) Sole Proprietor	-0.11 -0.08 -0.13 -0.03 -0.01 1
(7) C-Corporation	0.12 0.17 0.10 0.06 0.05 -0.20 1
(8) S-Corporation	0.02 -0.01 0.04 -0.01 -0.38 -0.16 1
(9) LLC	0.03 0.00 0.04 0.01 0.00 -0.47 -0.20 -0.39 1
(10) General Partner	-0.03 -0.02 -0.02 -0.01 -0.11 -0.05 -0.09 -0.12 1
(11) Limited Partner	0.01 0.00 0.01 0.00 0.00 -0.08 -0.03 -0.07 -0.08 -0.02 1
(12) Employees (In)	0.12 0.10 0.16 0.03 0.05 -0.25 0.16 0.18 -0.01 -0.03 0.03 1
(13) Home Based	-0.07 -0.08 -0.11 0.00 -0.02 0.23 -0.12 -0.14 -0.01 -0.03 -0.03 -0.41 1
(14) Comparative Adv	0.19 0.12 0.17 0.13 0.09 -0.06 0.05 0.02 0.01 0.01 0.00 0.14 -0.12 1
(15) Provide Service	-0.16 - 0.17 - 0.14 - 0.06 - 0.07 0.04 - 0.08 0.02 0.00 0.00 0.00 - 0.02 0.06 - 0.01 1
(16) Provide Product	0.20 0.15 0.17 0.13 0.10 -0.02 0.07 0.03 -0.05 0.01 0.00 0.11 -0.17 0.15 -0.39 1
(17) Has Land or Blg	-0.05 -0.02 -0.03 -0.04 -0.02 -0.03 -0.02 -0.04 0.06 0.02 0.02 0.08 -0.06 -0.03 0.00 0.02 1
(18) Has Equipment	0.04 0.00 0.05 0.02 0.02 -0.03 0.01 0.05 -0.02 -0.01 -0.01 0.18 -0.15 0.10 0.06 0.08 0.06 1
(19) # Owners	0.15 0.24 0.15 0.07 0.12 -0.13 0.23 -0.02 0.00 0.01 0.03 0.20 -0.13 0.06 -0.10 0.07 0.01 0.02 1
(20) # Owner Operators	0.15 0.18 0.14 0.07 0.09 -0.31 0.20 0.07 0.08 0.11 0.06 0.27 -0.20 0.09 -0.08 0.08 0.07 0.04 0.45 1
(21) High Tech	0.12 0.16 0.09 0.10 0.07 -0.10 0.07 0.06 0.03 -0.05 -0.03 0.06 -0.01 0.06 -0.01 0.04 -0.10 0.01 0.07 0.11 1
(22) Founder's Educ	0.16 0.11 0.12 0.12 0.08 -0.18 0.06 0.04 0.14 -0.09 0.01 0.07 -0.03 0.10 -0.03 -0.06 -0.08 -0.04 0.10 0.08 0.16 1
(23) Founder's Gender	0.02 0.05 0.03 0.01 0.01 -0.10 0.05 0.04 0.06 -0.06 0.01 0.09 -0.04 0.00 0.03 0.00 0.02 0.03 0.03 0.02 0.11 0.00 1
(24) Founder's Work Exp	0.00 0.02 -0.01 0.01 0.01 -0.06 0.03 0.01 0.04 -0.03 0.01 0.05 -0.02 0.01 0.09 -0.09 -0.02 0.02 0.03 0.02 0.10 0.04 0.19 1
(25) Founder's Age	0.01 0.03 0.01 0.00 -0.01 0.00 0.01 -0.05 0.03 0.00 0.02 -0.02 0.02 -0.05 -0.05 0.01 0.05 -0.04 0.04 0.05 -0.01 0.12 0.01 0.39 1
(26) Hours Per Week	0.06 0.03 0.09 0.02 0.04 -0.13 0.07 0.12 -0.01 -0.02 -0.02 0.30 -0.29 0.18 0.04 0.09 0.01 0.20 0.06 0.05 0.01 -0.07 0.11 0.08 -0.10 1
(27) Founder's Race	-0.01 -0.01 0.00 -0.01 0.02 -0.03 -0.06 0.04 0.03 -0.01 0.02 -0.04 0.01 0.01 -0.03 0.05 0.03 0.06 0.01 0.01 -0.04 -0.02 0.04 0.08 0.12 -0.02 1
(28) Credit Risk	-0.02 -0.03 -0.03 -0.01 -0.01 0.11 0.00 -0.07 -0.06 0.03 -0.01 -0.10 0.07 0.01 0.00 -0.01 -0.05 -0.03 -0.04 -0.10 -0.06 -0.08 -0.02 -0.05 -0.10 -0.01 -0.08 1
(29) GDP per capita	0.07 0.04 0.06 0.06 0.05 -0.10 0.04 0.06 0.04 -0.05 0.01 0.03 0.02 -0.01 -0.02 -0.06 -0.14 -0.06 0.06 0.01 0.09 0.22 0.02 0.06 0.05 0.01 -0.04 -0.07 1
(30) Competitive Density	0.02 -0.01 0.00 0.05 0.03 0.00 0.00 0.02 -0.02 0.00 -0.01 -0.01 0.06 0.02 0.09 -0.12 -0.09 -0.04 -0.01 -0.03 0.14 0.14 0.02 0.02 -0.04 0.01 -0.11 -0.03 0.26 1

Note. N=23,184. Correlations above |.013| are statistically significant p < 0.05.

anel: Panel A: Logit Regression ^a			Panel B: Poisson Regression ^b					
Dependent Variable:	Have IP	Have	Have	Have	Number IP	Number	Number	Number
Model:	(1)	Patent (2)	Trademark (3)	Copyright (4)	(5)	Patents (6)	Trademarks (7)	Copyrights (8)
Focal Variable ^c					, í	2.7		<u> </u>
Incorporated	1.361***	1.385**	1.694***	1.073	-0.105	0.525^{***}	0.481***	-0.237**
	(0.058)	(0.138)	(0.085)	(0.058)	(0.068)	(0.050)	(0.101)	(0.083)
Firm Characteristics								
Employees (ln)	1.112***	0.977	1.193***	1.036	0.0951**	0.185***	0.0401	0.0139
	(0.023)	(0.040)	(0.027)	(0.029)	(0.034)	(0.020)	(0.037)	(0.049)
Home Based	1.135**	0.820^{*}	0.952	1.318***	0.184^{*}	-0.110*	-0.186*	0.276**
	(0.047)	(0.073)	(0.045)	(0.072)	(0.073)	(0.047)	(0.092)	(0.092)
Comp Advantage	2.182***	3.351***	2.207***	2.171***	0.660***	0.759***	1.347***	0.563***
	(0.088)	(0.342)	(0.104)	(0.120)	(0.076)	(0.049)	(0.109)	(0.094)
Provide Service	0.589^{***}	0.511***	0.635***	0.765***	-0.316***	-0.371***	-0.535***	-0.222*
	(0.031)	(0.045)	(0.036)	(0.052)	(0.074)	(0.047)	(0.080)	(0.109)
Provide Product	2.419***	2.916***	1.971***	2.908***	0.908***	0.695***	0.939***	0.965***
	(0.104)	(0.304)	(0.097)	(0.161)	(0.073)	(0.049)	(0.114)	(0.088)
Has Land or Building	0.816**	0.970	0.808**	0.902	-0.00486	-0.0794	0.0859	0.0237
	(0.052)	(0.135)	(0.057)	(0.080)	(0.111)	(0.069)	(0.143)	(0.151)
Has Equipment	1.067	0.697***	1.096*	1.079	0.107	0.0349	-0.293***	0.226**
	(0.042)	(0.057)	(0.050)	(0.056)	(0.066)	(0.044)	(0.074)	(0.086)
# Owners	1.037***	1.038***	1.025***	1.007*	0.00910***	0.00800****	0.0154***	-0.00927*
	(0.006)	(0.005)	(0.004)	(0.003)	(0.002)	(0.001)	(0.001)	(0.004)
# Owner-Operators	1.145***	1.136***	1.075**	1.131***	0.100***	0.0463**	0.0729***	0.0989**
-	(0.027)	(0.035)	(0.024)	(0.028)	(0.020)	(0.014)	(0.016)	(0.036)
High Tech	1.227***	1.785***	1.230***	1.052	-0.0100	0.226***	0.439***	-0.0977
e	(0.065)	(0.158)	(0.074)	(0.067)	(0.073)	(0.052)	(0.073)	(0.100)
Founder Characteristics								
Founder's Education	1.126***	1.176***	1.085***	1.129***	0.0944***	0.0645***	0.188^{***}	0.0796***
	(0.011)	(0.024)	(0.011)	(0.014)	(0.016)	(0.010)	(0.021)	(0.020)
Founder's Gender	1.070	1.380**	1.112*	1.035	0.0197	0.170***	0.165	-0.0322
	(0.045)	(0.135)	(0.053)	(0.057)	(0.072)	(0.047)	(0.093)	(0.091)
Founder's Work Exp.	0.995**	0.997	0.991***	1.002	0.00507	-0.00863***	-0.00207	0.00892*
	(0.002)	(0.004)	(0.002)	(0.003)	(0.003)	(0.002)	(0.004)	(0.004)
Founder's Age	1.003	1.009*	1.006**	0.997	-0.0110****	0.00536**	0.0106**	-0.0182***
	(0.002)	(0.004)	(0.002)	(0.002)	(0.003)	(0.002)	(0.004)	(0.004)
Hours Per Week	1.003**	0.998	1.004***	1.002	0.00518***	0.00346***	-0.000949	0.00741 ***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Founder's Race	0.926	0.743**	0.997	0.935	0.302***	0.0469	-0.0275	0.427***
	(0.045)	(0.073)	(0.055)	(0.059)	(0.077)	(0.050)	(0.092)	(0.107)
Credit Risk	1.013	0.998	1.011	1.000	0.0235	0.0195	0.0121	0.00915
	(0.020)	(0.040)	(0.022)	(0.026)	(0.030)	(0.020)	(0.033)	(0.041)
Regional Characteristics		()	(/		()	(()	(,
GDP per capita (ln)	1.334***	1.129	1.480^{***}	1.386***	0.243*	0.485***	0.0839	0.226
F (****)	(0.093)	(0.163)	(0.114)	(0.124)	(0.098)	(0.069)	(0.124)	(0.127)
Competitive Density	1.001	1.003	1.002	1.005	0.00624	-0.00251	-0.000493	0.0122
	(0.006)	(0.013)	(0.007)	(0.007)	(0.009)	(0.007)	(0.012)	(0.010)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 4: Regression Estimates

Notes. N=23,184. Standard errors in parentheses. ^aLogit regression where dependent variable is dummy coded. Coefficients reported as odds ratios (OR). OR > 1 represent a positive relationship and OR < 1 indicate a negative relationship. ^bWe use Poisson regression with robust standard errors to account for overdispersion ^c Incorporated includes LLC, S-Corp, and C-Corp. Reference categories include sole-proprietorship and partnership. ^{*} p < 0.05, ^{**} p < 0.01, ^{***} p < 0.001.

Panel:	Panel A:]	Logit Regres	sion ^a	0	Panel B: F	oisson Regress	ion ^b	
Dependent Variable:	Have IP	Have	Have	Have	Number IF	Number	Number	Number
		Patent	Trademark	Copyright		Patents	Trademarks	Copyrights
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Legal Form Organization ^c								
LLC	1.356***	1.367**	1.768***	1.073	-0.111	0.514***	0.554***	-0.245*
	(0.066)	(0.157)	(0.102)	(0.067)	(0.080)	(0.117)	(0.058)	(0.098)
S-Corporation	1.291***	1.205	1.701***	0.980	-0.175*	0.271*	0.552***	-0.270**
	(0.069)	(0.150)	(0.105)	(0.068)	(0.084)	(0.125)	(0.061)	(0.103)
C-Corporation	1.817***	2.771***	2.031***	1.289**	-0.0241	1.074***	0.635***	-0.324*
	(0.130)	(0.374)	(0.163)	(0.119)	(0.102)	-0.00238	(0.073)	(0.154)
General Partnership	0.889	0.788	1.049	0.802	-0.389	(0.300)	0.0163	-0.447
	(0.111)	(0.254)	(0.152)	(0.134)	(0.206)	0.480	(0.148)	(0.255)
Limited Partnership	1.326	2.091*	1.701**	1.029	0.0863	(0.303)	0.454**	0.0864
	(0.200)	(0.624)	(0.284)	(0.210)	(0.202)	0.514***	(0.151)	(0.245)
Difference statistic ^d	_							
C-Corp. vs. LLC	20.44***	45.77***	3.97*	4.78*	0.98	35.84***	1.94	0.31
C-Corp. vs. S-Corp.	26.17***	55.30***	6.16**	9.81**	2.71	68.51***	1.80	0.13
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table	5: Regress	ion Estima	tes, by I	egal For	n of Org	anization
I GOIC	CITCHICOD	TOH LOUING		Jogai I OII		

Notes. N= 23,184. Standard errors in parentheses. ^aLogit regression where dependent variable is dummy coded. Coefficients reported as odds ratios (OR). OR > 1 represent a positive relationship and OR < 1 indicate a negative relationship. ^bWe use Poisson regression with robust standard errors to account for overdispersion. ^cReference category includes sole-proprietorship. ^dWe use the Wald test in Panel A and F-test in Panel B to test for a statistically significant difference between coefficients. ^{*}p < 0.05, ^{**}p < 0.01, ^{***}p < 0.00