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Intellectual Property Protection for Startups:

A Law and Economics Perspective

Master's Thesis

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I declare that I wrote the submitted master's thesis independently and that all the sources were duly stated, and that the thesis has not been used to attain another or the same degree.

Furthermore, I declare that the actual text of the thesis, including footnotes, has 204,492 characters including spaces.

In Prague, 1. 11. 2023

Tomáš Vaverka

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1 Introduction

The stories of successful startups have fascinated the public for decades now.¹ Since the rise of Silicon Valley linked with the opening of Fairchild Semiconductor in 1956, technology enthusiasts have gathered in Palo Alto and the surrounding shores of San Francisco Bay to create innovative companies.² Today, startups are springing up all over the world and the Czech Republic is no exception. Startup founders are inevitably faced with the question of whether and how to protect their innovations. If they choose not to implement any protective measures, they expose themselves to the risk of having their innovation copied by imitators at little or no cost.³

However, literature exploring the relationship between intellectual property rights and entrepreneurship is scarce.⁴ Classical economic theory primarily addresses the challenge of balancing the incentive for innovation, a role fulfilled by the intellectual property rights system, with potential drawbacks related to restricting access to that innovation due to the assignment of exclusive rights to the owner.⁵ Moreover, while intellectual property rights represent a practical option for protection of innovative outputs, it is important to recognize that the intellectual property regime is inherently embedded in a larger economic context. Entrepreneurs can employ informal appropriability methods to recover their investments in innovation and gain competitive advantage, including strategies such as first mover advantage or secrecy.⁶ Several survey-based studies have recognized this reality, examining the use and effectivity of

¹ Please note that the following tools were used to increase the linguistic and stylistic level of the text and to check its grammatical correctness: ChatGPT, DeepL. These tools were used in the scope of the entire thesis.

² WILLIAMS, James C. The Rise Of Silicon Valley. In: *Invention & Technology Magazine* [online]. 1990 [Accessed 30.5.2021]. Available from: <https://www.inventionandtech.com/content/rise-silicon-valley-1?page=full>

³ ARROW, Kenneth J. Economic Welfare and the Allocation of Resources for Invention. In: NATIONAL BUREAU OF ECONOMIC RESEARCH, ed. *The Rate and Direction of Inventive Activity: Economic and Social Factors*. Princeton: Princeton University Press, 1962, p. 615. ISBN 0-87014-304-2.

⁴ GRAHAM, Stuart J.H. et al. High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey. *Berkeley Technology Law Journal*. 2009, Vol. 24, no. 4, p. 1259. ISSN 1086-3818.

⁵ POSNER, Richard A. Intellectual Property: The Law and Economics Approach. *Journal of Economic Perspectives*. 2005, Vol. 19, no. 2, p. 57. DOI: 10.1257/0895330054048704

⁶ MERGES, Robert P. Economics of Intellectual Property Law. In: PARISI, Francesco, ed. *The Oxford Handbook of Law and Economics: Volume 2: Private and Commercial Law*. Oxford: Oxford University Press, 2017, p. 203. ISBN 978-0-19-968420-5.

various intellectual property rights and informal appropriability methods at the firm level. Nevertheless, a notable research gap exists when it comes to startups - companies distinguished by characteristics such as rapid growth, scalability, presence in technology-related domains, as well as capital constraints. The Berkeley survey⁸ remains the sole comprehensive research paper delving into the topic of appropriability methods used by startups, albeit with a primary focus on the role of the patent system.

To address this conspicuous research gap and drawing on my background in venture capital and law, I have chosen to focus my thesis on the subject of appropriability strategies used by startups and the importance of intellectual property rights for these companies. In addition to the theoretical aspects of this thesis, I empirically investigate the topic within a sample of seventeen Czech software startups through semi-structured interviews with C-level executives. By structuring my research in a manner similar to the Berkeley survey, I am well-positioned to make direct comparisons and explore the differences between Czech software startups and their American counterparts.⁹

Following this introduction, the second chapter delves into the classical theory of law and economics concerning intellectual property. It explores the intricate interplay between the static and dynamic efficiency, analyzing the inherent trade-off between incentive and access embedded in intellectual property rights. Simultaneously, it introduces alternative perspectives on the functions of the intellectual property rights regime and allows for critical analysis. The third chapter outlines the key characteristics of selected intellectual property rights from the perspective of both United States and European Union legislation, while also considering the perspective of law and economics theory. This chapter lays the foundation for comprehending the empirical section of the thesis, as each right has a distinct design, scope and term, and regulation differs significantly between the European Union and the United States in certain respects. In the fourth chapter, I conduct a literature review concerning the methods that startups use to appropriate gains from innovation. Given the limited scope of the available literature, the

⁷ Notable examples include the Yale and Carnegie surveys. See LEVIN, Richard C. et al. Appropriating the Returns from Industrial Research and Development. *Brookings Papers on Economic Activity*. Brookings Institution Press, 1987, Vol. 1987, no. 3, pp. 783–831. DOI: 10.2307/2534454; COHEN, Wesley M. and NELSON, Richard R. and WALSH, John P. Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not). *NBER Working Paper Series*. 2000, Working Paper No. 7552. DOI: 10.3386/w7552

⁸ See GRAHAM et al., supra note 4.

⁹ The Berkeley survey reported data separately for startups operating in several industries, including software. This allows me to compare results without having to account for inter-industry differences.

review also includes papers and surveys examining the topic among companies that share certain key characteristics with startups. Finally, before concluding, I present the results of my research among Czech software startups.

I find that Czech software startups consider informal methods of appropriation, such as complementary assets and first mover advantage, to be among the most important for securing a competitive advantage from their technological innovations. This finding is consistent with results of the Berkeley survey. However, my research presents novel findings on the significance of copyright. Startup executives rate copyright as the most important formal appropriability method and the second most important method overall. Copyright, while unable to shield startups from legitimate copying of their product's functionality by competitors such as through reverse engineering, plays a crucial role in internal protection. Every startup in my sample employs copyright assignment clauses, a practice also mandated by investors. Other formal appropriability methods are rated as considerably less important, with patents receiving the lowest rating, not even considered as "slightly important." It is worth noting that some Czech software startups do seek patents in the United States, however patent-holding does not seem to play a significant role for investors in their decision to invest. Finally, I present anecdotal evidence on topics such as experiences with patent troll attacks, the high costs associated with enforcing intellectual property rights and the variability in commercial strategies employed by software startups.

2 The Law and Economics of Intellectual Property

Efficiency is usually defined in at least two ways: as static and dynamic efficiency. Static efficiency describes the situation of optimal combination of given inputs where the total net benefits from the use of a resource are maximized, subject to the constraints imposed by a fixed production function.¹⁰ It focuses on a static image of the economy, exploring maximization of utility and minimization of waste within a fixed set of initial conditions. Dynamic efficiency, on the other hand, explores changing the production function in a profitable direction. It involves continuous reconsideration of initial conditions.¹² From the dynamic perspective, the focus is not so much on a prevention of waste, rather on creation of new means and ends, fueling new entrepreneurial activity and growth.¹³

These concepts relate closely to intellectual property protection. Innovation is essentially the creation of information (and knowledge), which has differing characteristics from tangible goods.¹⁴ Information goods and knowledge have a feature that sets them apart from ordinary goods – they are public goods. As such, they have the quality of non-rivalrous consumption. Without intellectual property rights, there is no marginal cost associated with accessing the knowledge.¹⁵ The ease of access and reproducibility, however, creates a problem for innovators in recouping their investments in knowledge development, as they might find themselves at a disadvantage compared to competitors who could presumably imitate this knowledge at significantly lower cost.¹⁶ Since appropriability of knowledge is always incomplete, a

¹⁰ GHEMAWAT, Pankaj and COSTA, Joan E. Ricart I. The Organizational Tension between Static and Dynamic Efficiency. *Strategic Management Journal*. 1993, Vol. 14, p. 60.

¹¹ Ibid.

¹² Ibid., p. 59.

¹³ SOTO, Jesús Huerta De. *The Theory of Dynamic Efficiency*. London; New York: Routledge, 2009, p. 10. ISBN 978-0-415-42769-2.

¹⁴ DAM, Kenneth W. The Economic Underpinnings of Patent Law. *The Journal of Legal Studies*. 1994, Vol. 23, no. 1, p. 247. ISSN 0047-2530.

¹⁵ STIGLITZ, Joseph. Economic Foundations of Intellectual Property Rights. *Duke Law Journal*. 2008, Vol. 57, no. 6, pp. 1699–1700. ISSN 0012-7086.

¹⁶ LÓPEZ, Andrés. INNOVATION AND APPROPRIABILITY, EMPIRICAL EVIDENCE AND RESEARCH AGENDA. In: *THE ECONOMICS OF INTELLECTUAL PROPERTY: Suggestions for Further Research in Developing Countries and Countries with Economies in Transition* [online]. WIPO, 2009, p. 2 [Accessed 31.8.2023]. ISBN 978-92-805-1791-0. Available from: https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1012-intro1.pdf

difference is created between the private and social marginal return of any new knowledge generated, which could lead to under-investment in innovation activities!¹⁷ Intellectual property rights solve this problem by giving the creators a limited right to exclude others from reproducing the knowledge, which allows the creators to recover their costs during the exclusion period.¹⁸ In the view of traditional law and economics theory, it is the right to exclude that provides the incentive to create new knowledge.¹⁹

From a static efficiency perspective, free distribution is a necessity for the efficient use of knowledge. In a perfectly competitive market, the price of a good equals to the opportunity cost of the resources required to produce it.²⁰ Depriving a user of access to the good is only efficient if it frees up the good for someone who values it more or if the resources saved by denying access are more valuable than providing access. However, this is not the case for public goods – their use is non-rival and no resources would be freed up, as the investment is only made once. In a perfectly competitive market with many suppliers, the competitive price would have to be zero and all users would be served.²¹ If knowledge is provided under temporary exclusive rights through intellectual property rights, access will be priced above marginal cost and creators will receive a return on their investments. Intellectual property rights thus introduce inefficiency in use and distortions, including the creation of monopoly power.²² Some scholars contend that monopoly power can be used to leverage to further monopoly power creating a dangerous spiral.²³ This perspective is not universally held within academia. Contemporary antitrust views tend to have a more favorable outlook on intellectual property rights.²⁴ Nevertheless, deadweight loss is arguably the main defect of intellectual property as an incentive mechanism.

¹⁷ Ibid.

¹⁸ ARROW, supra note 3.

¹⁹ POSNER, supra note 5, pp. 57 - 59.

²⁰ SCOTCHMER, Suzanne. *Innovation and Incentives*. Cambridge and London: The MIT Press, 2006, p. 34. ISBN 0-262-19515-1.

²¹ Ibid., p. 35.

²² ILIE, Livia. Intellectual Property Rights: An Economic Approach. *Procedia Economics and Finance*. 2014, Vol. 16, p. 549. DOI: 10.1016/S2212-5671(14)00837-5

²³ STIGLITZ, supra note 15, p. 1702.

²⁴ BURK, Dan L. Law and Economics of Intellectual Property: In Search of First Principles. *Annual Review of Law and Social Science*. 2012, Vol. 8, no. 1, p. 401. DOI: 10.1146/annurev-lawsocsci-102811-173857

In terms of dynamic efficiency, however, free distribution of knowledge would be inefficient – without property rights, the incentive to innovate would be missing. Innovators would not be able to recoup their costs. The static inefficiency of intellectual property rights is viewed as necessary for dynamic efficiency, to stimulate innovation.²⁵ There is a fundamental trade-off in setting intellectual property rights. Both static and dynamic efficiency pursue valid objectives: static efficiency aims at ensuring access, while dynamic efficiency focuses on providing incentives for innovation. Striking a balance between these goals is challenging.²⁶ Intellectual property rights operate on the mixture of the two market distortions. Excessively weak property rights satisfy the static goal but suffer from lack of incentives to create intellectual property – forgoing innovation and leading to slower economic growth. Excessively strong property rights favor the dynamic goal but create the static inefficiency of insufficient access and the economy suffers from inadequate dissemination of information and knowledge, while generating surplus transfers to innovators.²⁷ However, Landes and Posner argue that reducing the theory of intellectual property rights to the tradeoff of incentive and access would be an oversimplification. They view the prevention of congestion (which occurs commonly when access to property is free to all users) as a static benefit of property rights and the possession of the right providing an incentive for investment as a dynamic benefit of property rights.²⁸

The costs of intellectual property rights are multifold. Transaction costs tend to be high even when few transactors are involved, as due to the intangible nature of the right, it is hard to define the scope of what is being transferred.²⁹ Rent seeking, which involves pricing above marginal costs, even after accounting for the risk of failure, represents another significant concern.³⁰ This issue is particularly pertinent to patents. Moreover, because there is no ownership until the right is created, wasteful duplication of investment in research and development may occur – so called “patent races”. The combined expenditures of firms may be higher than is socially

²⁵ STIGLITZ, supra note 15, p. 1704.

²⁶ MASKUS, Keith E. *Intellectual Property Rights in the Global Economy*. Washington: The Peterson Institute for International Economics, 2000, p. 29. ISBN 978-0-88132-282-8.

²⁷ Ibid., pp. 29–31.

²⁸ LANDES, William M. and POSNER, Richard A. *The Economic Structure of Intellectual Property Law*. Cambridge, MA: Harvard University Press, 2003, pp. 11–16. ISBN 978-0-674-01204-2.

²⁹ POSNER, Richard. Transaction Costs and Antitrust Concerns in the Licensing of Intellectual Property. *John Marshall Review of Intellectual Property Law*. 2005, Vol. 4, p. 325.

³⁰ POSNER, supra note 5, p. 59.

optimal.³¹ Intellectual property is also costly to protect. Technical and judicial actions to exclude free riders may involve significant expenditures.³² Due to the intangible public-good character of intellectual property, misappropriation and freeriding is much harder to prevent in the absence of special legal mechanisms. However, even when the law provides for a protection, it is difficult to detect a breach of an intellectual property right.³³ It is perhaps for this reason that certain industries, such as the software industry, rely on technical means of protection to some extent.

Another body of critique is related to the incremental nature of both inventions and expressive creations, which heavily build on previous work. Intellectual property rights may in fact raise the incentives to innovate but may also reduce the efficiency of the knowledge-generation activity. Due to intellectual property rights, new inventors have limited access to prior knowledge, which leads to slower progress, duplication of efforts and reduced working of knowledge complementarity.³⁴ This concern is however partly reflected in the design of various intellectual property rights. None of the exclusive rights are absolute, generally, there are limits in both the duration and scope.³⁵ This is an important difference to tangible property, which is not limited in such a way. This difference also stems from the fact that intellectual property rights tend to be, in many ways, more costly than rights in physical property.³⁶

Following the critique, proposals of alternative systems of intellectual property have appeared. This includes a system of government prizes, which could be used to spur innovation efforts.³⁷ The innovation prize is awarded ex post for innovations meeting certain standards. After compensating the innovator, the invention can subsequently be placed in the public domain without incurring the deadweight loss associated with patents.³⁸ However, such a

³¹ BESEN, Stanley M. and Leo J. RASKIND. An Introduction to the Law and Economics of Intellectual Property. *The Journal of Economic Perspectives*. 1991, Vol. 5, no. 1, p. 6. ISSN 0895-3309.

³² MASKUS, supra note 26, p. 31.

³³ LANDES and POSNER, supra note 28, pp. 18–19.

³⁴ ANTONELLI, Cristiano. The tradeoff of intellectual property rights reconsidered. *Revista Económica*. 2008, Vol. 10, no. 2, pp. 20–22. DOI: 10.22409/economica.10i2.p109

³⁵ BURK, supra note 24, p. 402.

³⁶ LANDES and POSNER, supra note 28, p. 21.

³⁷ See SHAVELL, Steven and VAN YPERSELE, Tanguy. Rewards versus Intellectual Property Rights. *The Journal of Law & Economics*. 2001, Vol. 44, no. 2, pp. 525–547. DOI: 10.1086/322811

³⁸ For more information on the effectiveness of various incentive systems, see CLANCY, Matthew S. and MOSCHINI, GianCarlo. Incentives for Innovation: Patents, Prizes, and Research Contracts. *Applied Economic Perspectives and Policy*. 2013, Vol. 35, no. 2, pp. 206–241. DOI: 10.1093/aep/ppt012

system is in danger of being politicized. Furthermore, calculating the correct prize proves to be difficult and similarly to patents, the prize system can induce excessive aggregate investment which is socially suboptimal. Kitch's influential prospect theory suggests a solution to the problem of competition for intellectual property rights. His theory was intended to align intellectual property theory more closely with economic theories of property.³⁹ Kitch argued that a coordinated development of innovation should be preferred over rivalry.⁴⁰ In essence, the responsibility for the innovation development should be entrusted to a single entity, which would oversee the utilization and exploitation of the innovation to maximize its value.⁴¹ Critics point out that if implemented, Kitch's system could simply engender patent races to become the "prospector" managing the innovation development.⁴²

Some scholars argue that intellectual property rights are in fact not needed at all to spur innovative efforts.⁴³ Certain goods may be produced in the absence of an incentive, in which case the costs of exclusion leave society worse off. Many creators create simply for fun or to enhance their reputation.⁴⁴ A fitting example would be the open-source movement, which has particularly seen success in software. Furthermore, it should be noted that even in the present day, our innovation system heavily relies on the groundwork of basic research, primarily conducted within academic and government-sponsored research facilities. While it is obvious that research must be funded, the current intellectual property regime does not reflect the fact that monetary rewards represent only a minor aspect of what drives these researchers.⁴⁵ Moreover, even when innovation is financed by for-profit firms, there are other ways to appropriate returns without legal exclusivity. Such appropriability strategies include using secrecy, first mover advantage, and other informal appropriation mechanisms.⁴⁶ Interestingly, selected parts of the economy function in intellectual property's "negative spaces" – where

³⁹ BURK, supra note 24, p. 406.

⁴⁰ See KITCH, Edmund W. The Nature and Function of the Patent System. *The Journal of Law & Economics*. 1977, Vol. 20, no. 2, pp. 265–290.

⁴¹ BURK, supra note 24, p. 406.

⁴² LANDES and POSNER, supra note 28, p. 319.

⁴³ See STALLMAN, Richard. Patent Law is, at Best, Not Worth Keeping. *Loyola University Chicago Law Journal*. 2013, Vol. 45, no. 2, pp. 389–399. ISSN 0024-7081.; JOHNSON, Eric. Intellectual Property and the Incentive Fallacy. *Florida State University Law Review*. 2012, Vol. 39, no. 3, pp. 623–680. ISSN 0096-3070.

⁴⁴ BURK, supra note 24, p. 403.

⁴⁵ STIGLITZ, supra note 15, p. 1697.

⁴⁶ Ibid.

innovators heavily rely on informal appropriability methods instead of the legal framework. This includes niche activities, such as stand-up comedy, but also the multibillion-dollar fashion industry.⁴⁷

In conclusion, the incentive theory captures only a limited part of a reality that is significantly more intricate. Given the vast range of innovation activities in various of economic sectors and due to different designs of intellectual property rights, no single theory can encompass all situations. Intellectual property rights are likely to perform different functions in diverse economic settings.⁴⁸

⁴⁷ MERGES, *supra* note 6, pp. 204–205.

⁴⁸ BURK, *supra* note 24, p. 411.

3 Overview of Selected Intellectual Property Rights

While there are many forms of intellectual property rights, including designs, plant variety rights or database rights, the leading intellectual property rights include copyright, patents, trade secrets and trademarks. This chapter provides an overview of key attributes of selected types of intellectual property rights. Focus is directed toward the legal framework in both the United States and in the European Union, highlighting elements of regulation pertinent to software startups. Significant differences between the legal frameworks in the European Union and the United States is also under scrutiny. Moreover, building on the preceding chapter, the following text delves into the theoretical literature of law and economics, which not only provides rationale for the existence of each intellectual property right, but also presents critique of the associated private and social costs.

It is essential to note that there is no comprehensive intellectual property law applicable internationally. Intellectual property rights are territorial by nature. However, many characteristics are common to intellectual property rights, as most countries follow predominantly similar rules, especially after the enactment of the worldwide TRIPS Agreement in 1994.⁴⁹ Similarly, specific aspects of the intellectual property system have been harmonized in the European Union through legislation, rulings of the Court of Justice of the European Union and by international treaties.

The text below lays the foundation for understanding the empirical section of this thesis. Each type of intellectual property right offers a unique scope and form of protection to harness the benefits of innovation. Additionally, since the empirical part of the thesis compares appropriability strategies of software startups established in the EU and the US, it's crucial to be aware of regulatory differences that can significantly affect the results.⁵⁰

⁴⁹ SCOTCHMER, *supra* note 20, p. 65.

⁵⁰ Please note that this overview does not seek to comprehensively encompass all facets of legislation in the European Union or the United States, nor does it aim to exhaustively analyze international intellectual property rights harmonization instruments. Rather, this text should aid the reader in understanding the legal environment in which software startups operate and the regulatory differences they must take into account.

3.1 Copyright

Copyright protects original literary and artistic works of authorship, such as books, paintings, music, performances, films, software, and broadcasts.⁵¹ It confers on the rightsholder exclusive economic and moral rights. Economic rights give the author the opportunity to reap financial gains from the utilization of their work by granting them authority over its reproduction, distribution, publication, and adaptation. Moral rights, on the other hand, protect the non-economic interest of authors, represented by rights such as the right of attribution and the right of integrity.⁵² Copyright protection extends to the expression of an idea, such as a painting, a written word or a computer program, rather than the idea itself. This expression is safeguarded against unauthorized actions such as copying, distribution, publication, or other infringements on the exclusive rights of the author. Permission from the copyright owner is necessary. However, independent development of a work does not constitute infringement, it is a complete defense.⁵³ Protection is obtained automatically by the act of creating the work, no formal registration is needed.⁵⁴ Although copyright is inherently territorial in its nature, international harmonization instruments provide authors with a degree of minimum standard protection in countries that are parties to these international treaties.⁵⁵

⁵¹ The criterion of originality has received substantial attention in the European Union, especially in the landmark case of the Court of Justice of the European Union, Judgement of 16.7.2009, Infopaq C-5/08, EU:C:2009:465, and in related case law.

⁵² In the European Union, moral rights are not subject to the harmonization under the InfoSoc Directive, however, such rights cannot be waived in most member states. This approach follows from a philosophical underpinning of the French Code Civil, which takes the natural rights perspective and protects the “extension of personality” of the artist in his work. The American approach is much more pragmatic and primarily emphasizes the economic arguments for the existence of copyright. It was perhaps for this reason that the United States were reluctant to become a signatory to the Berne Convention and opted for a narrow interpretation of the institute of moral rights after ratifying the treaty and extended moral rights only to authors of a limited number of visual works. For more information, see CROMAR, Scott A. Copyright and Moral Rights in the U.S. and France. *SSRN Electronic Journal*. 2011. DOI: 10.2139/ssrn.1898326

⁵³ LEMLEY, Mark A. Economics of Improvement in Intellectual Property Law. *Texas Law Review*. 1996, Vol. 75, no. 5, p. 1014. ISSN 0040-4411.

⁵⁴ While generally, no registration is needed, because copyright is attached to the work at the moment of creation, the author must register his work if he wishes to file a lawsuit for infringement of a US work. This approach is disallowed by the Berne Convention.

⁵⁵ The Berne Convention stands as the most important international treaty dealing with international copyright protection. It has been largely incorporated into the TRIPS Agreement.

Generally, the Berne Convention stipulates that at minimum, protection must be granted until the expiration of the 50th year after the author's death. In both the European Union and United States, the term has been prolonged to 70 years. After expiry, the work enters the public domain. In the United States, subject to certain exception, moral rights last for the life of an author.⁵⁶ However, moral rights and their term is not harmonized within the EU law. In the Czech Republic, for example, moral rights end with the life of an author, except for the right of attribution and right of integrity.⁵⁷ The long term of copyright protection is offset by numerous exemptions that limit the scope of protection – such as the fair use doctrine in the United States or targeted exceptions in the European Union – including legitimate activities like criticism, news reporting or education.

Crucially, software is covered by copyright protection as a literary work.⁵⁸ This has important implications for the breath of protection, as the functionality of a computer program is not protected under that program's copyright. This view was also supported by the European Court of Justice, which held that program functionality does not “*constitute a form of expression of that program*”.⁵⁹ Hence, copyright protection does not preclude competitors from copying certain functions of a program, provided they refrain from directly copying the original source code. This is significant especially because under the European Patent Convention, programs for computer fall within the subject-matter excluded from patentability, which limits the range of appropriability mechanism available to startups operating in the European Union.⁶⁰ On the other hand, in the United States, software patents are admissible. More on this in the commentary on patents.

Generally, the author retains copyright ownership of the work. Therefore, software startups must ensure they have the necessary rights to use software developed by their employees or contractors. The concept of “work made for hire” simplifies the situation. In the United States, if a work is deemed to be “made for hire”,⁶¹ the employer or other person for whom the work

⁵⁶ 17 U.S.C. § 106A (2021).

⁵⁷ Section 11 of Act No. 121/2000 Coll. of April 7, 2000, on Copyright and Related Rights and on Amendments to Certain Acts (Copyright Act), as amended.

⁵⁸ Generally, this does not preclude protection of the program's graphical user interface under design rights.

⁵⁹ Court of Justice of the European Union, Judgement of 2.5.2012, SAS Institute C-406/10, EU:C:2012:259, paragraph 46.

⁶⁰ Article 52 of the European Patent Convention

⁶¹ Under definitions set in 17 U.S.C. § 101 (2021), a “work made for hire” is defined as a work prepared by an employee within the scope of his or her employment or a work specially ordered or commissioned within

was prepared is considered the author and owns all of the rights comprised in the copyright.⁶² In the European Union, under the harmonization provided by the Computer Programs Directive, where a computer program is created by an employee in the execution of his duties or following the instructions given by his employer, the employer is entitled to exercise all economic rights in the program.⁶³ Czech legislation has adopted the European framework and extended the employee work regime to include computer programs created to order.⁶⁴

Ensuring that a startup can exercise all rights to its software is critical and startups generally cannot rely solely on the statutory regime. It is good practice to include a clause regulating the assignment of intellectual property rights to the startup in contracts with employees and contractors.⁶⁵ While subsidiary rules provided by legislation are useful, they have various limitations. In the Czech Republic, the basic statutory regime requires the author's consent in a situation where the employer wishes to assign the exercise of the economic rights to a third person⁶⁶ and it also grants the author a right to equitable supplementary remuneration.⁶⁷ Contractual arrangements are the most effective way to tackle these limitations of the legal

categories exhaustively specified in the act. For ordered or commissioned works, a written agreement between the party that ordered or commissioned that work and the creator of the work must be signed, expressly agreeing that the work is to be considered a work made for hire. It is advisable to conclude expressive agreements with all software engineers to guarantee that the startup has been assigned all rights to the software.

⁶² 17 U.S.C. § 201(b) (2021).

⁶³ Article 2(3) of the Directive 2009/24/EC of the European Parliament and of the Council of 23 April 2009 on the legal protection of computer programs.

⁶⁴ Section 58(7) of Act No. 121/2000 Coll. of April 7, 2000, on Copyright and Related Rights and on Amendments to Certain Acts (Copyright Act), as amended.

⁶⁵ In the United States, it is generally possible to transfer ownership in copyright from the author to a third party. However, in certain jurisdictions, including the Czech Republic, copyright ownership is not transferrable. Instead, it is necessary to use a copyright license. Most Czech academics reason that only an employer who has been granted the exclusive right to exercise the economic rights by virtue of the law regulating work made for hire can assign such rights to a third party. Given the complex nature of this topic and for the sake of simplicity, I use the term "assignment" to address all situations related to determining who will exercise the rights to the software. For more information on the legal regime applicable in the Czech Republic, *see* HOLCOVÁ, Irena et al. *Autorský zákon a předpisy související (včetně mezinárodních smluv a evropských předpisů) - Komentář*. Praha: Wolters Kluwer, 2019. ISBN 978-80-7598-049-6.

⁶⁶ Section 58(1) of Act No. 121/2000 Coll. of April 7, 2000, on Copyright and Related Rights and on Amendments to Certain Acts (Copyright Act), as amended.

⁶⁷ Section 58(6) of Act No. 121/2000 Coll. of April 7, 2000, on Copyright and Related Rights and on Amendments to Certain Acts (Copyright Act), as amended.

regime. In the United States, when concerning ordered or commissioned works, the law requires an express written agreement that the work is to be considered a “work made for hire” signed by the both parties, provided that the work falls within defined categories as set by legislation.⁶⁸ Startups may also be exposed to situations where software development takes place outside the employment or contractor relationship, such as when founders develop software before legally establishing a company. In such situations, it is necessary to conclude a licensing agreement or assign ownership. Finally, software startups must ensure compliance with the relevant open-source licenses when utilizing open-source software.

On its own, copyright has not received much attention in the law and economics literature. Still, allow a brief explanation of the economic theory behind copyright protection. The copyright framework is justified by providing incentives for output of creative work. In a fundamental analysis of copyright law, Landes and Posner argue that in the absence of copyright protection, there would be increased incentive to create transitory works, authors would be more likely to circulate their works privately and contractual restrictions on copying would multiply.⁶⁹ But the two authors do not emphasize the monopoly aspect of copyright, rather, they focus on the positive and negative incentives to creativity.⁷⁰ Various doctrines of copyright law such as the distinction between idea and expression or the fair use doctrine may be viewed as a balancing act between promoting economic efficiency through encouraging the creation of new works by limiting copying and the effect of less protection for the purpose of supporting creation of new works by reducing the cost of creating them.⁷¹ Balance is achieved when the cost of extra protection of copyright inhibiting creative output by restricting access to the public domain equals the incentive it provides to authors.⁷² Copyright also offers additional advantages, such as reducing congestion and encouraging ongoing investment in the maintenance of creative works.⁷³

⁶⁸ 17 U.S.C. § 101 (2021).

⁶⁹ LANDES, William M. and POSNER, Richard A. An Economic Analysis of Copyright Law. *The Journal of Legal Studies*. 1989, Vol. 18, no. 2, p. 332. ISSN 0047-2530.

⁷⁰ TOWSE, Ruth and HANDKE, Christian and STEPAN, Paul. *The Economics of Copyright Law: A Stocktake of the Literature*. 2008, Vol. 5, no.1, p. 6. ISSN 1698-1359.

⁷¹ LANDES and POSNER, supra note 69, p. 333.

⁷² TOWSE, Ruth and HANDKE, Christian and STEPAN, Paul, supra note 70, pp. 6–7.

⁷³ POSNER, supra note 5, p. 61.

3.2 Patents

Patents represent exclusive rights granted for inventions – products or processes which provide, in general, a new way of doing something or offer a new technical solution to a problem.⁷⁴ The TRIPS Agreement provides that for an invention to qualify for patent protection, it must be new, involve an inventive step and be capable of industrial application.⁷⁵ These requirements are designed to limit some problems of the patent system such as strategic patenting, patent races and excessive shrinking of the public domain and related transaction costs.⁷⁶ For example, the requirement that an invention must involve an inventive step excludes property rights in inventions where rent-seeking would become a serious problem, as “obviousness” implies a low cost of discovery and development, potentially inducing excessive patenting.⁷⁷ Unlike copyright, patents are awarded after assessment of application by patent offices. Such process often involves high fees for the party submitting the application. Patent law requires as a condition for the grant of a patent disclosure of the details comprising the innovation, which should lead to dissemination of information. Importantly, patent rights are territorial, being only applicable in the legal jurisdictions under which they were registered.⁷⁸

The patent right is very powerful, as it allows the patentee to exclude all others from making, selling, importing, or using the patented subject-matter, effectively granting him a legal monopoly.⁷⁹ As opposed to copyright, patent protects against any duplication of the invention rather than merely prohibiting the copying of it.⁸⁰ Such protection is commercially vastly more valuable. It is also for this reason that the patent's duration is established at 20 years, in contrast to the notably lengthier term of 70 years for copyright. The breath of the patent, delineating the technological territory protected by the patent, is affected by what claims of originality are

⁷⁴ WIPO. Patents. In: *WIPO* [online] [Accessed 18.9.2023]. Available from: <https://www.wipo.int/patents/en/index.html>

⁷⁵ Article 27(1) of the TRIPS Agreement.

⁷⁶ LANDES and POSNER, supra note 28, pp. 302–310.

⁷⁷ LANDES, William M. and POSNER, Richard A. Trademark Law: An Economic Perspective. *The Journal of Law & Economics*. 1987, Vol. 30, no. 2, p. 268. ISSN 0022-2186.

⁷⁸ However, the Patent Cooperation Treaty of June 19, 1970, allows patentees to file a single international application to protect their invention in all contracting states.

⁷⁹ While it is largely undisputed that patents grant its owner a legal monopoly, the view that an economic monopoly is gained is contentious. See KITCH, Edmund W. Patents: Monopolies or Property Rights?. *Research in Law and Economics*. 1986, Vol. 8, pp. 31–50. ISBN 0-89232-654-9.

⁸⁰ LANDES and POSNER, supra note 28, p. 295.

accepted by the patent examiner and by the extent to which fundamental processes or products are covered. Patents covering basic processes or products will have greater impact on a range of users.⁸¹ Nonetheless, in most jurisdictions, patents will not be awarded for fundamental discoveries flowing from basic physical laws.⁸²

I now turn my attention to selected elements of the legislation on patents. In the United States, patent law is governed by the Patent Act and extensive case law. Patentees can file for patent protection with the United States Patent and Trademark Office. Situation in the European Union is more complex. Patentees can use the “national route” and file for patents in their country of interest, following applicable national norms. They can also use single grant procedure under the regulation of the European Patent Convention before the European Patent Office,⁸³ which confers protection in all the contracting states designated by the applicant.⁸⁴ In each of the contracting states for which it is granted, the European patent has the effect of and is subject to the same conditions as a national patent granted by that state.⁸⁵ This fragmentation complicates patent enforcement, as it requires adherence to respective national laws in the process, resulting in an effect limited to the jurisdiction of that specific country. Furthermore, building on the framework of European Patent Convention, a unitary patent protection is available under the procedure of enhanced cooperation of participating member states of the European Union. After the grant of the European patent, a separate post-grant procedure can be initiated at the European Patent Office at the request of the proprietor, leading to an attribution of a unitary effect for the territory of the participating member states.⁸⁶ A single Unified Patent Court has been established, where those patents can be challenged and defended. Although this is a significant step forward towards the unification of patent law, many member states do not yet participate in this system and companies are choosing to opt out and not transfer active

⁸¹ GREENHALGH, Christine and ROGERS, Mark. *Innovation, Intellectual Property and Economic Growth*. Princeton: Princeton University Press, 2010, p. 37. ISBN 978-0-691-13798-8.

⁸² MASKUS, supra note 26, p. 39.

⁸³ European Patent Office is not a body of the European Union, rather, it is the executive body of the European Patent Organisation, an international organisation with 39 member states. All 27 member states of the European Union are members of the Organisation.

⁸⁴ WIPO. An International Guide to Patent Case Management for Judges. In: *WIPO* [Accessed 18.9.2023]. Available from: <https://www.wipo.int/patent-judicial-guide/>

⁸⁵ Article 2(2) of the European Patent Convention.

⁸⁶ EPO. The Unitary Patent architecture. In: *EPO* [Accessed 18.9.2023]. Available from: https://www.epo.org/en/legal/guide-up/2022/uppg_a_iii_1.html

European patents under the new system.⁸⁷ However, the new system is still in its infancy, and it is too early to evaluate it.

Significant disparities exist in patent regulation between the United States and Europe. These differences encompass aspects like the availability of filing provisional patent applications, intricacies in patent eligibility criteria, exclusions from patentability regarding certain subject-matter, and strategies pertaining to the patentability of publicly available inventions, as well as the concept of a "grace period." What is of interest, however, is the approach to the patentability of software. In the United States, patenting of software is allowed, although subject to more stringent criteria than was historically the case.⁸⁸ According to the European Patent Convention, a computer program *as such* is not recognized as a patentable invention.⁸⁹ The expression "as such" has been subject of extensive interpretation efforts. In the decision T 154/04,⁹⁰ it was summarized that having a "technical character" was an implicit requirement of an "invention" within the meaning of Article 52(1) of the European Patent Convention. Consequently, Article 52(2) does not exclude from patentability any subject-matter or activity having a technical character.

The exclusion from patentability does not apply to computer programs having a "further technical effect". A further technical effect "*goes beyond the 'normal' physical interactions between the program (software) and the computer (hardware) on which it is run*".⁹¹ Examples include a computer program specifying a method of controlling an anti-lock braking system in a car, compressing video files, or controlling the internal functioning or operation of a

⁸⁷ COLLIS, Helen and HANCOCK, Edith. After a 70-year wait, will Europe's new patent system be a total flop? In: *POLITICO* [online]. 31. 5. 2023 [Accessed 18.9.2023]. Available from: <https://www.politico.eu/article/70-year-wait-europe-unitary-patent-system/>

⁸⁸ US statutory law sets only broad criteria for patentability without explicitly excluding certain subject-matter from patent eligibility. As a result, an approach to qualify patentable inventions has been developed largely through case law. Landmark cases *Mayo v. Prometheus*, 566 U.S. 66 (2012), and *Alice Corp. v. CLS Bank International*, 573 U.S. 208 (2014), led to the establishment of the Alice/Mayo test, a two-step test determining subject-matter eligibility for patent protection. The introduction of the test has led to increased cautiousness in relation to the granting of software patents.

⁸⁹ Article 52 of the European Patent Convention.

⁹⁰ Technical Board of Appeal, Decision of 15.11.2006, Duns Licensing Associates, T 154/04, ECLI:EP:BA:2006:T015404.20061115.

⁹¹ Enlarged Board of Appeal, Decision of 12.5.2010, Programs for computers, G 0003/08, EP:BA:2010:G000308.20100512, paragraph 10.2.1.

computer, such as memory allocation.⁹² If a program passes the test for having a technical effect, examination of novelty and inventive steps follows.⁹³ Inventions involving computer programs that implement business, mathematical or similar methods and do not produce technical effects are not patentable.⁹⁴ Consequently, computer-implemented inventions⁹⁵ with a technical character are also patentable if they involve an inventive technical contribution to the prior art, irrespective of whether they are implemented by hardware or software.⁹⁶

This is perhaps the most relevant difference in legislation which limits the available range of appropriability mechanisms for software startups operating within the European Union. While software is protected by copyright, the protection extends only to the expression of the concept, not the underlying idea or functionality. Such a protection is mainly useful against piracy. Patents, on the other hand, can protect the technical solution offered by the computer program. The practical implications of this legislative difference will be under scrutiny in the practical part of this thesis.

The framework of patent protection has long been under strong criticism by the law and economics movement. Apart from well-documented critique of monopoly pricing and patent races, critics point out that innovation efforts may spur out naturally. Importantly, informal appropriability methods such as the first mover advantage might be substantial in producing competitive rents without patents.⁹⁷ There is also evidence that suggesting that patenting of software leads to slowdown in innovation, because software innovation is mostly sequential and complements previously developed software solutions.⁹⁸ As such, access to previous

⁹² EPO. 3.6.1 Examples of further technical effects. In: *EPO* [Accessed 19.9.2023]. Available from: https://www.epo.org/en/legal/guidelines-epc/2023/g_ii_3_6_1.html

⁹³ EPO. 3.6 Programs for computers. In: *EPO* [Accessed 19.9.2023]. Available from: https://www.epo.org/en/legal/guidelines-epc/2023/g_ii_3_6.html

⁹⁴ EPO. *Patents for software?* [online]. Munich, Germany: European Patent Office, 2009, p. 12 [Accessed 19.9.2023]. Available from: <https://ciencias.ulisboa.pt/sites/default/files/fcul/inovacao/PI-Pack-INPI-E-Patents-for-Software-EPO.pdf>

⁹⁵ The term “computer-implemented inventions” refers to inventions that incorporate computers, computer networks, or other programmable devices, with at least one aspect being implemented through the use of a computer program.

⁹⁶ EPO, supra note 93, p. 10.

⁹⁷ BOLDRIN, Michele and LEVINE, David K. The Case against Patents. *Journal of Economic Perspectives*. 2013, Vol. 27, no. 1, p. 10. DOI: 10.1257/jep.27.1.3

⁹⁸ See BESSEN, James and MASKIN, Eric. Sequential innovation, patents, and imitation. *The RAND Journal of Economics*. 2009, Vol. 40, no. 4, pp. 611–635. DOI: 10.1111/j.1756-2171.2009.00081.x

knowledge is essential for further progress. Stiglitz heavily criticized the patent system for its costs related to impediment of access to life-saving drugs. Reduced access to generic medicines weighs heavily on developing countries.⁹⁹ Then again, it is important to realize that patenting is extremely important in the biotechnological sector and many small and medium firms would not come into existence without the patent protection.¹⁰⁰ Patent propensity is heavily industry-specific and might be more readily defensible in industries where it provides sufficient incentive for innovating.¹⁰¹

Patents are often sought for reason unrelated to the justification of innovation cost recovery. These scenarios include defensive patenting, occurring when the patentee seeks to prevent others from obtaining a patent that could be used to extract licensing fees for use of the patented solution, and patent suppression, encompassing more or less deliberate decisions not to use or license the technology.¹⁰² Related to this topic is the issue of nonpracticing entities. These are entities that buy up patents, build large patent portfolios, and then use them to extract fees from other companies that are forced to license the protected technology to avoid patent litigation. While optimists might view such behavior as legitimate, because it provides independent inventors who sell their patents to nonpracticing entities with rents they might not otherwise realize, critics view such behavior as harmful.¹⁰³ Unfortunately, the current role of nonpracticing entities largely lives up to their nickname of “patent trolls”. They tend to target firms which have already developed the technology, focusing on industries such as software where patent boundaries are “fuzzy” and innovation is sequential.¹⁰⁴ Small companies are frequently targeted, which bears significant operational impacts for the organization.¹⁰⁵ Such

⁹⁹ STIGLITZ, *supra* note 15, p. 1701.

¹⁰⁰ MAZZOLENI, Roberto and NELSON, Richard R. The benefits and costs of strong patent protection: a contribution to the current debate. *Research Policy*. 1998, Vol. 27, no. 3, p. 276. DOI: 10.1016/S0048-7333(98)00048-1

¹⁰¹ Multitude of empirical studies have confirmed this trend. *See* MANSFIELD, Edwin. Patents and Innovation: An Empirical Study. *Management Science*. 1986, Vol. 32, no. 2, pp. 173–181. ISSN 0025-1909.; COHEN et al., *supra* note 7.

¹⁰² LANDES and POSNER, *supra* note 28, pp. 320–321.

¹⁰³ BESSEN, James and FORD, Jennifer and MEURER, Michael J. The Private and Social Costs of Patent Trolls Property. *Regulation*. 2011, Vol. 34, no. 4, p. 26.

¹⁰⁴ *Ibid.*, pp. 34–35.

¹⁰⁵ *See* CHIEN, Colleen. Startups and Patent Trolls. *Stanford Technology Law Review*. 2013, Vol. 17, pp. 461–506.

strategic uses of the patent system cast a doubt on the efficiency of a patent system as a framework for optimizing inventive activity.¹⁰⁶

However, there are also strong rationales in defense of the patent system. The award of legal monopoly is commonly justified by the incentive effect for research and commercialization of new innovations (as with most intellectual property rights). Landes and Posner argue that the most important arguments for patent protection are not connected to the traditional cost-internalization argument. While a deadweight loss is incurred due to the inefficiencies stemming from monopoly pricing, without patents, the overall structure of markets may be monopolistic rather than competitive. A monopolistic innovator is often capable of internalizing the benefits of his invention without patent protection, but competitive firms lack advantages such as economies of scale or superior efficiency, making them more dependent on legal protection.¹⁰⁷ But this view is controversial, as informal appropriability methods are generally viewed as more important by SMEs than legal protection,¹⁰⁸ suggesting that the use of these informal appropriability methods alone might be sufficient for internalizing benefits of innovation.

Another important argument for existence of the patent system is the disclosure of technical knowledge to the public. In absence of patent protection, the inventor will likely try to keep the innovation secret. Patent proponents believe that early disclosure of technical information has positive effects, holding the view that patents are dynamically pro-competitive even if they are statically anti-competitive.¹⁰⁹ While competitors cannot use the same solution during the term of the patent (that is without obtaining a license from the patent owner), the disclosure allows them to invent around the patented solution, while lowering their costs of production.¹¹⁰ In theory, the absence of patents would lead to increased investment in maintaining trade secrecy (and offensive actions of competitors to unmask them) and inventive activity might be inefficiently directed towards inventions that can be kept secret.¹¹¹ Disclosure also may support dissemination of useful inventions into new industries. If the invention is kept secret, how is the patent owner going to learn that there are other useful applications for his solution?¹¹² While

¹⁰⁶ LANDES and POSNER, *supra* note 28, pp. 320–321.

¹⁰⁷ *Ibid.*, p. 330.

¹⁰⁸ For more information, *see* chapter 4 of this thesis.

¹⁰⁹ MASKUS, *supra* note 26, pp. 40-41.

¹¹⁰ LANDES and POSNER, *supra* note 28, pp. 298–299.

¹¹¹ *Ibid.*, p. 328.

¹¹² *Ibid.*, p. 329.

these are all well-structured claims, there is little systematic evidence that patent disclosure enhances the dissemination of technical information.¹¹³ A consequent economic argument for patenting is the increased efficiency in manufacturing achieved through licensing of patents from an inventor to a more efficient manufacturer, which would be difficult under trade secrecy.¹¹⁴

All in all, the apparent conflict between the lack of empirical evidence of the benefits of patents in the process of fostering innovation and the potentially high costs associated with any change to this system is perhaps best summarized by the statement included in the conclusion of a study produced for the United States Senate in 1958 by Fritz Machlup: *“If we did not have a patent system, it would be irresponsible, on the basis of our present knowledge of its economic consequences, to recommend instituting one. But since we have had a patent system for a long time, it would be irresponsible, on the basis of our present knowledge, to recommend abolishing it.”*¹¹⁵ Subsequent studies, while employing more sophisticated methods, have largely found similarly unsatisfactory evidence for the efficiency of patents.¹¹⁶

3.3 Trade Secrets

A trade secret is an item of information that has commercial value and that the firm possessing the information wants to conceal from its competitors to prevent duplication. Trade secrets encompass a broad range of information, including both technical and business information. This includes information concerning manufacturing processes, research data, software algorithms, business plans, lists of clients, financial information and others.

¹¹³ MASKUS, supra note 26, p. 44.

¹¹⁴ LANDES and POSNER, supra note 28, p. 329. On the other hand, empirical research shows that trade secrecy is viewed among startups as enabling licensing revenue, precluding the presumption that the use of secrecy would entail prohibitive licensing costs for the protected technology. See LEVINE, David S. and SICHELMAN, Ted M. Why Do Startups Use Trade Secrets? *Notre Dame Law Review*. 2018, Vol. 94, p. 811. DOI: 10.2139/ssrn.3166834

¹¹⁵ MACHLUP, Fritz. *An Economic Review of the Patent System* [online]. U.S. Government Printing Office, 1958, p. 80. [Accessed 21.9.2023]. Available

from: https://cdn.mises.org/An%20Economic%20Review%20of%20the%20Patent%20System_Vol_3_3.pdf

¹¹⁶ See BIAGIOLI, Mario. Weighing intellectual property: Can we balance the social costs and benefits of patenting? *History of Science*. 2019, Vol. 57, no. 1, pp. 140–163. DOI: 10.1177/0073275318797787; BOLDRIN and LEVINE, supra note 97.

¹¹⁷ LANDES and POSNER, supra note 28, p. 354.

The regulation of trade secret protection is harmonized across the EU through Trade Secrets Directive.¹¹⁸ In the United States, the Defend Trade Secrets Act¹¹⁹ was enacted for the same reason, because prior to the introduction of this new legislation, trade secrets were governed by state law alone. Although they use different language, the US and EU definitions of trade secrets are broadly identical.¹²⁰ In essence, protection is granted if the information (i) is not generally known or accessible (ii) it has commercial value because it is secret (iii) the owner of the information has taken reasonable steps to keep the information secret!¹²¹ The similarities between the regulations are not surprising considering the key characteristics of trade secret protection are set in Article 39.2 of the TRIPS Agreement.

In general, an infringement of trade secrecy occurs when there is an unauthorized acquisition, use, or disclosure of trade secrets.¹²² This covers situations such as unauthorized access to the secret through theft, bribery or a cyberattack, unlawful disclosure of information by an employee of the company, making copies of confidential files in violation of a non-disclosure agreement etc. Both EU and US legislation incorporate detailed provisions addressing this matter.¹²³ Importantly, independent discovery and creation, reverse engineering and other lawful means of acquisition of trade secrets are permitted and the law provides no remedy.¹²⁴ There is no exclusive right to use the information if it becomes part of the public domain through fair means. While trade secrets have no fixed term, they can run out in the natural course of competition.¹²⁵

¹¹⁸ Directive (EU) 2016/943 of the European Parliament and of the Council of 8 June 2016 on the protection of undisclosed know-how and business information (trade secrets) against their unlawful acquisition, use and disclosure.

¹¹⁹ 18 U.S.C. § 1836, et seq. (2021).

¹²⁰ RADCLIFFE, Jonathan and RYDSTROM, Kirsten. INSIGHT: A Comparison of the New EU and U.S. Trade Secrets Regimes. In: *Bloomberg Law* [online]. 2018 [Accessed 23.9.2023]. Available from: <https://news.bloomberglaw.com/ip-law/insight-a-comparison-of-the-new-eu-and-us-trade-secrets-regimes>

¹²¹ Article 2(1) Trade Secrets Directive; 18 U.S.C. § 1839(3) (2021).

¹²² See RADCLIFFE and RYDSTROM, supra note 120.

¹²³ Article 4 Trade Secrets Directive; 18 U.S.C. § 1839(5)(6) (2021).

¹²⁴ Article 3 Trade Secrets Directive; 18 U.S.C. § 1839(6) (2021).

¹²⁵ MASKUS, supra note 26, p. 49.

As was hinted in the commentary on patent law, trade secrets and patents are closely intertwined and show signs of complementarity.¹²⁶ So when is the use of trade secrecy rationally conceivable for an inventor? Landes and Posner contend that secrecy is justified in three unique situations. The first encompasses cases when disclosure would render the invention worthless. In the second case, the inventor has a patentable invention that he believes that no one will come up with within 20 years (surpassing the term of a patent). In the final case, the inventor has a nonpatentable invention but believes that competitors will require much time to invent it on their own that he will be allowed to obtain substantial returns while maintaining secrecy.¹²⁷ The decision is evident in the first and third instances, but one might ask if the choice in the second case is not wrong? After all patent law generally provides stronger protection. While that is true, the disclosure requirement of a patent might enable competitors to invent around in less time than it would take them to discover the secret. Other factors such as costs of patenting and its relation to value of the invention are also principal in the decision process.¹²⁸ These factors render trade secrecy a viable alternative to patenting. Moreover, empirical studies show that the use of trade secrets is overall preferred over patenting, suggesting the importance of existence of this institute.¹²⁹ The literature also presents an intriguing finding that the implementation of strategies focused on employee loyalty leads to a higher use of trade secrets over patents.¹³⁰ This suggests that to fully understand the relationship between secrecy and patenting, a comprehensive examination is necessary, as solely considering the legal or economic aspects may not offer a complete understanding.

¹²⁶ LANDES and POSNER, supra note 28, p. 371. Notably, firms can sometimes use trade secrets and patents as complements even after patent issuance, see SIMON, Brenda M. and SICHELMAN, Ted M. Data-Generating Patents. *Northwestern University Law Review*. 2017, Vol. 111, No. 2, pp. 377–438.

¹²⁷ LANDES and POSNER, supra note 28, pp. 356–357. The notion that secrecy is used as a substitute for patent protection is also supported by empirical research, see DIRECTORATE-GENERAL FOR INTERNAL MARKET, INDUSTRY, ENTREPRENEURSHIP AND SMES. *Study on Trade Secrets and Confidential Business Information in the Internal Market* [online]. European Commission, 2013, p. 124 [Accessed 26.9.2023]. Available from: <https://ec.europa.eu/docsroom/documents/14838/attachments/1/translations/en/renditions/pdf>.

¹²⁸ LANDES and POSNER, supra note 28, pp. 357–359. Many other business considerations are likely to influence the choice of protection. See BECKERMAN-RODAU, Andrew. The Choice between Patent Protection and Trade Secret Protection: A Legal and Business Decision. *Journal of the Patent & Trademark Office Society*. 2002, Vol. 84, pp. 371–409. ISSN 0882-9098.

¹²⁹ See chapter 4 of this thesis for more information.

¹³⁰ GALLIÉ, Emilie-Pauline and LEGROS, Diégo. French firms' strategies for protecting their intellectual property. *Research Policy*. 2012, Vol. 41, no. 4, pp. 782–783. DOI: 10.1016/j.respol.2011.12.008

A question that arises in the literature is the correlation between the value of the invention and the type of protection employed. Although one would expect, following the reasoning of Landes and Posner, that secrecy will be chosen for innovations of low value (where patent protection would appear too costly) and patents for the most valuable inventions, theoretical models show that large innovations are protected more through secrecy as a result of greater risk of imitation. As the innovation size decreases, use of secrecy is less likely.¹³¹ Further research on this topic is desirable.

Considering the welfare effect of existence of trade secrecy, it is essential to recognize that allowing secrecy is intricately related to striking a balance between the incentive to innovate that trade secrets provide to inventors for whom the patent route is unattractive, and the costs associated with the loss of information that would otherwise be disclosed under patent protection or through other means.¹³² While the incentive function is important, the explanation for existence of trade secrecy lies in the exceptions to its rule.¹³³ Unlike patents, the scope of protection conferred by trade secrets is rather narrow. Trade secret law prohibits only the costliest means of obtaining such secrets through misappropriation.¹³⁴ In the absence of such protection, innovators would likely be pushed into overinvesting into actual secrecy. And importantly, trade secret law deters investment of competitors into industrial espionage and other unlawful means of obtaining information.¹³⁵ The current legal regulation provides an attractive substitute to such costly actions. At the same time, reverse engineering and independent research is allowed, leading to a socially more desirable investment of resources, and limiting the social costs that society would incur under an overly broad scope of protection. As Landes and Posner note, forbidding reverse engineering would inhibit the development of products that do not even compete with the one that is being reverse engineered.¹³⁶

¹³¹ See ENCAOUA, David and LEFOUILI, Yassine. Choosing Intellectual Protection: Imitation, Patent Strength and Licensing. *Annales d'Économie et de Statistique*. 2005, no. 79/80, pp. 241–271.

¹³² LANDES and POSNER, supra note 28, p. 360.

¹³³ BURK, supra note 24, p. 410.

¹³⁴ LANDES and POSNER, supra note 28, p. 364.

¹³⁵ BURK, supra note 24, p. 410.

¹³⁶ LANDES and POSNER, supra note 28, p. 365.

3.4 Trademarks

Trademark law protects signs which are capable of distinguishing the goods or services of one undertaking from those of other undertakings. Such signs may take many forms, including words, letters, figurative elements, and colors. Generally, trademarks must be registered with a trademark office for the protection to be granted.¹³⁷ Costs connected to obtaining the protection are significantly lower compared to patenting, making the trademark protection more accessible. A successful registration grants its owner an exclusive right to use the registered trademark within the respective jurisdiction. The owner is entitled to prevent third parties from using identical or similar marks to those covered by the trademark in course of trade for goods or services where such use would result in a likelihood of confusion. Trademark rights can be maintained indefinitely through the renewal of the trademark. While the initial term of protection and of each renewal of registration is set at 7 years by virtue of Article 18 of the TRIPS Agreement, this has been extended to 10 years in both the European Union and United States.¹³⁸

At the international level, trademarks have been subject to many standardization initiatives. The TRIPS Agreement, the leading harmonization instrument, is largely based on the existing Paris Convention system.¹³⁹ It sets the minimum standard of protection. Furthermore, the Nice Agreement established a widely adopted system of classifying goods and services for the purpose of registering trademarks. It permits actors seeking to trademark a good or a service to indicate appropriate classes for registration, streamlining the process.

Economic actors who wish to obtain trademark protection have multiple routes to choose from. If the actor wishes to register the trademark only in a selected country, he can file his trademark application directly at the relevant national trademark office, subject to local laws.¹⁴⁰

¹³⁷ The current American system function on the mixture of registration rule and first-use rule. More on this in the text below.

¹³⁸ See Article 52 of Regulation (EU) 2017/1001 of the European Parliament and of the Council of 14 June 2017 on the European Union trade mark and Article 48 of Directive (EU) 2015/2436 of the European Parliament and of the Council of 16 December 2015 to approximate the laws of the Member States relating to trade marks. See 15 U.S.C. § 1058 (2021) for regulation applicable in the United States.

¹³⁹ Article 2(1) of the TRIPS Agreement employs incorporation by reference to include material provisions of the Paris Convention within its scope.

¹⁴⁰ In the European Union, an application can also be submitted to the Benelux Office of Intellectual Property for trademark protection in those three member states. In the United States, the applicant has the option of filing for a

In the European Union, it is also possible to submit an application for an European Union trademark through the European Union Intellectual Property Office.¹⁴¹ If successful, the owner will be granted the exclusive right in all member states of the European Union. Crucially, the protection provided by the European Union trademark coexists with trademark protection at the national level within member states. This national regime has been harmonized through EU legislation in its core provisions to ensure a consistent level of protection.¹⁴² Additionally, an international registration procedure is available. The Madrid System, as governed by the Protocol Relating to the Madrid Agreement Concerning the International Registration of Marks, allows international registration of trademarks. Protection can be obtained in one or more contracting states. The Madrid system is centrally administered; however, it does not create a single unified registration as in the case of the European Union trademark system. Each country has discretion to refuse the application.¹⁴³ Once the trademark is registered, it is granted equivalent protection in each concerned jurisdictions as if it had been directly deposited with that country's office.¹⁴⁴ The main advantages of the Madrid System lie in simplification of the process and reduction of financial demands on the applicants.

While several differences exist in the legal regimes of the European Union and the United States, only a major one will be highlighted here. The United States follows a "first to use" doctrine, whereby the first party to use a mark in commerce generally has superior rights over subsequent users of such mark.¹⁴⁵ In relation to EU trademark, the doctrine of "first to file" is upheld, where a right is granted to the person who first filed a trade mark application.¹⁴⁶ Same approach is followed by the EU Directive approximating the law of EU member states.¹⁴⁷

trademark at the federal level with the United States Patent and Trademark Office, as stipulated by the Lanham Act. Trademarks can also be registered at the state level.

¹⁴¹ The principal piece of legislation governing the European Union trademark is the Regulation (EU) 2017/1001 of the European Parliament and of the Council of 14 June 2017 on the European Union trade mark.

¹⁴² The main instrument is the Directive (EU) 2015/2436 of the European Parliament and of the Council of 16 December 2015 to approximate the laws of the Member States relating to trade marks.

¹⁴³ Article 5 of the Protocol Relating to the Madrid Agreement Concerning the International Registration of Marks.

¹⁴⁴ Article 4 of the Protocol Relating to the Madrid Agreement Concerning the International Registration of Marks.

¹⁴⁵ Please note that the "intent to use" application can also establish priority. *See* 15 U.S.C. § 1051 (2021) and 15 U.S.C. § 1057(c) (2021).

¹⁴⁶ Article 8 of the Regulation (EU) 2017/1001 of the European Parliament and of the Council of 14 June 2017 on the European Union trade mark.

¹⁴⁷ Article 5 of the Directive (EU) 2015/2436 of the European Parliament and of the Council of 16 December 2015 to approximate the laws of the Member States relating to trade marks.

Trademarks operate quite differently from copyrights and patents and are based on objectives other than promoting investment into innovation activity¹⁴⁸ Most scholars even claim that a trademark is not a public good, as it has social value only when used to identify a single brand.¹⁴⁹ The aim of trademark exclusivity is not to spur development of better trademarks. Rather, the value of a trademark to the firm that uses it lies in saving of customer's search costs, because the trademark conveys information about the quality of the firm's brand.¹⁵⁰ Instead of having to become the expert on the characteristics of products, consumers can rely on trademarks as a quick indicator of quality and characteristics. Although the leading justification for trademark protection rests on the signaling theory and the preservation of the salience of the signal conveyed to customers,¹⁵¹ trademarks also have a self-enforcing feature, because they are valuable only insofar as they denote consistent quality. Only a firm capable of maintaining consistent quality has an incentive to invest into the development of a strong trademark. Related to this is the idea that without trademark protection, free riding on the reputation of a strong trademark would be cheap and the incentive to develop a valuable trademark might be lost altogether.¹⁵² Landes and Posner deny any social costs of trademark law in connection to brand advertising, excessive competition, or monopoly power.¹⁵³

¹⁴⁸ MENELL, Peter S. and SCOTCHMER, Suzanne. Chapter 19 Intellectual Property Law. In: POLINSKY, A. M. and S. SHAVELL, eds. *Handbook of Law and Economics*. Vol. 2. Elsevier, 2007, p. 1536. DOI: 10.1016/S1574-0730(07)02019-1

¹⁴⁹ For a contrasting view on the issue, see BARNES, David. A New Economics of Trademarks. *Northwestern Journal of Technology and Intellectual Property*. 2006, Vol. 5, no. 1, pp. 22–67. ISSN 1549-8271.

¹⁵⁰ LANDES and POSNER, supra note 28, p. 168.

¹⁵¹ BURK, supra note 24, p. 409.

¹⁵² LANDES and POSNER, supra note 28, p. 168.

¹⁵³ *Ibid.*, pp. 172–174.

4 Empirical Evidence on the Use of Innovation Appropriability Methods by Startups: A Literature Review

4.1 Introduction

This literature review aims to review the use of various appropriability strategies used by startups in the view of available empirical literature. Several studies have examined the strategies used by large companies to appropriate the value of their innovations and their approach to the patent system.¹⁵⁴ Although such studies provided valuable insights, their results may not be applicable to startups. First and foremost, the majority of existing studies have focused on the manufacturing sector, while startups typically operate in software or high-tech industries focused on development of radical innovations. Moreover, startups frequently do not have any revenues to protect, which makes the value to be obtained by patenting seem remote. During their initial phases, startups are engaged in the process of search for the right product to develop, often pivoting to new ideas, as picking the winning marketable idea may be difficult. Finally, these companies frequently have very limited budgets, allowing them to file only a small number of patent applications.¹⁵⁵

Perhaps the most complete study on the topic was conducted in 2008 by a team at the University of California, Berkeley.¹⁵⁶ To the best of my knowledge, the Berkeley survey represents the first comprehensive empirical research holistically mapping the preferred methods of appropriating innovation value by startups, although it predominantly focuses on patenting.¹⁵⁷ While there are some studies that touched upon the subject of intellectual property in startups, none of them presented rich data on the use of appropriability methods. Topics included inter alia the relationship between patenting and fundraising,¹⁵⁸ patenting and firm

¹⁵⁴ The most important examples include the Yale and Carnegie surveys, see LEVIN et al., supra note 7, and COHEN et al., supra note 7. Notably, the research undertaken by these studies was also revisited in 2023, see MEZZANOTTI, Filippo and SIMCOE, Timothy. Innovation and Appropriability: Revisiting the Role of Intellectual Property. *NBER Working Paper No. w31428*. 2023. DOI: 10.2139/ssrn.4505058

¹⁵⁵ GRAHAM, Stuart J. H. and SICHELMAN, Ted M. Why Do Start-Ups Patent? *Berkeley Technology Law Journal*. 2008, Vol. 23, no. 3, pp. 1073–1074. ISSN 1086-3818.

¹⁵⁶ See GRAHAM et al., supra note 4.

¹⁵⁷ An overview of studies examining motives to patent and reasons not to patent from 2010 can be found in GRAHAM, Stuart J. H. and SICHELMAN, Ted M. Patenting by Entrepreneurs: An Empirical Study. *Michigan Telecommunications and Technology Law Review*. 2010, Vol. 17, no. 1, pp. 137–148. SSN 1528-8625.

¹⁵⁸ See MANN, Ronald J. and SAGER, Thomas W. Patents, venture capital, and software start-ups. *Research Policy*. 2007, Vol. 36, no. 2, pp. 193–208. DOI: 10.1016/j.respol.2006.10.002; HSU, David H. and ZIEDONIS,

success,¹⁵⁹ and the relationship between software patenting, the length of the funding cycle, commercialization of the new technology and company exit.¹⁶⁰

The following text aims to present empirical studies that have investigated which mechanism startups use to appropriate gains from innovation. It's worth noting that startups represent a unique category of companies, even though they are often conflated with small and medium-sized enterprises.¹⁶¹ However, such classification is misleading. While startups are typically small companies, their key characteristics include rapid growth, scalability and typically also presence in technology-related fields. This raises the question of whether such companies behave differently when commercializing their innovations. Since the empirical literature on the utilization of appropriability strategies among startups is limited, with the Berkeley survey being a notable exception, the review will also include papers and surveys examining companies that share certain key characteristics with startups. Where relevant, reference will also be made to papers that examined the topic of appropriability mechanism within the general population of companies.

The structure of the following literature review follows the approach taken by López,¹⁶² who examined the empirical evidence regarding the use of appropriability mechanisms among the general population of firms. Therefore, subchapter 4.2 provides background on various appropriability methods that firms can employ. Subchapter 4.3 proceeds to review available empirical evidence on the topic of appropriability methods used among startups. Finally,

Rosemarie H. Patents as Quality Signals for Entrepreneurial Ventures. *Academy of Management Proceedings*. 2007, Vol. 2008, pp. 1–6. DOI: 10.5465/AMBPP.2008.33653924

¹⁵⁹ See GAULE, Patrick. Patents and the Success of Venture-Capital Backed Startups: Using Examiner Assignment to Estimate Causal Effects. *CERGE-EI Working Paper Series No. 546*. 2015. DOI: 10.2139/ssrn.2633503

¹⁶⁰ See COCKBURN, Iain M. and MACGARVIE, Megan. Patents, Thickets, and the Financing of Early-Stage Firms: Evidence from the Software Industry [online]. *NBER Working Paper w13644*. 2007 [Accessed 20.3.2023]. Available from: <https://www.nber.org/papers/w13644>

¹⁶¹ There is extensive literature in the realm of SMEs that delves into the subject of appropriation of innovation. See KITCHING, John and BLACKBURN, Robert. Intellectual property management in the small and medium enterprise (SME). *Journal of Small Business and Enterprise Development*. 1998, Vol. 5, no. 4, pp. 327–335. DOI: 10.1108/EUM000000006797; LEIPONEN, Aija and BYMA, Justin. If you cannot block, you better run: Small firms, cooperative innovation, and appropriation strategies. *Research Policy*. 2009, Vol. 38, no. 9, pp. 1478–1488. DOI: 10.1016/j.respol.2009.06.003; OLANDER, Heidi and HURMELINNA-LAUKKANEN, Pia and MÄHÖNEN, Jukka. What's Small Size Got to Do with It? Protection of Intellectual Assets in SMEs. *International Journal of Innovation Management*. 2009, Vol. 13, no. 03, pp. 349–370. DOI: 10.1142/S1363919609002339.

¹⁶² LÓPEZ, supra note 16.

subchapter 4.4 concludes, presenting the findings, analyzing common trends, and identifying gaps in the literature.

4.2 Outline of Appropriability Methods

As was highlighted in the theoretical part of this thesis, information-goods and knowledge are public goods, meaning they have the quality of non-rivalrous consumption. As such, if innovators could not rely on some mechanisms to protect their innovations, rivals could imitate their work at minimal cost, making it challenging to recover expenses, let alone make a profit.¹⁶³ Therefore, when an innovator introduces a new product to the market, he must assess the risk of imitation or independent development of the innovation by competitors. If the magnitude and likelihood of such risk is not insignificant, use of appropriability mechanisms is warranted.¹⁶⁴ Theory distinguishes between formal and informal methods for appropriation of returns from innovations.

Formal appropriability methods are enshrined in law and traditionally include mechanisms such as patenting, copyright, and trademarks.¹⁶⁵ These methods are designed to provide ex ante incentives to innovate by providing a reward system that makes it easier for innovators to achieve ex post profits if their innovation is successful by allowing them to exclude imitators for a limited period.¹⁶⁶

Informal appropriability methods lack a legal foundation but arise from a company's strategic approach. These encompass strategies such as lead time advantage, complementary assets (such as production, implementation or marketing capabilities),¹⁶⁷ maintaining secrecy, and difficulty of reverse engineering.¹⁶⁸ While secrecy is classifiable as a type of intellectual property, because trade secrets are legally protected in jurisdictions relevant to this thesis –

¹⁶³ Ibid.

¹⁶⁴ GRAHAM and SICHELMAN, supra note 155, pp. 1071–1072.

¹⁶⁵ MORALES, Pablo et al. The effectiveness of appropriation mechanisms for sustainable innovations from small and medium-sized enterprises. *Journal of Cleaner Production*. 2022, Vol. 374, p. 2. DOI: 10.1016/j.jclepro.2022.133921

¹⁶⁶ HALL, Bronwyn et al. The Choice between Formal and Informal Intellectual Property: A Review. *Journal of Economic Literature*. 2014, Vol. 52, no. 2, p. 376. DOI: 10.1257/jel.52.2.375

¹⁶⁷ For discussion on the benefits of complementary assets, see TEECE, David J. Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy*. 1986, Vol. 15, no. 6, pp. 285–305. DOI: 10.1016/0048-7333(86)90027-2

¹⁶⁸ MORALES, supra note 165.

including member states of the European Union and the United States – it will be considered an informal appropriability methods in line with most previous studies and theoretical literature.¹⁶⁹ If trade secrets and confidential information were to be included in the definition of intellectual property, any “new to market” innovation would, by definition, contain intellectual property. The goal is, however, is to ascertain whether formal intellectual property rights are instrumental in achieving gains from innovation.¹⁷⁰

Companies may choose to use different strategies at various stages of product development and commercialization. As such, companies may, for example, rely upon secrecy prior to the commercialization of a new product and use patents subsequently. Alternatively, they may disregard formal protection altogether and employ aggressive marketing and lead-time strategies. Crucially, various appropriability methods interact with one another. Some mechanism can be viewed as pre-requisite, derivative or supportive of other forms of protection.¹⁷¹ As such, trade secrecy can act as both a complement and a substitute to patenting.¹⁷² In some industries, trade secrets can also be used to maintain lead-time advantage.¹⁷³

4.3 The Empirical Evidence

Given the limited literature on appropriability strategies among startups, this subchapter will be organized around key findings from the Berkeley survey. Where other data is available, these findings will then be compared and contrasted with results from other pertinent literature. The classification of this subchapter will thus be as follows: [4.3.1 Patent Holding Among Startups](#), [4.3.2 The Use and Importance of Selected Appropriability Methods](#), [4.3.3 Motives for Patenting](#), [4.3.4 Reasons to Forgo Patenting](#), [4.3.5 The Relationship Between Patents and Financing of Startups](#).

¹⁶⁹ Previous studies have employed the term “secrecy” in place of “trade secret,” a terminology that might be perceived as having both broader and narrower connotations than a “trade secret”. The authors of the Berkeley study decided to use the term “secrecy” in their study, as the understanding of the two terms did not differ substantially among respondents. I have chosen to take an identical approach, using the terms “secrecy” and “trade secrets” interchangeably.

¹⁷⁰ GREENHALGH and ROGERS, supra note 81, p. 152.

¹⁷¹ LÓPEZ, supra note 16, p. 4.

¹⁷² LEVINE and SICHELMAN. supra note 114, p. 810.

¹⁷³ Ibid., p. 809.

4.3.1 Patent Holding Among Startups

The Berkeley survey¹⁷⁴ found that startups hold more patents than was previously reported. On average, high-tech firms held close to 5 (4.7) patents and applications. Furthermore, venture-backed startups held in average almost 19 (18.7) patents. These findings are however strongly influenced by a few firms with significant patent portfolios, as 61% of firms from the general population held no patents at all. Among venture-backed firms, a comparatively small 18% held no patents or applications.¹⁷⁵ The results clearly show that venture-backed startups tend to hold and file for more patents compared to the general population of innovative technological firms.¹⁷⁶

The results of the Berkeley survey on patent-holding are in stark contrast to previous research. A paper by Ronald J. Mann and Thomas W. Sager analyzed patent holding by venture-backed software and biotechnology startups and possible links between patenting and company performance. They reported that “*The 877 software firms have a combined 624 patents, for an average of 0.71 patents per firm.*”¹⁷⁷ In the biotechnology industry, there was an average of 5.48 patents per firm.¹⁷⁸ There are number of factors that could have caused this discrepancy in findings; however, no single factor can account for the results entirely. Part of the problem lies in the difference of employed research methods.¹⁷⁹ However, even when one matches the

¹⁷⁴ The study was conducted among 1,332 early-stage technological companies, including both the general population and venture-backed startups, The surveyed companies were founded in the United States during the last ten years prior to study date. The field of study was limited to certain high technology sectors – biotechnology, software, medical device, and IT hardware. See GRAHAM et al., supra note 4, pp. 1263–1274.

¹⁷⁵ GRAHAM et al., supra note 4, pp. 1275–1276.

¹⁷⁶ The higher rate of patenting among VC-backed startups might be explained by the fact that investors are persuading their portfolio companies to apply for patent protection; alternatively, investors might be more inclined to investing into companies with a product that is more amenable to patenting. Another plausible explanation might be that venture-backed firms are producing higher quality innovations that that meet the criteria for patentability, which helps them secure funding in the first place. See SAMUELSON, Pamela. Why do software startups patent (or not)? *Communications of the ACM*. 2010, Vol. 53, no. 11, p. 31. DOI: 10.1145/1839676.1839687

¹⁷⁷ MANN and SAGER. supra note 158, p. 197.

¹⁷⁸ Ibid.

¹⁷⁹ Authors of the Berkeley study specifically asked the respondents to report on patents from three sources: coming from the founders themselves, acquired by the company and filed by the company. All patent application were counted as well, even though not all application results in patents being granted. Generally, comparable studies use a method of matching granted patents listed in the United States Patent and Trademark Office to company names. For information, see GRAHAM et al., supra note 4, pp. 1274–1275.

method employed by Mann and Sager, the patenting figures in the Berkeley survey are still substantially higher.¹⁸⁰ Different timing of surveying also can not alone explain the difference, but it could have had an effect.¹⁸¹ It is, however, likely that the combination of these factors had a significant influence on the results.

Table I Patents and Application Held by Startup Companies: Results of the Berkeley Survey

Table 1: Patents and Applications Held by Startup Companies⁶⁷

Source	Industry	All respondents	Biotechnology	Medical Devices	Software/Internet	IT Hardware [‡]
Population of companies (D&B)						
Companies holding patents/applications (share)		39%	75%	76%	24%	—
Average # patents/applications held (all companies)		4.7	9.7	15.0	1.7	—
Average # filed by company (patent holders only)		8.1	8.5	13.0	5.0	—
Average # from founders (patent holders only)		1.9	2.0	3.0	1.2	—
Average # acquired (patent holders only)		2.1	2.4	3.7	0.9	—
Venture-backed companies						
Companies holding patents/applications (share)		82%	97%	94%	67%	91%
Average # patents/applications held (all companies)		18.7	34.6	25.2	5.9	27.4
Average # filed by company (patent holders only)		15.8	22.9	16.1	7.1	23.6
Average # from founders (patent holders only)		2.5	3.8	3.8	0.7	3.1
Average # acquired (patent holders only)		4.2	9.0	6.5	0.7	3.5

[‡] Available only for *VentureXpert* listed companies.

Source: GRAHAM et al., p. 1277, 2009¹⁸²

Furthermore, a study by Conti et al. found that in the sample of 787 Israeli startups, 433 were never granted a patent nor had their founders received a patent relevant to the startup. For those companies with at least one patent, the average number of patents was 6.3¹⁸³ These results are slightly lower than those reported by the Berkeley survey, the difference is however not as

¹⁸⁰ Ibid., p. 1281.

¹⁸¹ Ibid.

¹⁸² Ibid., p. 1277.

¹⁸³ CONTI, Annamaria and THURSBY, Jerry and THURSBY, Marie. Patents as Signals for Startup Financing. *The Journal of Industrial Economics*. 2013, Vol. 61, no. 3, pp. 602–603. DOI: 10.1111/joie.12025

pronounced and can likely be attributed to factors such as slightly different methods of patent counting and differences in legal regulation of patenting.¹⁸⁴

Another principal finding of the Berkeley survey is that the propensity to patent is heavily industry specific.¹⁸⁵ Company's age is not a significant factor.¹⁸⁶ There is no overriding characterization of how startups use and are affected by the patent system.¹⁸⁷ Although three quarters of biotechnology startups in the general population have filed patent applications or own patents, the proportion is considerably lower for software startups, with only about a quarter having submitted patent applications or holding patents.¹⁸⁸ Furthermore, venture-backed firms are much more likely to hold patents regardless of industry.¹⁸⁹ The variation in patent holdings is to an extent influenced by a higher probability of software startups to have no patents in their possession. Large patent-portfolio companies also play a role in influencing the final statistics.¹⁹⁰ Arguably the most significant finding is that software startups are notably less inclined to possess patents when compared to companies in all other sectors covered by the survey.¹⁹¹ Similarly, Conti et al. also find that patenting is influenced by industry, with companies in sectors such as life sciences, medical devices or semiconductors seeing higher averages of patents.¹⁹²

¹⁸⁴ For each startup, patents granted to the startup or patents where at least one of the founders was listed as an inventor were counted. *See Ibid.*, p. 602.

¹⁸⁵ GRAHAM et al., *supra* note 4, pp. 1262.

¹⁸⁶ *Ibid.*, p. 1276.

¹⁸⁷ SICHELMAN, Ted M. Startups & the Patent System: A Narrative. *SSRN Electronic Journal*. 2012, p. 1. DOI: 10.2139/ssrn.2029098

¹⁸⁸ GRAHAM et al., *supra* note 4, pp. 1277.

¹⁸⁹ *Ibid.*, p. 1280.

¹⁹⁰ *Ibid.*, pp. 1278–1279.

¹⁹¹ Interestingly, the authors also discovered that early-stage IT companies may be more susceptible to nuisance patent disputes than was previously believed. Among the research group of venture-backed startups, 39% of IT hardware firms and 12% of software firms acquired a patent license. Out of those firms that took a patent license, approximately one in four of their last patent licenses was acquired solely for defensive purposes, but not to gain technology or information. *See Ibid.*, pp. 1318–1320.

¹⁹² CONTI et al., *supra* note 183, pp. 602–603.

4.3.2 The Use and Importance of Selected Appropriability Methods

For this review, the most important results concern the data on the use and importance of various appropriability methods. Among the respondents of the Berkeley survey, first mover advantage is clearly ranked as the most important appropriability strategy overall. Next – secrecy, complementary assets, and patenting – are rated by respondents on average between “slightly important” and “moderately important,” although closer to the latter. The final three appropriability strategies – difficulty of reverse engineering, trademarks, and copyright – fall between “slightly important” and “moderately important.”¹⁹³

Figure 1: Capturing Competitive Advantage from Technology, by Industry¹⁰⁹

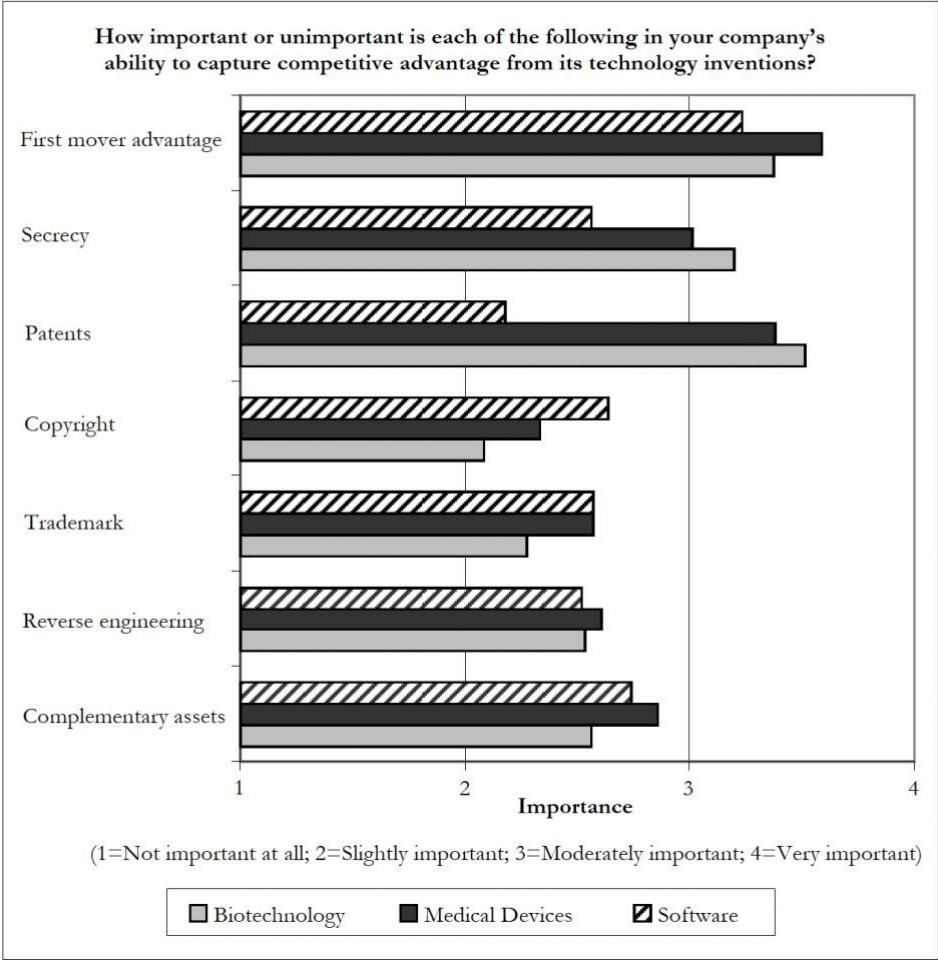


Figure 1 Capturing Competitive Advantage from Technology, by Industry: Results of the Berkeley Survey

Source: GRAHAM et al., p. 1290, 2009¹⁹⁴

¹⁹³ GRAHAM et al., supra note 4, p. 1289.

¹⁹⁴ Ibid., p. 1290.

It is noteworthy that the top three most important methods of protection belong to the category of informal appropriability methods.¹⁹⁵ However, characteristics such as the technological focus of the company or the type of funding secured influence the degree of importance attributed to various appropriability methods. Clearly, for biotechnology, medical devices and IT hardware startups, patenting is among the most important appropriability strategies. For biotechnology firms, this result remains true even when researchers excluded venture-backed startups. This is significant, as in a previous study conducted by Cohen, Nelson, and Walsh,¹⁹⁶ patenting was considered less effective than secrecy in securing competitive advantage from innovation among the sample of both large and small pharmaceutical firms. Furthermore, in the Berkeley survey, venture-backed IT hardware firms ranked patenting at least as important as secrecy.¹⁹⁷ This is surprising, because in the 1994 Carnegie-Mellon Survey, IT hardware firms reported that patenting was effective at protecting about one-quarter of their product innovations, while secrecy was effective at protecting about one-half.¹⁹⁸

For software startups, patenting is rated as the least important appropriability strategy.¹⁹⁹ This is in line with the assertion by Mann that patenting to maintain supracompetitive pricing is not a viable strategy for software firms.²⁰⁰ At the same time, however, software startups rely on secrecy significantly less than on first mover advantage and complementary assets. This is also consistent with the conclusions of a research conducted by Mann. Because reverse engineering a functionality of a software product does not violate trade secret law, the protection offered by such mechanism is limited.²⁰¹ Trade secrecy does not establish a “foothold” protection, as many firms will typically attempt to develop the same product and trade secrecy does nothing to prevent them from doing so.²⁰² Then again, as the results of the Berkeley survey show, most software startups choose to pursue the strategy of shipping their product as fast as possible and obtaining a lead-time advantage. In this regard, utilizing trade secrecy as a complementary strategy before the product is launched could be a sensible

¹⁹⁵ Ibid., s. 1289.

¹⁹⁶ See COHEN et al., supra note 7.

¹⁹⁷ GRAHAM et al., supra note 4, p. 1292.

¹⁹⁸ Ibid., pp. 1291–1292.; see COHEN et al., supra note 7.

¹⁹⁹ Ibid., pp. 1292–1293.

²⁰⁰ MANN, Ronald J. Do Patents Facilitate Financing in the Software Industry? *Texas Law Review*. 2005, Vol. 83, no. 4, p. 981. ISSN 0040-4411.

²⁰¹ Ibid., p. 1020.

²⁰² Ibid.

approach. While copyright is rated as the most important formal appropriability mechanism by software startups in the Berkeley survey, interviews conducted by Mann support the perspective that copyright is not useful for exclusion of competitors.²⁰³ Generally, copyright protects the lines of code of which the program consists, so it is easy to reverse engineer and write a completely new program consisting of different code, yet providing the same functionality.²⁰⁴ The value of copyright lies elsewhere. It can prevent customers from copying the code and thus obtaining the product without paying.²⁰⁵ Furthermore, copyright protection prevents employees or business partners from leaking the code or otherwise infringing upon the protected work. Copyright offers a simple and effective remedy in such cases.²⁰⁶

While the Berkeley survey finds that product innovators place almost twice as much importance on patenting compared to process innovators, the choice of a viable appropriability strategy seems to be mainly driven by technology differences, not by the type (product vs. process) of innovation.²⁰⁷ Moreover, the scholars find that technology startups in all industries use various appropriability strategies, possibly in complementary ways.²⁰⁸ This is significant, as a common preconception is that different forms of intellectual property protection often serve as substitutes for each other. A more comprehensive understanding of this issue is warranted.²⁰⁹

The general trend of favoring informal appropriability mechanism is also visible in the results of a study conducted by the Cordes et al.¹⁰ Similarly to the Berkeley survey, respondents

²⁰³ Ibid., p. 1012.

²⁰⁴ Ibid., p. 1013.

²⁰⁵ Ibid., p. 1015.

²⁰⁶ Ibid., pp. 1017–1018.

²⁰⁷ GRAHAM et al., supra note 4, pp. 1293–1294.

²⁰⁸ Ibid., p. 1294.

²⁰⁹ GRAHAM, Stuart J. H. and SICHELMAN, Ted M. Intellectual Property and Technology Startups: What Entrepreneurs Tell Us. In: Marie C. Thursby (ed.), *Technological Innovation: Generating Economic Results (Advances in the Study of Entrepreneurship, Innovation & Economic Growth, Vol. 26)*. Bingley: Emerald Group Publishing Limited, 2016, p. 165. ISBN 978-1-78635-238-5. For a discussion on complementary use of various appropriability methods such as trade secrets, patents and first mover advantage, see LEVINE and SICHELMAN, supra note 114.

²¹⁰ The study was conducted in the United States among small firms in high technology sectors. The sample comparatively smaller to the Berkeley study, responses of 200 firms were recorded. Furthermore, it would be misleading to say that the study targeted startups, as a quarter of the respondents had been in business for less than 10 years, however the average age of the firms responding was 25 years. The survey companies were also larger in terms of the number of employees compared to the respondents who participated in the Berkeley survey. See CORDES, Joseph J. and HERTZFELD, Henry and VONORTAS, Nicholas S. A Survey of High Technology

were asked to indicate the effectiveness of following appropriability methods: patents, copyrights, trademarks, trade secrets and gaining lead time. Interestingly, for both product and process innovators, informal appropriability methods topped the rankings. In terms of total number of respondents rating lead time as important or very important, it dominated all other appropriability methods. Trade secrecy was rated as a close second for protecting product innovation, and even more process innovation.²¹¹ These results support the theoretical notion that secrecy and lead time can act as complements, and that trade secrecy is especially important for process innovations.²¹² Patents and other formal forms of intellectual property protection were ranked behind secrecy and lead time by a considerable margin. Only half of the respondents rated patents as an important or very important form of protection related to product innovations and only 37 % of respondents indicated so for process innovations.²¹³ The relative higher importance assigned to patenting by product innovators is in line with the findings of the Berkeley survey, although it reported that the difference is even more pronounced and is likely driven primarily by technology differences.²¹⁴ However, it is surprising to see that patenting was rated so low in importance, since the sample companies operated in six high-technology sectors where patenting is typically perceived as relatively important.²¹⁵ It is difficult to explain this difference when comparing the results with the Berkeley survey. The general trend, however, is clearly consistent – informal appropriability strategies lead in importance for small innovative firms.

A more recent study titled “*Which IP strategies do young highly innovative firms choose?*”²¹⁶ also examined the appropriability methods used by R&D intensive young companies (YICs).²¹⁷ The study finds that young highly innovative companies report higher

Firms. *United States Small Business Administration* [online]. 1999 [Accessed 23.3.2023]. Available from: https://www.researchgate.net/publication/267419022_A_Survey_of_High_Technology_Firms

²¹¹ Ibid., pp. 55–57.

²¹² HALL et al., supra note 166, p. 380.

²¹³ CORDES et al., supra note 210, p. 58.

²¹⁴ See GRAHAM et al., supra note 4, pp. 1293–1294.; CORDES et al., supra note 210, pp. 55–57.

²¹⁵ The sectors included Biotechnology, Advanced Materials, Subassemblies, Testing and Measurement, and Telecommunications and Factory Automation.

²¹⁶ VEUGELERS, Reinhilde and SCHNEIDER, Cédric. Which IP strategies do young highly innovative firms choose? *Small Business Economics*. 2018, Vol. 50, no. 1, pp. 113–129. DOI: 10.1007/s11187-017-9898-y

²¹⁷ Authors of the study note that the sample of firms used for this paper do not represent startups, but young highly innovative companies. These firms have already successfully survived the startup phase. Such firms are defined

use of appropriability strategies compared to other innovators. While the study did not survey effectiveness or importance of appropriability methods, it provides statistics on their use. Similarly to the Berkeley survey, lead time and secrecy emerge as the two most prominent mechanism for YICs. Trademarks, patents, and complexity follow with a considerable gap, with copyright being used in only 12.5% of companies²¹⁸ YICs thus rely mainly on informal appropriability methods. But some of the differences as compared to the Berkeley survey are hard to reconcile – especially the low use of copyright is surprising. The results are probably influenced by the cross-sectional nature of the selected dataset.²¹⁹

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Table 3 YICs and appropriation strategies—use

	YICs	Use	SD	Other innovators	Use	SD	Mean difference YICs–other innovators
Formal protection	101	64.4%	0.481	1242	55.4%	0.497	0.090*
Patent	97	39.2%	0.491	1217	38.6%	0.487	0.006
Utility model	93	12.9%	0.337	1171	29.6%	0.457	-0.167***
Design	93	3.2%	0.178	1143	7.0%	0.255	-0.038
Trademark	98	42.9%	0.497	1180	31.4%	0.464	0.114**
Copyright	96	12.5%	0.332	1140	14.8%	0.355	-0.023
Informal protection	101	84.2%	0.367	1201	69.4%	0.461	0.148***
Secrecy	99	75.8%	0.431	1169	55.1%	0.498	0.207***
Complexity	95	30.5%	0.463	1119	26.1%	0.439	0.044
Lead time	99	76.8%	0.424	1176	59.6%	0.491	0.172***

***1%, **5%, *10%—significance levels

Figure 2 Use of Appropriation Strategies among YICs

Source: VEUGELERS et SCHNEIDER, p. 122, 2018²²⁰

Furthermore, the authors establish that YICs are less likely to use no protection or only formal methods of protection when compared to other innovators. Conversely, YICs – as the firms combining a young age, small size, and a highly innovative profile – are significantly more likely to use a combination of informal and formal methods of appropriating innovation

by the following criteria: the company needs to be less than 10 years old, have less than 250 employees and spend at least 10% of its revenues on R&D. See Ibid., pp. 118–119.

²¹⁸ Ibid., pp. 121–122.

²¹⁹ Authors of the survey at hand has very well controlled for several factors but for a cross-sectional nature of the firm sample. As such, the results of the study cannot be viewed as causal. See Ibid., p. 118.

²²⁰ Ibid., p. 122.

returns,²²¹ further supporting the thesis for complementary use of appropriability mechanisms. The study also tested various other combinations of these three firm characteristics and found that it is the combination of young age and high R&D intensity that distinguishes YICs from other innovators regarding the use of a full appropriation strategy.²²²

Veugelers et Schneider also find that large and disruptive innovations are more likely to be protected by secrecy. There is an important caveat, however: secrecy is not a substitute for formal protection. On the contrary, firms with large innovations are more likely to deploy secrecy along with formal appropriability methods.²²³ These results thus only partly support the prediction in literature that large innovation will be primarily protected through secrecy.²²⁴ All in all, the most robust result of the study is that characteristics of being a young, small and highly innovate company are associated with a higher likelihood to use an IP strategy and that YICs primarily use informal appropriability mechanism.

A study by Willoughby investigated the use of intellectual property mechanism in the biotechnology sector.²²⁵ The sample of biotechnology firms used for the paper included startups, SMEs, and larger firms.²²⁶ This review focuses on the findings relevant to startup firms.²²⁷ The paper makes it apparent that the most utilized formal appropriability methods among biotechnology startups are trade secrets and patents, with both methods being employed at a similar level of frequency.²²⁸ The results differ from the findings of the Berkeley survey, which saw patents as the most used formal method of protection by biotechnology startups by some margin.²²⁹ The divergence in findings may be attributed to differences in the startup samples used, the nature of the innovations produced, and variations in the formulation of research questions. Importantly, Willoughby measures the use of various appropriability methods, rather than their importance. Nevertheless, if we use the number of intellectual property items as a

²²¹ Ibid.

²²² Ibid., p. 124.

²²³ Ibid., p. 125–126.

²²⁴ Ibid., p. 124. Also see ANTON, James J. and YAO, Dennis A. Little Patents and Big Secrets: Managing Intellectual Property. *The RAND Journal of Economics*. 2004, Vol. 35, no. 1, pp. 1–22. DOI: 10.2307/1593727

²²⁵ WILLOUGHBY, Kelvin. Intellectual Property Management and Technological Entrepreneurship. *SSRN Electronic Journal*. 2010. DOI: 10.2139/ssrn.1630666

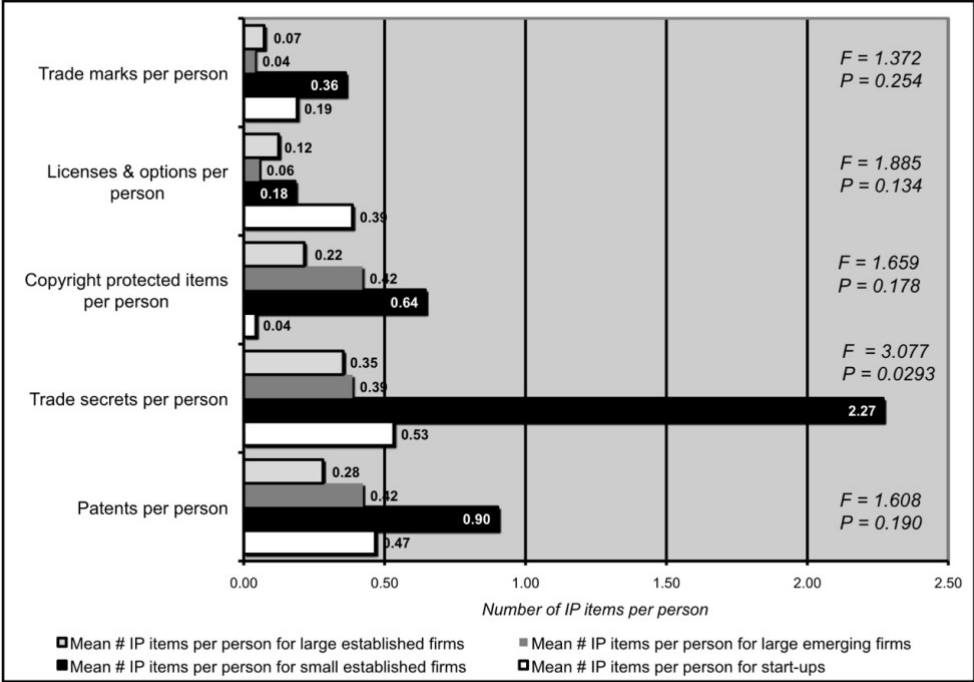
²²⁶ Ibid., pp. 13–14.

²²⁷ Defined as firms no older than 5 years and no larger than 25 employees. See Ibid., p. 13.

²²⁸ Ibid., p. 25.

²²⁹ GRAHAM et al., supra note 4, pp. 1290.

proxy for their importance, both studies confirm that trade secrets and patents are the most important formal appropriability methods utilized by biotechnology startups. Another major conclusion of the paper, in line with the findings presented in the Berkeley survey, is that biotechnology firms in general tend to employ and balance many types of intellectual property protection simultaneously.²³⁰



F = F Ratio from one-way Analysis of Variance calculations. P = probability that the results are not statistically significant.

Figure 3 Use of Intellectual Property Items Among Biotechnology Companies

Source: WILLOUGHBY, p. 25, 2010²³¹

Willoughby also finds that small biotechnology firms make heavier use of nearly all forms of intellectual property rights as compared to large enterprises (on a per person basis). Furthermore, the emphasis put on trade secrets by small firms is significantly higher than in other firms.²³² To an extent, these results are consistent with the findings of Veugelers and Schneider.²³³ While their study focused on young, small, highly R&D intensive companies, at least two of those characteristics can be assigned to small biotechnology companies as well.

²³⁰ WILLOUGHBY, supra note 225, pp. 33–34.

²³¹ WILLOUGHBY, supra note 225, p. 25.

²³² Ibid., pp. 22–24.

²³³ VEUGELERS and SCHNEIDER, supra note 216, p. 118.

While more research is needed, it seems that when the analysis is restricted to small R&D intensive companies, higher use of intellectual property strategies is observed compared to other innovators. This would support the notion put forward by Teece that small firms without complementary assets will make greater use of intellectual property protection to appropriate innovation returns.²³⁴ However, considering the study conducted by Willoughby, one must ponder: why do startups display a lower utilization of intellectual property items per person compared to small established firms, a disparity that challenges initial expectations? The variation in results is likely due to the fact that Willoughby measures the number of intellectual property items per person, whereas most other studies assess the use of appropriability methods. It is plausible that startups have fewer innovations to protect, which would explain the difference in the number of intellectual property items in their inventory compared to small established firms. Nevertheless, startups are the second most intensive user of intellectual property protection for all categories except copyright.²³⁵

Finally, expanding beyond the examination of specific appropriability methods, the paper by Gans, Hsu and Stern²³⁶ investigates whether startups earn their returns on innovation through product market competition or through cooperation with established firms. While many scholars suggest that startup innovation spurs the “gale of creative destruction”, this paper offers a more nuanced view on the issue. According to the model presented in the paper, stronger intellectual property rights not only affect the absolute returns to innovation (regardless of commercialization strategy), but also the relative returns to competition versus cooperation.²³⁷ The relationship found between strong intellectual property rights and the adoption of commercialization through cooperation is striking: *“These results provide support for a model in which start-up innovators earn their returns on innovation through the market for ideas when the environment offers a strong intellectual property regime, and, at the same time, the start-up faces high relative costs in acquiring and controlling complementary assets necessary for commercialization success. As imperfections arise in the market for ideas (e.g., through increases in the expropriation hazard), start-up innovators are more likely to pursue*

²³⁴ See TEECE, supra note 167.

²³⁵ WILLOUGHBY, supra note 225, p. 25.

²³⁶ See GANS, Joshua S. and HSU, David H. and STERN, Scott. When Does Start-Up Innovation Spur the Gale of Creative Destruction? *The RAND Journal of Economics*. 2002, Vol. 33, no. 4, pp. 571–586. DOI: 10.2307/3087475

²³⁷ Ibid., p. 572.

competitive strategies, which in turn contribute to the gale of creative destruction.”²³⁸ While most previous studies emphasized how intellectual property rights increase the absolute returns to innovation, the results of presented in the paper are consistent with the idea that intellectual property rights affect the relative returns to cooperation by facilitating the market for ideas. Notably, however, economic environments vary between industries, which in turn also influences the choice of commercialization strategy.²³⁹ To the extent that complementary assets owned by incumbents are costly to duplicate, the relative profitability of competitive entry is decreased.²⁴⁰ The probability of cooperation is highest in the biotechnology sector, where the expenses associated with acquisition of complementary assets are high.²⁴¹ The model is based on a sample of startups which obtained funding either from venture capitalists or from the Small Business Innovation Research program. While the results are robust, it would be interesting to run the model again with a more diverse sample of startups to include more vigorous controls for factors such as startup liquidity, project-quality and varying commercialization environments.

4.3.3 Motives for Patenting

In the theory of law and economics, patenting and the conferred monopoly rights are commonly justified on the basis of providing an incentive to innovate. Another surprising finding of the Berkely study is that this might not be true in practice, because startup executives reported that patents offer mixed to weak incentives to innovate.²⁴² Correspondingly to other results in the study, there are inter-industry differences present. For example, biotechnology companies reported a moderate level of incentive to innovate, while software startups reported at best slight incentives.²⁴³

²³⁸ Ibid., p. 581.

²³⁹ Ibid., p. 583.

²⁴⁰ Ibid., p. 572.

²⁴¹ Ibid., p. 579.

²⁴² GRAHAM et al., supra note 4, pp. 1289.

²⁴³ Ibid., p. 1286.

Figure 3: Incentive Function of Patents, by D&B Industry

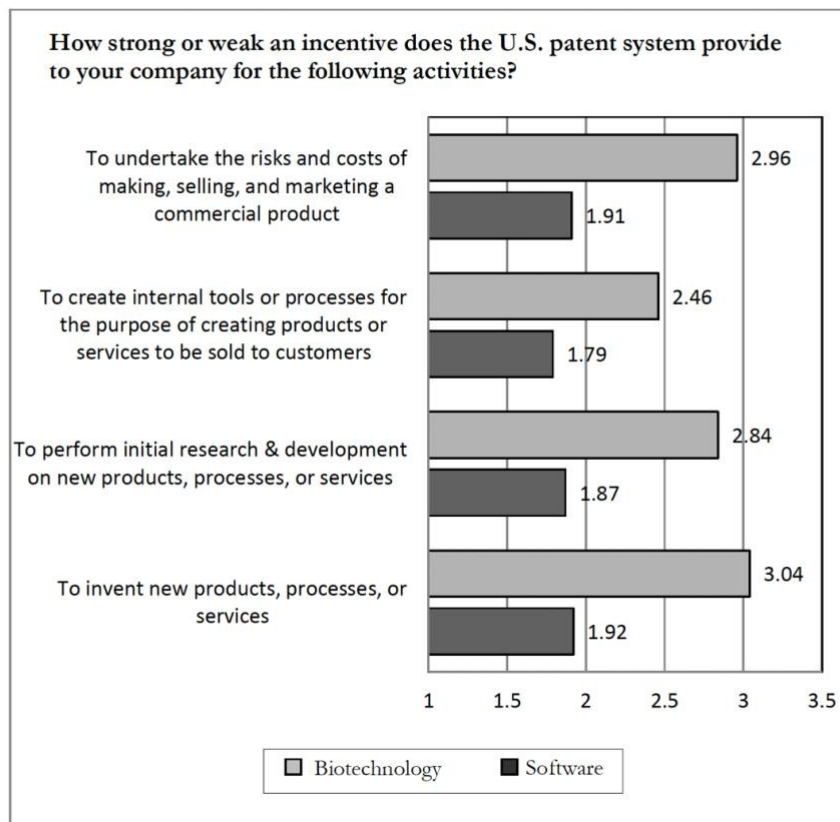


Figure 4 Incentive Function of Patens, by D&B Industry: Results of the Berkeley Survey
Source: SICHELMAN, p. 10, 2012²⁴⁴

However, the section inquiring about the incentive function of patents likely lacks substantial explanatory value. While the results do accurately reflect disparities between industries in patent propensity, I have reservations about assessing the incentive effect of patents through a single ambiguously defined question. As the authors themselves acknowledge, the term “incentive” can be subject to varying interpretations. It is possible that the respondents interpreted the question in absolute terms, as meaning something in the lines of: “Would I have conducted this innovation even without a patent?”. Patents, however, play a more nuanced role in the commercialization process.²⁴⁵ The inconsistency in the interpretation

²⁴⁴ SICHELMAN, *supra* note 187, p. 10.

²⁴⁵ GRAHAM et al., *supra* note 4, p. 1284.

of the question could explain why the reported incentive levels are relatively low even in industries such as biotechnology, where patent propensity is high.²⁴⁶

Far more interesting and robust results are provided by the Berkeley survey regarding the importance of patent functions for their decision to patent. As the results show, the most important reason for patenting is preventing others from copying the startup's product or service.²⁴⁷ This result holds true across various characteristics including firm age, revenues, industry, and patent portfolio size.²⁴⁸ This result is notable, as it contradicts previous comments indicating that the high costs of patenting and enforcing patents generally preclude startups from using the patent system to safeguard their innovations.²⁴⁹

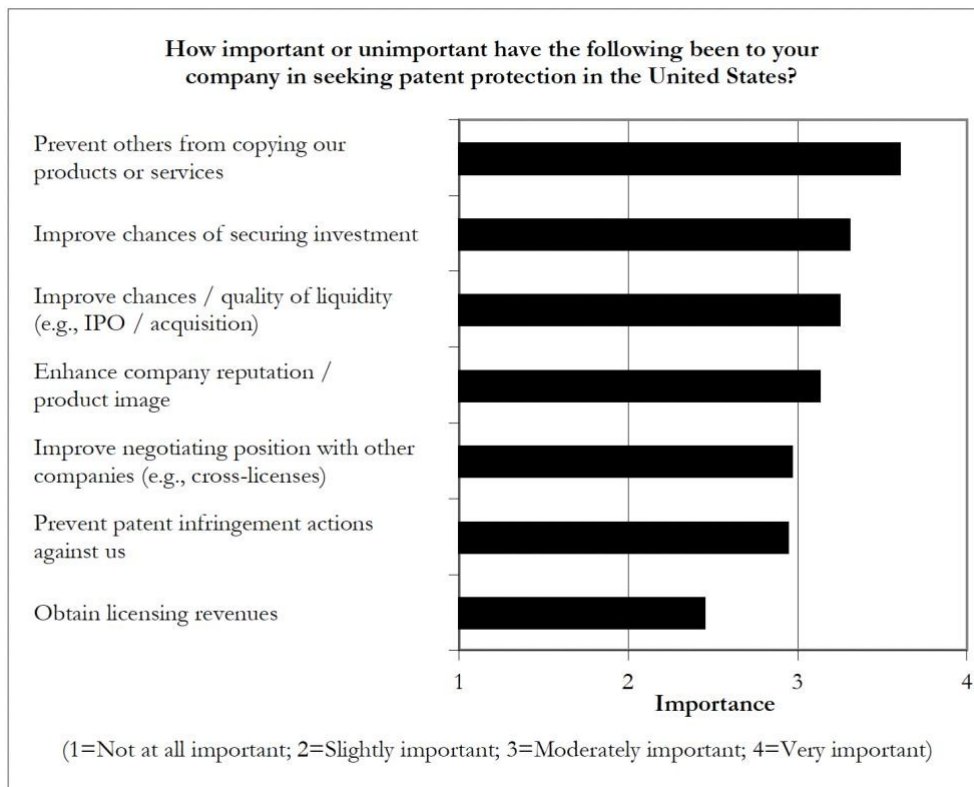
²⁴⁶ Nevertheless, comments from respondents highlight the fact that there are many different commercial strategies available to entrepreneurs. Perhaps contrary to the thought behind the patent system, it becomes apparent that establishing a monopoly is not the sole means of recovering research costs, and it may not even be the most efficient approach. This is of course not applicable in industries such as biotechnology, where imitation can be relatively straightforward, and patenting thus remains very important. *See* SICHELMAN, *supra* note 187, pp. 4–9.

²⁴⁷ Yet, in line with previous commentaries, respondents of the Berkeley study indicated that the premier reason for not seeking patents were the high costs of filing and enforcement. Graham and Sichelman note that these competing results raise the following question: if startups are sensitive to the costs of patenting and enforcement, how can preventing copying and competition be the primary driver for startup patenting? Perhaps startups elect not to patent most of their innovations and only pursue the protection where the benefits of filing outweigh the costs. Startups weigh in a number of factors when deciding whether to patent. As these calculations will vary in respect of each innovation, it is not inconsistent for startups to answer that preventing competition is the primary reason for patenting, while cost consideration are the primary reason for not seeking patent protection. For more information, *see* GRAHAM and SICHELMAN, *supra* note 157, pp. 154–155.

²⁴⁸ *Ibid.*, p. 114.

²⁴⁹ MANN, *supra* note 200, p. 981.

Figure 2: Motivations for Patenting – All Startups Filing Patents



The above question was asked of those reporting that their company had filed for at least one U.S. patent (averages reported).

Figure 5 Motivations for Patenting Among All Startup Filing Patents: Results of the Berkeley Survey

Source GRAHAM et al., p. 1299, 2009²⁵⁰

Wesley Cohen notes that the premier answer of “preventing copying” may be in part the result of socially desirable bias and results may thus be skewed.²⁵¹ The results have, however, been verified by a series of qualitative interviews, so such an option is improbable.²⁵² The second most important function of patenting – improving chances for obtaining an investment – will be addressed later in this review. Subsequent reasons for patenting are related to negotiation and defensive motives. These results undermine the previously held belief that strategic use of patents is a significant motivation only for larger-firm patenting.²⁵³ Previous research papers had implicitly assumed that startups, at least in the biotechnology industry, are not typically targeted in enforcement activity at sufficiently high rates to justify using patents

²⁵⁰ GRAHAM et al., supra note 4, p. 1299.

²⁵¹ Ibid., p. 1297.

²⁵² Ibid., pp. 1297–1298.

²⁵³ Ibid., p. 1326.

defensively.²⁵⁴ Importantly, the smaller firms in the sample of the study found patenting for strategic reasons nearly as important as the larger firms.²⁵⁵

Finally, all startups rate “obtaining licensing revenues” as the least important reason for patenting – scoring only between “slightly important” and “moderately important.”²⁵⁶ When we segment the firms by revenue, high-revenue firms report that licensing is significantly less important to patenting when compared to low-revenue firms.²⁵⁷ However a non-trivial number of firms from the sample generate all or nearly all of their revenue from licensing.²⁵⁸ This is consistent with previous studies indicating that licensing takes on a more prominent role for firms lacking complementary assets.²⁵⁹ Furthermore, there are significant inter-industry differences regarding the utility of patents for licensing. Specifically, biotechnology firms exhibit a significantly higher emphasis on utilization of patents for licensing purposes. This may stem from the difficulties that biotechnology startups face in commercialization of their inventions.²⁶⁰ These results are also in line with the findings of Gans, Hsu, and Stern, who observe that biotechnology startups are most inclined toward a cooperative commercialization strategy.²⁶¹ While there are some differences regarding motivations to patent between the top patent filers and the rest of firms, the research is robust the overall findings of the Berkeley survey can be deemed representative for the entire cohort of respondents.²⁶²

²⁵⁴ Ibid., p. 1300.

²⁵⁵ GRAHAM and SICHELMAN, supra note 157, p. 161.

²⁵⁶ Interestingly, firms with more patent applications did not see obtaining licensing revenue as a more important motivation for filing patents compared to firms with smaller patent portfolios. See Ibid., p. 164.

²⁵⁷ Ibid., p. 163.

²⁵⁸ Ibid., p. 164.

²⁵⁹ See ARORA, Ashish and CECCAGNOLI, Marco. Patent Protection, Complementary Assets, and Firms' Incentives for Technology Licensing. *Management Science*. 2006, Vol. 52, no. 2, pp. 293–308. ISSN 0025-1909.

²⁶⁰ GRAHAM and SICHELMAN, supra note 157, p. 164. See also KATILA, Riitta and ROSENBERGER, Jeff D. and EISENHARDT, Kathleen M. Swimming with Sharks: Technology Ventures, Defense Mechanisms and Corporate Relationships. *Administrative Science Quarterly*. 2008, Vol. 53, no. 2, pp. 295–332. DOI: 10.2189/asqu.53.2.295

²⁶¹ GANS et al., supra note 236, p. 579.

²⁶² GRAHAM and SICHELMAN, supra note 157, pp. 165–166.

Figure 3: Motivations for Seeking Patent Protection, by D&B Industry

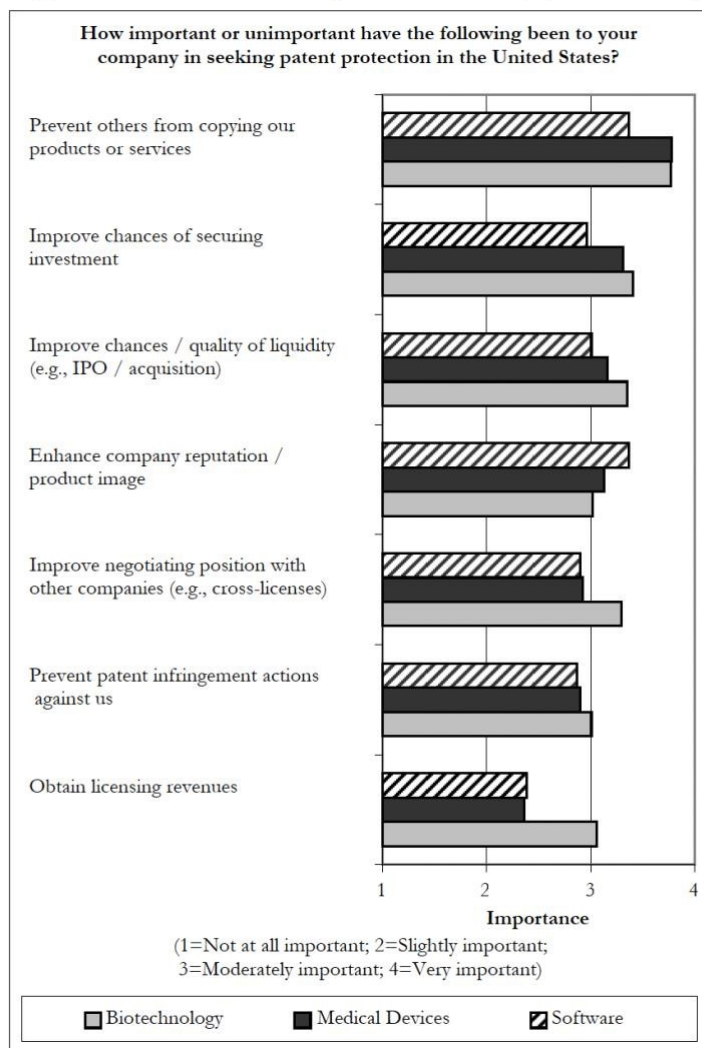


Figure 6 Motivations for Seeking Patent Protection, by D&B Industry: Results of the Berkeley Survey

Source: GRAHAM et al., p. 1301, 2009²⁶³

The results also show marked inter-industry differences in the motives for seeking patents, as is evident from the figure above. Biotechnology and medical devices Industry companies tend to cluster in their answers, that is with the exception of answer relating to “improving negotiation position” and “obtaining licensing revenues.” Software startups, on the other hand, generally see most patent functions as less important, with the notable exception of enhancing company reputation or product image. The answers correspond to the results concerning patent propensity and the evaluation of the importance of various appropriability methods, where

²⁶³ GRAHAM et al., supra note 4, p. 1301.

software startups rated patenting as the least important mechanism.²⁶⁴ The reported inter-industry differences are consistent with previous studies.²⁶⁵ The Carnegie Mellon study, for example, found that patenting was a notably more important means of securing competitive advantage in the pharmaceutical and medical equipment industries compared to the electronic component and semiconductor industries.²⁶⁶

4.3.4 Reasons to Forgo Patenting

The Berkeley survey also surveyed startup executives for reasons forgo patenting their innovations. It is apparent that the cost of obtaining a patent is the most commonly cited reason for not patenting a technology. “Cost of enforcing patent” closely follows as the second most cited reasons for forgoing patenting.²⁶⁷ Cost considerations clearly loom large in patenting.²⁶⁸ Importantly, startups tend to be more sensitive to the costs of acquiring and enforcing patents compared to large firms.²⁶⁹ This conclusion is also supported in a summary of studies on reasons for not pursuing patent protection by Graham and Sichelman.²⁷⁰ However, the greater cost-sensitivity of startups compared to large companies might not be caused solely by lack of liquidity, because startups reported significantly higher patent prosecution costs than larger companies.²⁷¹

²⁶⁴ Even as such, software startups still rate “Preventing others from copying our products or services” as the second most important motive for patenting. This suggests that patents can to some extent accomplish this role, however other commercialization strategies are seen as more effective for software innovations.

²⁶⁵ GRAHAM and SICHELMAN, *supra* note 157, p. 159.

²⁶⁶ COHEN et al. *supra* note 7, p. 32.

²⁶⁷ *Ibid.*, p. 1310.

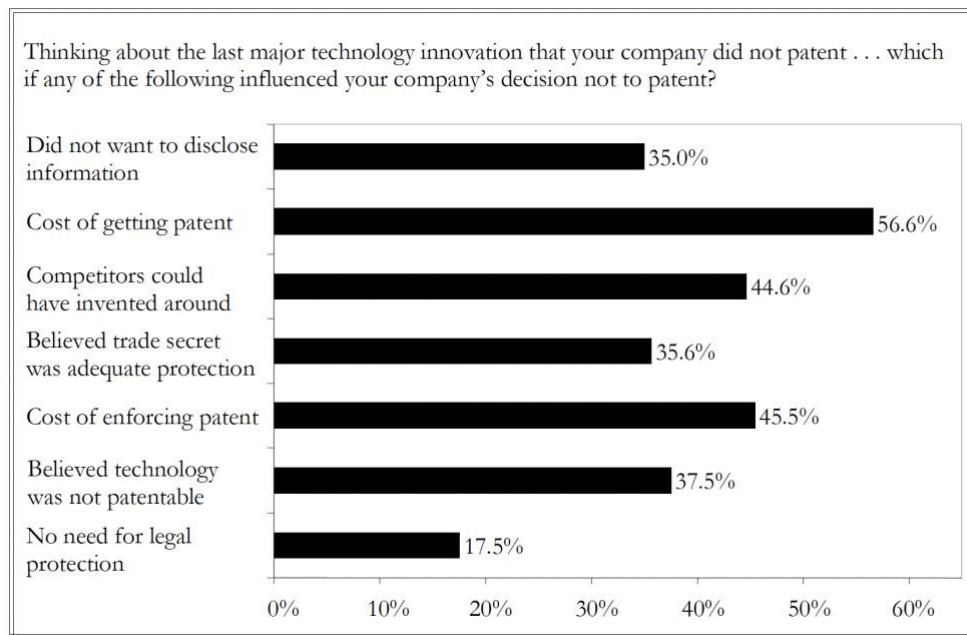
²⁶⁸ The average US patent cost is currently reported at about \$60,000. *See* KRAJEC, Russ. How Much Does A Patent Cost? The Real Truth. In: *Medium* [online]. 23. 10. 2019 [Accessed 26.3.2023]. Available from: <https://medium.com/patentmyths/how-much-does-a-patent-cost-the-real-truth-5559e380014d>

²⁶⁹ COHEN et al. *supra* note 7, pp. 14–16.

²⁷⁰ *See* GRAHAM and SICHELMAN, *supra* note 157, p. 147.

²⁷¹ *Ibid.*, p. 169.

Figure 4: Reasons for Startups to Forgo Patent Protection on Major Technologies



Respondents were asked to indicate all the reasons that applied (share of respondents indicating that the option influenced the decision is reported).

Figure 7 Reasons for Startups to Forgo Patent Protection on Major Technologies: Results of the Berkeley Survey

Source: GRAHAM *et al.*, p. 1311, 2009²⁷²

Furthermore, the respondents from the general population of firms were much more likely to cite costs as the primary reason for forgoing patenting compared to the venture-backed startups. This may be attributable to the greater capitalization of venture-backed firms.²⁷³ Additionally, older firms were significantly less sensitive to the cost of acquiring and enforcing patents compared to younger firms.²⁷⁴ Startups operating in technologies where patents are considered relatively effective at appropriating value from innovation (such as in the biotechnology sector) reported high costs to be a less of a disincentive for patenting in comparison to firms developing technologies where patents are considered to be less effective (typically in the software industry).²⁷⁵

²⁷² GRAHAM *et al.*, *supra* note 4, p. 1311.

²⁷³ GRAHAM and SICHELMAN, *supra* note 157, p. 168.

²⁷⁴ GRAHAM, Stuart J. H. a Ted M. SICHELMAN, *supra* note 157, p. 168.

²⁷⁵ *Ibid.*

FIGURE 7
 REASONS FOR FORGOING PATENT PROTECTION BY DATA SOURCE.³¹⁹
 FOR THAT SAME UNPATENTED INNOVATION, WHICH IF ANY OF THE
 FOLLOWING INFLUENCED YOUR COMPANY’S DECISION NOT TO PATENT?

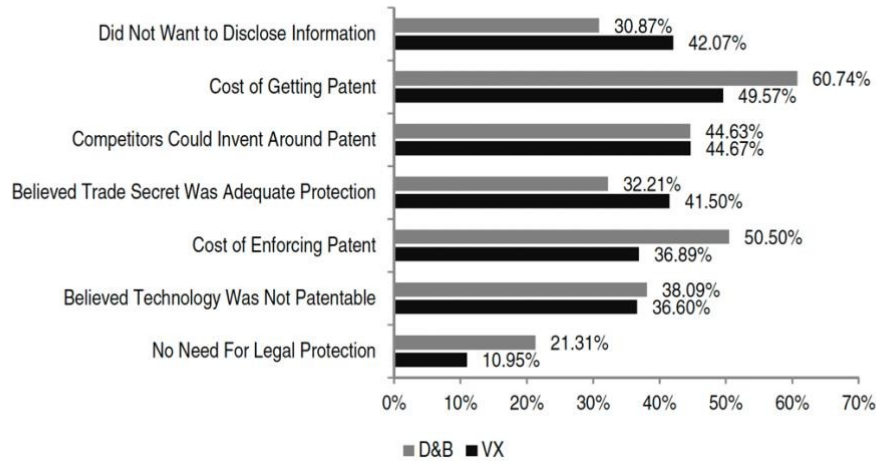


Figure 8 Reasons for Forgoing Patent Protection by Data Source: Results of the Berkeley Survey

Source: GRAHAM and SICHELMAN, p. 174, 2010²⁷⁶

The subsequent set of reasons for forgoing patenting seems to be connected to the respondents’ perception about the effectiveness of the patent system.²⁷⁷ Nearly half of all respondents submitted that the reasons for not filing for a patent is that “competitors could have invented around”. More than a third of respondents indicated that they did not seek patent protection because they considered their innovations unpatentable.²⁷⁸ In addition to the reasons listed above, some startups regarded their trade secret protection as adequate or did not want to disclose information by filing for a patent.²⁷⁹ Generally, the relative frequency of these reasons

²⁷⁶ Ibid., p. 174.

²⁷⁷ Ibid., p. 170.

²⁷⁸ Graham and Sichelman highlight the surprising nature of these findings in light of the criticism that courts frequently uphold patents with overly broad scope and that the US Patent Office regularly upholds patents with questionable inventiveness. *See* Ibid.

²⁷⁹ The companies that marked “trade secrecy as adequate” and “did not want to disclose information” as the most important reason for not seeking a patent held more patents than companies reporting other reasons. This suggests a complementary relationship between patenting and trade secrets. Furthermore, the two reasons likely complement each other, as both relate to maintaining trade secrecy. *See* LEVINE and SICHELMAN, *supra* note 114, p. 799.

tends to track the large firm surveys.²⁸⁰ Finally, about 18% of respondents declared “no need for legal protection” as a motive for not seeking a patent. The fact that relatively few firms stated that they did not need any legal protection indicates that trade secrecy law may play an important role in protection of innovations.²⁸¹

Similarly, as with the motivation for patenting, the factors which most strongly influence the decision to forgo patenting differ according to industries. A significant finding of the Berkeley survey is that the most important reason for biotechnology startups to not patent was a reluctance to disclose information.²⁸² Biotechnology companies are more than twice as likely to cite this reason compared to software startups.²⁸³ This is also related to the belief that trade secrecy provides adequate protection, where 49% of biotechnology startups indicated this reason, compared to only 29% of software startups. For software companies, the most important determinants for omitting patenting were costs and the ease of inventing around,²⁸⁴ a finding which is consistent with the comparably lower importance assigned to patents by these companies.²⁸⁵ A considerable inter-industry variance is also observable in relation to the belief that the innovation is not patentable with software firms considerably more prone to citing this as a reason for forgoing patenting.²⁸⁶

²⁸⁰ GRAHAM and SICHELMAN, *supra* note 157, p. 173.

²⁸¹ GRAHAM and SICHELMAN, *supra* note 209, pp. 189–190.

²⁸² GRAHAM et al., *supra* note 4, p. 1312.

²⁸³ *Ibid.*, p. 1313.

²⁸⁴ Graham and Sichelman suggest that it is harder to invent around incremental innovations compared to disruptive innovations. Interestingly, the “magnitude of innovation” might impact the likelihood of patenting such innovations. *See* GRAHAM and SICHELMAN, *supra* note 209, p. 189.

²⁸⁵ GRAHAM et al., *supra* note 4, p. 1313.

²⁸⁶ One explanation for this may be that software entrepreneurs did not believe that their product would meet the standards of novelty, non-obviousness and the like. A further plausible explanation is centered around the contentious nature of software innovation patentability, which has persisted for decades and the fact that some entrepreneurs have strong philosophical or practical objections to the use of patents in their field. *See* SAMUELSON, *supra* note 176, p. 32. Moreover, some scholars speculate that a non-trivial share of the software firms that do not seek patent protection due to the patent breath or perceived non-patentability may simple not have enough experience and information about the patent system. This opinion is confronted by the fact that no significant differences in the perceived ability to invent around a patent or the patentability of the innovation were found when segmenting respondent firms by the size of their patent portfolio. This result suggests that less experienced firms in patenting share similar views with companies with more patenting experience. *See* GRAHAM and SICHELMAN, *supra* note 157, p. 172.

Table II Reasons for Not Seeking Patent Protection – Selected Industries: Results of the Berkeley Survey

Table 2: Reasons for Not Seeking Patent Protection – Selected Industries

Thinking about the last major technology innovation that your company did not patent . . . which if any of the following influenced your company’s decision not to patent?

Reason	Category	All respondents	Biotechnology	Software	Difference	Test of difference
Did not want to disclose		35%	59%	25%	+ 34%	**
Cost of filing		55%	43%	64%	- 21%	**
Ease of inventing around		44%	42%	46%	- 4%	
Trade secret was adequate		36%	49%	29%	+ 20%	**
Cost of enforcing		44%	36%	52%	- 16%	**
Did not believe patentable		38%	28%	42%	- 14%	**
Did not need protection		17%	17%	20%	- 3%	
Total responses		1,057	136	589		

** Differences noted, significant at the 95% confidence intervals. Tests for differences in means were conducted between columns, within rows.

Source: GRAHAM et al., p. 1313, 2009²⁸⁷

To obtain a more detailed view of these results, respondents were also surveyed for the single most important reason for forgoing patenting. Among the whole pool of respondents, the cost of filing and the belief that the technology is unpatentable were the most highly cited reasons (by 25% and 21% of respondents, respectively).²⁸⁸ Over a third (34%) of biotechnology firms named hesitance to disclose information as the most important consideration, nearly matching the responses of venture-backed IT hardware companies (32%).²⁸⁹ Regardless of inter-industry differences, the cost of patenting is a significant constraint for startups, as more than 20% of startups in each sector identified this reason as the most important cause of not seeking patents for their innovation.²⁹⁰

²⁸⁷ GRAHAM et al., supra note 4, p. 1313.

²⁸⁸ Ibid., p. 1314.

²⁸⁹ Ibid.

²⁹⁰ Ibid.

FIGURE 8
 REASONS TO FORGO PATENTING BY INVENTION TYPE.³²²
 FOR THE SAME UNPATENTED INNOVATION, WHICH IF ANY OF THE
 FOLLOWING INFLUENCED YOUR COMPANY'S DECISION NOT TO PATENT?

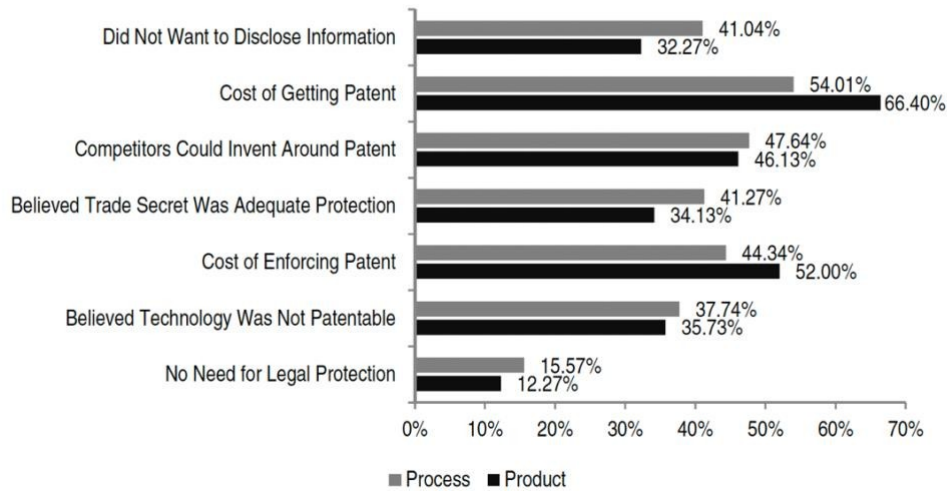


Figure 9 Reasons for Forgoing Patenting by Invention Type: Results of the Berkeley Survey

Source: GRAHAM and SICHELMAN, p. 175, 2010²⁹¹

The Berkeley survey also considered the influence of the type of innovation (product or process innovation) on the decision to not apply for a patent. Unsurprisingly, trade secrecy is viewed as a more suitable protection for process innovations rather than product innovations. This is in line with the premise that processes are easier to keep secret. Patents are relatively ineffective at protecting process innovations.²⁹² Process innovators were also more likely to report that the reason for not patenting was that they did not want to disclose information. This aligns with the findings of the Yale survey, where large firms indicated a lower willingness to disclose process innovation.²⁹³ While cost consideration seem to be especially pronounced for product innovators, this might be driven by a selection effect, because a large part of the sample are software startups.²⁹⁴ Although authors of the survey argue that part of the inter-industry differences described earlier might be driven by the type of technology (product vs. process)

²⁹¹ GRAHAM and SICHELMAN, *supra* note 157, p. 175.

²⁹² See TEECE, *supra* note 167, p. 287.

²⁹³ See LEVIN et al., *supra* note 7, p. 806.

²⁹⁴ GRAHAM and SICHELMAN, *supra* note 209, pp. 192–193.

respondents were contemplating patenting, they fail to establish this with conclusive evidence. Further research on the topic is needed.²⁹⁵

The Small Business Administration survey also asked respondents to indicate the relative importance of various limitations of patent protection on new products and processes. The most reported limitations were high enforcement costs (by 74% of respondents) and the fact that competitors could invent around (by 72% of respondents). This was followed by the high costs of maintaining a patent portfolio (61% of respondents) and rapid changes in technology limiting patent protection (57% of respondents). As noted in the study, these responses were expectable, because small business typically lack resources for building and maintain a large enough patent portfolio to fend off competitors.²⁹⁶ Cost considerations and the ability of competitors to invent around were the most commonly cited reasons in the Berkeley survey as well, ²⁹⁷ however the fact that rapidly changing technology can significantly limit patenting is a novel finding.

Moreover, 46% of respondents saw as important/very important the limitation that “Patents documents disclose too much information”.²⁹⁸ This is at odds with another finding of the study – that only a small number of firms consider patent disclosures to be a very important method for acquiring new technology.²⁹⁹ With that, it is worth mentioning that reverse engineering was also rated as a very important method for acquiring new technology only by a low percentage of respondents.³⁰⁰ It seems that patents are primarily used for defensive reasons and small firms tend to over-estimate the knowledge-disseminating function of patents.³⁰¹ Other perceived limitations of patent protection included high likelihood of invalidity of patents and licensing concerns.³⁰²

In summary, respondents in both studies perceived the most important limitations of patents similarly. Clearly, the most prominent limitation of the patent system is the cost related to patenting. Additionally, entrepreneurs perceive the risk of inventing around and disclosing information about their invention as significant. Although these studies use different formulations of their questions and offer varying choices of response options, a consistent trend

²⁹⁵ GRAHAM et al., *supra* note 4, pp. 1314–1315.

²⁹⁶ CORDES et al., *supra* note 210, p. 58.

²⁹⁷ GRAHAM et al., *supra* note 4, p. 1311.

²⁹⁸ CORDES et al., *supra* note 210, p. 59.

²⁹⁹ *Ibid.*, p. 43.

³⁰⁰ *Ibid.*, p. 44.

³⁰¹ *Ibid.*, p. 43.

³⁰² *Ibid.*, p. 59.

emerges across both.³⁰³ Nevertheless, to obtain truly robust results, it would be necessary to conduct further research involving diverse samples of companies.

4.3.5 The Relationship Between Patents and Financing of Startups

Interestingly, startups in the Berkeley survey rate patenting as more than moderately important for securing investment.³⁰⁴ Among general population of companies, just over two thirds of venture capitalists had indicated to respondents that patents were an important factor in their investment decision. The share rises to 76 % among VC-backed companies. This contrasts with previous large-firm surveys in which patenting was ranked as relatively unimportant for raising funds.³⁰⁵ These results, however, align with the findings from the Carnegie Mellon survey, which indicated that smaller firms place relatively greater importance on patenting as a means of enhancing their reputation compared to larger firms.³⁰⁶

As anticipated, venture-backed startups in the Berkeley survey assign greater importance to improving the likelihood of securing investment and liquidity events compared to the general population of firms.³⁰⁷ Even here, inter-industry differences are notable. Results show that investors view patenting as much less important for software startups as compared to biotechnology startups.³⁰⁸ Furthermore, Graham and Sichelman argue that because biotechnology and medical devices startups rate patenting highly in importance for appropriating value from their innovations, this may be evidence that the classical reason for patenting – to prevent competition – is a major driver of third-party investment decisions. Contrary to that, since software firms rate patenting as the least effective means for securing of competitive advantage, this supports the view that investor sentiment is primarily driven by patents' signaling qualities.³⁰⁹ The fact that “enhancing firm reputation” was the only reason

³⁰³ While the Berkeley study examined the reasons for not patenting a specific innovation, and the Small Business Administration survey focused on the limitations of patenting in general, it is plausible that respondents in both cases were drawing from their personal experiences with the patent system, rendering the results comparable.

³⁰⁴ See GRAHAM et al., supra note 4, p. 1299. This may be connected to the fact that startups often have little operational history and lack revenues or other measurable metrics and patents play a signaling role.

³⁰⁵ GRAHAM, Stuart J. H. et al., supra note 4, p. 1299.

³⁰⁶ See COHEN et al. supra note 7, p. 18.

³⁰⁷ GRAHAM and SICHELMAN, supra note 157, p. 157.

³⁰⁸ Still, 59 % of VCs indicated to software startups that patents are important to them. See GRAHAM et al., supra note 4, p. 1308.

³⁰⁹ GRAHAM and SICHELMAN, supra note 157, pp. 160–161.

rated more highly by software startups than biotechnology startups supports the signaling thesis.³¹⁰ Moreover, a subsequent study also confirmed that patents have a signaling value for venture capitalists.³¹¹

The relationship between patenting and funding of startups has been examined in numerous studies. Hall finds that patenting is linked with increased chance of obtaining funding, higher valuation during fundraising and upon exit for venture-backed firms. But it is difficult to establish causality. It is unsure whether patents are simply a proxy for the quality of the underlying firm and its technology, or whether there is value arising from the patent right.³¹² One of the most robust findings of the paper by Cockburn and MacGarvie is the importance of new software ventures obtaining their own patents. Companies with a higher number of patents and patent applications are more likely to receive funding from outside investors and to “exit” through IPO or acquisition. But the authors note that this correlation could also reflect reverse causality.³¹³ Furthermore, the analysis performed by Mann and Sager suggests that the factors that make it possible for startups to obtain patents relate to the factors that allow such firms to progress through the venture capital cycle, although it also notes that causal relation cannot be established.³¹⁴ Intriguingly, an Israeli study from 2013 has provided new evidence supporting the general notion that patenting has a positive influence on startup’s valuation, albeit with the caveat that this trend cannot be connected with software companies where no link between patenting and valuation was found.³¹⁵ All in all, while there is strong evidence that patenting is associated with a higher chance of funding, it is difficult to confirm that there is indeed causality. Hall suggests that it would be useful to conduct further case studies that take into

³¹⁰ Ibid., p. 161.; GRAHAM et al., supra note 4, p. 1301.

³¹¹ See CONTI, Annamaria and THURSBY, Marie and ROTHÄRMEL, Frank T. Show Me the Right Stuff: Signals for High-Tech Startups. *Journal of Economics & Management Strategy*. 2013, Vol. 22, no. 2, p. 361. DOI: 10.1111/jems.12012. Importantly, the authors note that the results are conditional on startups being located in an incubator.

³¹² HALL, Bronwyn H. Is There a Role for Patents in the Financing of New Innovative Firms?. *Max Planck Institute for Innovation and Competition Research Paper No. 18-06*. 2018, p. 22. DOI: 10.2139/ssrn.3177027

³¹³ COCKBURN and MACGARVIE, supra note 160, pp. 42–43.

³¹⁴ MANN and SAGER, supra note 158, p. 200.

³¹⁵ GREENBERG, Gili. Small Firms, Big Patents? Estimating Patent Value Using Data on Israeli Start-ups’ Financing Rounds. *European Management Review*. 2013, Vol. 10, No. 4, p. 193. DOI: 10.1111/emre.12015

account the quality of innovation and its impact on obtaining funding in a sample of patent and non-patent holding companies.³¹⁶

4.4 Conclusion

While empirical research on the topic of appropriability methods among startups is quite limited, and the reviewed papers employed various research methods with differing objectives, making direct comparisons challenging, some overarching conclusions can still be gleaned from the literature reviewed.

First, the review finds that early-stage firms use a multitude of appropriability strategies and employ respective mechanisms simultaneously. While startups do engage in patenting, potentially more than previously thought, in general, informal appropriability methods take precedence both in terms of usage and the perception of their effectiveness. Notably, first mover advantage and maintaining secrecy stand out among these informal methods. This confirms the general trend among all companies. Lead time or secrecy have been found to be a preferred forms of protection in many previous studies,³¹⁷ even though this finding is far from universal. Moreover, there is evidence that smaller businesses are generally more prone to using informal appropriability methods, even when the focus is off from highly innovative firms.³¹⁸

Second, pronounced inter-industry differences are observed in the results. While biotechnology companies make heavy use of patents, such methods are rated last in efficiency among software startups. These inter-industry differences are apparent in all aspects of the results and are likely driven by differences in technology. For instance, in the biotechnology sector, patenting is crucial for prevention of reverse engineering when introducing product innovations. Patents confer a strong protection. Software firms, on the other hand, heavily rely on first mover advantage. For software startups, patent protection seems to be perceived as costly, and while patents can prevent copying to an extent, other appropriability methods are better suited to their needs. It is essential to note that the Berkeley survey is the sole source within this review to address these inter-industry differences. Further research is needed to

³¹⁶ HALL, *supra* note 312.

³¹⁷ See COHEN et al. *supra* note 7.; HALL, *supra* note 166.; ARUNDEL, Anthony. The relative effectiveness of patents and secrecy for appropriation. *Research Policy*. 2001, Vol. 30, no. 4, pp. 611–624. DOI: 10.1016/S0048-7333(00)00100-1; MEZZANOTTI and SIMCOE, *supra* note 154.

³¹⁸ ARUNDEL, *supra* note 317, p. 614.; LEIPONEN and BYMA, *supra* note 161.; KITCHING and BLACKBURN, *supra* note 161.

comprehensively address this aspect, although the results are in line with previous large-firm studies addressed above, which also saw differences in the use of appropriability methods across industries.

Third, the review finds that high costs are the dominant factor deterring startups from patenting their innovations. Since startups are largely the drivers of innovation, these cost barriers could have a significant effect on the innovation economy.³¹⁹ Easiness of inventing around the patent and the disclosure requirement are also viewed as an important limitation of the patent system. The Berkeley survey also finds that startups are primarily motivated to file for patents to prevent copying by competitors, similarly to large firms.³²⁰ However, startups also patent for strategic and defensive reasons.

Fourth, the Berkeley survey finds that startups rely on the signaling function of patents to obtain financing, improve their exit prospects and enhance overall company and product image.³²¹ Furthermore, investors include patents as a factor in their investment decision. While literature fails to establish whether there is an inherent value arising from patents or whether they signal firm quality, positive correlation between patenting and an increased likelihood of raising investment is present. However, in general, establishing causality between patenting and securing investments is challenging.

Although this literature review highlights certain trends in the appropriability strategies of startups and similar firms, there are considerable knowledge gaps, often also found in relation to other companies. Some of these gaps have been precisely defined by López,³²² whose work partly informs the following text.

In order to obtain truly robust results, it would be particularly useful if more studies were devoted to the topic of the use of appropriability mechanisms among startups. Also, most existing studies focus mainly on patenting, although the majority of firms use other methods to appropriate gains from their innovations. It would be interesting to examine how firms use lead time advantage, secrecy, and other informal mechanisms. Additionally, as most studies primarily examine firms based in the United States, it would be valuable to explore whether the trends identified in the Berkeley survey and similar papers are applicable in other countries. The legal regulatory framework plays a crucial role in this context. While many aspects of

³¹⁹ GRAHAM and SICHELMAN, *supra* note 157, p. 179.

³²⁰ COHEN et al. *supra* note 7, p. 17.

³²¹ GRAHAM and SICHELMAN, *supra* note 157, p. 178.

³²² *See* LÓPEZ, *supra* note 16.

intellectual property rights are harmonized, substantial differences exist, especially in patent law. Hence, there is an opportunity to draw comparisons between startups operating in the United States and the European Union. This is what largely drove my interest in the topic and why I have decided to conduct research on the issue in the following chapter.

Following the work of Teece, there are also several conjectures in the literature about the importance of complementary assets in the choice of appropriability strategy, however the topic remains systematically unexplored.³²³ Considering that startups often lack strong complementary assets, it would be beneficial to investigate this issue in further research. Insights from interviews with entrepreneurs also indicate that a variety of strategies are available for commercializing innovations. Attaining a monopoly position through patents may not always be the most suitable choice. Therefore, it would be valuable to explore how different business strategies influence the selection of intellectual property rights and other appropriability methods.³²⁴ Finally, while the literature review suggests that startups employ various appropriability methods in complementary ways, the interaction between these mechanisms remains unclear. It would also be useful to examine the effectiveness of different appropriability methods for various types of innovation.³²⁵ This topic is relatively understudied even in the population of large firms.

³²³ Ibid., p. 24.

³²⁴ Ibid., pp. 23–24.

³²⁵ Ibid., p. 24.

5 Intellectual Property Strategies of Software Startups: Evidence from Semi-structured Interviews

5.1 Introduction

Schumpeter argued that economic change is driven by entrepreneurial innovation,³²⁶ challenging the classical static view of economy and introducing a new era of dynamic economic analysis.³²⁷ His theory has gained even more relevance in the age of information technology and the internet.³²⁸ The advent of these technologies has accelerated the prominence of technology companies focused on innovation and rapid growth. Today, startups are pivotal in the innovation economy³²⁹ and largely drive the creation of new jobs.³³⁰ Nonetheless, as with other innovators, the appropriation of returns from innovation remains a concern for startups and constitutes a central aspect of the rationale for the intellectual property rights system.³³¹ In view of the limited empirical research on the use and importance of various appropriability methods for appropriating return from innovation among startups, this study examines such aspects within a sample of Czech software startups.

The research is motivated by numerous questions, in part prompted by results of the Berkeley survey, including the following:

- Which appropriability methods do software startups use and how do they rate their importance in their ability to gain competitive advantage?

³²⁶ SCHUMPETER, Joseph A. *Capitalism, Socialism, and Democracy: Third Edition*. New York: Harper Perennial Modern Classics, 2008, p. 83. ISBN 978-0-06-156161-0.

³²⁷ ZIEMNOWICZ, Christopher. Joseph A. Schumpeter and Innovation. In: CARAYANNIS, Elias G., ed. *Encyclopedia of Creativity, Invention, Innovation and Entrepreneurship*. New York, NY: Springer New York, 2013, p. 1175. DOI: 10.1007/978-1-4614-3858-8_476

³²⁸ SKALA, Agnieszka. *Digital Startups in Transition Economies: Challenges for Management, Entrepreneurship and Education*. Cham: Springer International Publishing, 2019, pp. 8–9. ISBN 978-3-030-01500-8.

³²⁹ Startups form a multi-trillion-dollar ecosystem. See GAUTHIER, JF et al. *The Global Startup Ecosystem Report GSER 2022* [online]. Startup Genome, 2022, p. 29 [Accessed 19.9.2022]. Available from: <https://startupgenome.com/reports/gser2022>

³³⁰ See AUDRETSCH, David B. and ACS, Zoltan J. New-firm startups, technology, and macroeconomic fluctuations. *Small Business Economics*. 1994, Vol. 6, no. 6, p. 447. DOI: 10.1007/BF01064858; HALTIWANGER, John and JARMIN, Ron S. and MIRANDA, Javier. Who Creates Jobs? Small Versus Large Versus Young. *The Review of Economics and Statistics*. The MIT Press, 2013, Vol. 95, no. 2, p. 360. ISSN 0034-6535.

³³¹ LEIPONEN and BYMA, supra note 161, p. 1478.

- How does the regional or global ambition of Czech software startups influence their strategy?
- Given the fact that patenting computer programs *per se* is not possible in the EU, do Czech software startups seek patents in other jurisdictions such as the United States?
- Do patents play a major role in the decision to invest into Czech software startups? Is intellectual property protection a concern for investors?
- How do the results of this research correlate with the findings of the Berkeley survey relating to software startups?

Taking this into account, subchapter 5.2 delves into the research methodology, subchapter 5.3 presents the results, and subchapter 5.4 completes the analysis by offering conclusion and discussion of the findings.

5.2 Methodology

Since this research aims to explore how software startups make use of various appropriability methods and relate those findings to previous literature, a qualitative method of research was adopted in view of the goal of obtaining a holistic understanding of the issue at hand. The research is limited to the software startup sector, a decision primarily based on the sector's substantial size and the feasibility of obtaining a sufficiently representative sample of startups within this domain. I elected to conduct semi-structured interviews, opting for a different research method compared to the authors of the Berkeley survey. The interviews combined open questions, multiple-choice questions, and Likert-scaled item sets. The Likert-scaled item sets were primarily used to analyze the importance of various appropriability methods in capturing competitive advantage from technology innovations. In formulating the interview questions, a large sum of the question posed in the Berkeley survey were replicated with the aim of increased comparability of results. These were then combined with newly produced questions. The design of the interview helps ensure that specific topics are covered and standardized data are gathered across participants. However, it also allows for discussion and follow-up questions, enabling exploration of unexpected or interesting topics that may appear during the interview.

In this study, a purposive and convenience sampling approach was used to select early-stage software startups for interviews. This sampling strategy combined multiple methods, including

personal and network connections,³³² random selection, search through venture capital fund portfolios and web-based exploration. In the end, seventeen software startups with whom I have conducted interviews were chosen to be included in the sample.³³³ The interviews lasted anywhere from thirty minutes to an hour, they were recorded, and key findings were later transcribed. I targeted C-level executives for my interviews and all interviewees identified themselves as holding such positions.³³⁴ No interviewed startups have exited at the time of our interview. The median respondent was a seed-stage startup founded in 2020, with 20 employees,³³⁵ and backed by venture capital funding. The data obtained through interviews was analyzed using thematic analysis, descriptive statistics, frequency analysis and data visualization.

5.3 Results

The subsequent text presents key findings derived from the interviews. In addition, where relevant, space is devoted to insights from entrepreneurs that offer supplementary context, enhance comprehension of the factors influencing entrepreneurs' decisions and demonstrate their personal experiences. The findings are structured as follows: [5.3.1 The Implications of Startup's Business Strategy](#), [5.3.2 The Use and Enforceability of Intellectual Property Rights](#), [5.3.3 Importance of Various Appropriability Methods](#), [5.3.4 Motives for Patenting](#), [5.3.5 Reasons to Forgo Patenting](#), [5.3.6 The Relationship Between Intellectual Property Protection and Financing of Startups](#).

³³² Having previously worked as an analyst in a venture capital studio and being connected to the Czech startup community, I have established many connections that enabled me to recruit my initial respondents for the research. Furthermore, several of these respondents referred me to their connections in the software startup sector.

³³³ I have also interviewed three additional software companies, which I have decided not to include in the study. The decision was based on factors such as size of the company and incomplete data obtained during the interview.

³³⁴ Twelve respondents were CEOs, three were COOs, one was a CFO. Additionally, one interview was conducted with the CTO and the CMO simultaneously.

³³⁵ For the purposes of this research, the term "employees" includes contractors and part-time employees. A significant number of software engineers in the Czech Republic work as contractors, primarily for tax-related reasons.

5.3.1 The Implications of Startup’s Business Strategy

Software startups typically build their products with the aim of quickly scaling their business. Indeed, rapid growth and scalability are the defining characteristics of startups. While American companies might achieve sufficient scale even by operating solely in their domestic market, Czech startups do not have such luxury. They must expand into foreign markets. The results clearly support this, as when respondents were asked, “What markets is your startup targeting?”, none of them indicated that their focus is solely domestic. Most interviewed startups target the global market, with the rest focusing regionally.³³⁶

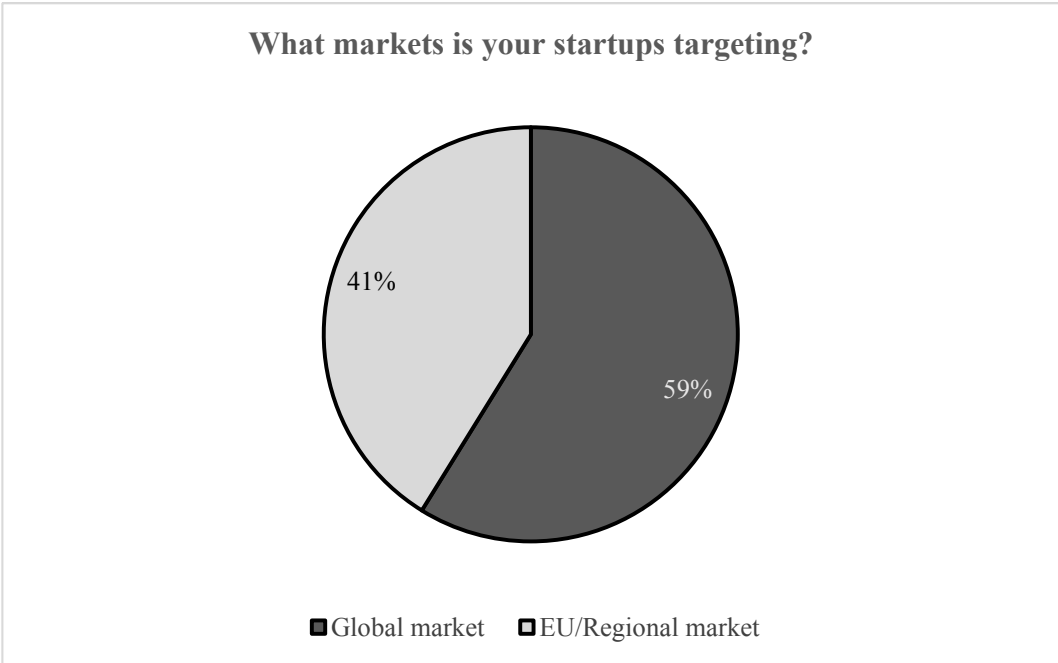


Figure 10 Markets Targeted by Czech Software Startups

These results bear important legal and business implications. Perhaps the most interesting finding is that majority of respondents are not based exclusively in the Czech Republic but rather have multiple entities or are based entirely outside the Czech Republic. A popular model is to establish a legal entity both in the Czech Republic and in the United States, with 41% of respondents (seven respondents) using such option.³³⁷ Interviewees have cited several reasons for this decision. First and foremost, a large portion of respondents have underscored the

³³⁶ While some startups with a regional focus were targeting the whole European market, others focused on regions such as CEE or DACH.

³³⁷ With one respondent having holding a corporation also in United Kingdom, which is used exclusively for sales.

significance of having an American entity when raising capital from international investors. Second, because the United States frequently serve as the principal market for software startups, and American clients generally prefer to conduct business with domestic organizations, Czech startups establish American companies for sales-related activities. Several startups have also stated that the American legal system allows them to use Employee Stock Ownership Plans,³³⁸ a feature not yet comprehensively regulated in the Czech Republic. And finally, certain startups view American business law as more stable and predictable compared to the Czech Republic.

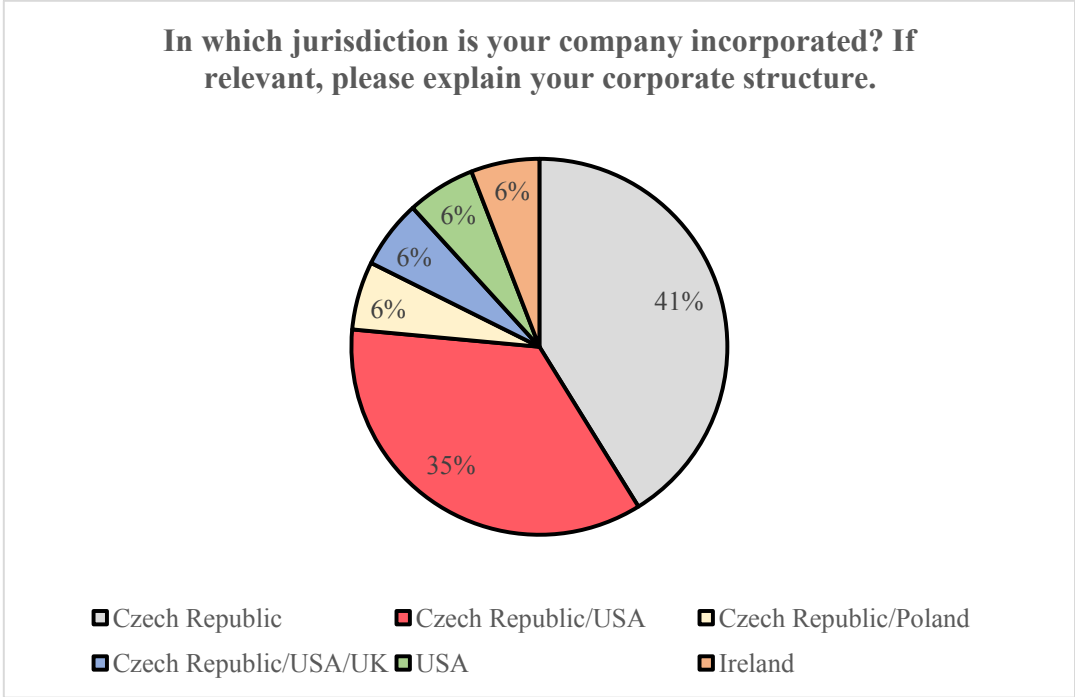


Figure 11 Jurisdictions Where Czech Software Startups Maintain a Corporate Presence

In summary, I find that Czech software startups are ordinarily expanding internationally. Such ambition, coupled with factors such as securing investments from international investors and favorable legal conditions, leads many of them to establish legal entities abroad. Some of these serve for sales or customer service, others function as primary entities, also holding all intellectual property.

³³⁸ A stock option gives the employee or contractor the right, but not an obligation, to buy the startup’s stock at a pre-determined price and date. It is used to motivate key employees to join the startup and perform at their best. See Y COMBINATOR. All about startup equity: YC Startup Job Guide. In: *Y Combinator* [online] [Accessed 4.10.2023]. Available from: <https://www.ycombinator.com/library/Ep-all-about-startup-equity>

5.3.2 The Use and Enforceability of Intellectual Property Rights

The results of my interviews show that software startups heavily use copyright protection and secrecy. Patents, on the other hand, are relatively unused, with only two startups indicating that they currently hold or are in the process of applying for patents.³³⁹ It is surprising that only less than two thirds of the interviewed startups use trademarks. Trademark protection is generally not very expensive or administratively challenging, and it can reduce the risk of litigation or forced rebranding. However, several startups indicated that they plan to file for trademarks in the future, and all respondents have registered a web domain. Furthermore, none of the respondents use industrial designs or utility models. It is worth noting that all interviewed startups consult with lawyers to some extent regarding their intellectual property protection.

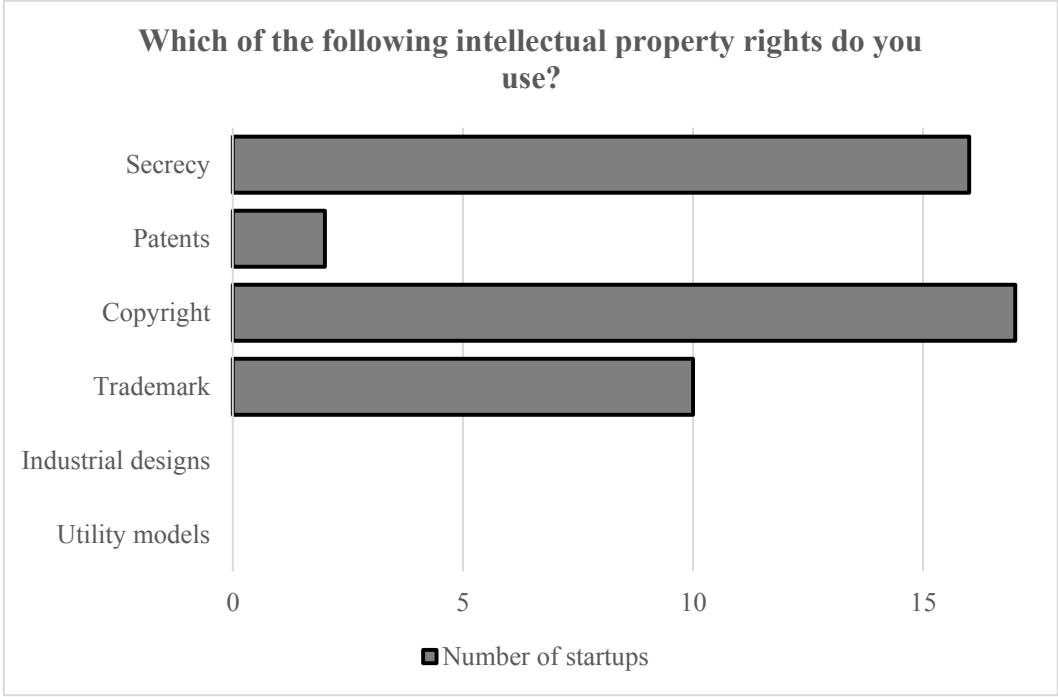


Figure 12 Use of Intellectual Property Rights by Czech Software Startups

Although the sample of interviewed startups is fairly limited, it is clear that the propensity to patent is comparatively lower compared to the findings reported in the Berkeley survey and

³³⁹ Given the fact that I did not have to rely solely on databases to determine patent propensity, I have elected to include startups currently in the process of drafting patent applications into the category of patenting startups.

results obtained by Mann.³⁴⁰ This observation holds true even though the sample consists primarily of venture capital-backed startups, where one might expect a higher inclination toward patenting. Of the two startups interested in patenting, while neither had obtained patents at the time of the interviews, both startups had either filed patent applications or were in the process of doing so, resulting in a total of six patent applications. The low rate of patenting among Czech software startups can be attributed, at least in part, to the fact that patenting computer programs *as such* is not allowed under the European Patent Convention.³⁴¹ Both of the patenting startups in my study were actively seeking patents in the United States, their target markets from a commercial standpoint. This is a significant finding in itself – while European software startups rarely seek patent protection, for some of them, patenting is of such significance that they opt to seek protection in the United States.³⁴²

Additionally, the respondents were asked to indicate which of the following mechanisms they use to safeguard their innovation internally: intellectual property assignment clauses,³⁴³ non-disclosure agreements (NDAs), non-compete clauses,³⁴⁴ internal company guidelines and a founders' agreement.³⁴⁵ Such instruments are used to prevent leakage of confidential

³⁴⁰ The Berkeley survey reported that 67% of venture-backed software startups held patents or patent applications. Mann reported that the average number of patents held among 877 software firms was 0.71. *See* GRAHAM et al., *supra* note 4, p. 1277.; MANN and SAGER, *supra* note 158, p. 197.

³⁴¹ *See* chapter 3.2 of this thesis.

³⁴² It is unclear whether the innovations of these two patenting startups would be patentable under the European regime and whether they would even elect to seek protection within the EU.

³⁴³ Such clauses are typically included in contracts concluded with employees and contractors to ensure that the company can exercise all right to the software (or other copyrighted work) they develop. As was previously noted, in the United States, it is possible to transfer ownership in copyright from the author to a third party. However, in certain jurisdictions, including the Czech Republic, copyright ownership is not transferrable. Given the complex nature of this topic and for the sake of simplicity, I use the term “assignment” to address all situations related to determining who will exercise the rights to the software. For more information, *see* chapter 3.1 of this thesis.

³⁴⁴ Generally, a non-compete agreement is an arrangement between an employer and an employee that restricts the employee's post-employment activities to prevent competition with the former employer and leakage of information to competitors. Such agreements might also extend to contractors, subject to applicable regulation. Although non-compete agreements are limited in term and scope, preventing disproportionate restrictions, their use is prohibited in certain jurisdiction altogether. Notably, such prohibition extends to California.

³⁴⁵ Founders' agreement is a contract entered into by startup founders governing their business relationship. It regulates areas such as ownership structure, confidentiality, decision-making and importantly, the assignment of intellectual property.

information, govern intellectual property assignment, and establish software development policies, among other purposes.

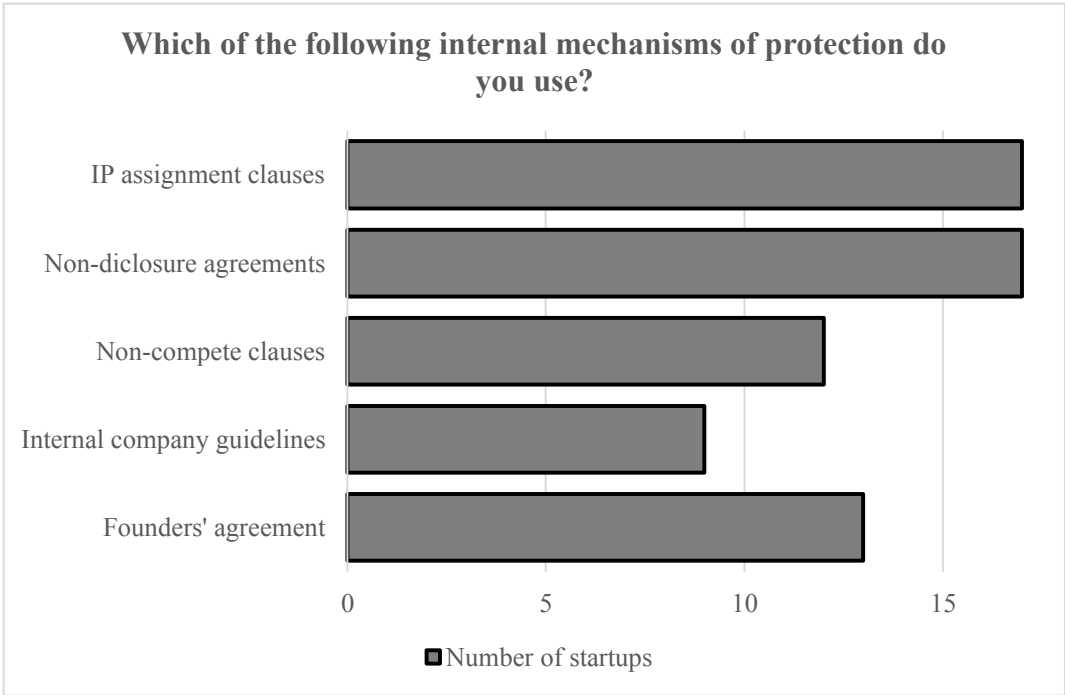


Figure 13 Internal Mechanism of Protection Used by Czech Software Startups

As is apparent, all interviewed startups use intellectual property assignment clauses and NDAs. Many stressed the importance of assignment clauses and noted that these were also required by investors. Startups cannot afford the risk of lacking exclusive rights to the software developed by their employees and contractors. Neglect of this legal issue could lead to costly financial settlements or even motivate the employee to establish a competing company. On the other hand, while using NDAs is something of a market standard, interviewees generally have doubts about their enforceability and effectiveness in truly retaining critical information within their firm. Similarly, while most startups utilize non-compete clauses in relation to their key employees and some startups have implemented internal guidelines, these instruments were not viewed as highly important to their overall strategy. Finally, founders’ agreements were used by most startups with multiple founders.

When discussing intellectual property rights, I inquired whether the startup has ever encountered any instances of infringement or breach of their intellectual property rights. Although most responded in the negative, a few startups have noted that they have encountered (potential) trademark infringement. One startup, offering data integration solutions, initiated an opposition against a trademark application for a similar word trademark to theirs. As the conflict

was unintentional, they eventually reached an agreement with the other party, particularly because the latter had restricted their trademark registration to only a few non-conflicting classes. Importantly, this resolution was facilitated by the absence of a genuine conflict, as the other party's business was primarily in agriculture.

Another Czech startup, focusing on data extraction, was confronted with a more difficult situation. As the COO of this startup described, there is a company in the United States that uses a very similar company name to theirs and is developing mobile applications. They became aware of this issue when the American company tried to register a trademark. Their application was rejected by the trademark office because this startup already had trademark registrations in both the United States and the European Union. At that time, the startup was considering raising another investment round and opening an office in the United States. They recognized the importance of “clearing the field” and preventing another company with such a similar name from operating in their key market. Given this, they intended to allocate some of the capital from that investment for a potential lawsuit. However, when they received the cost estimate for the lawsuit, it was around \$2 million. Consequently, they began to question whether it was worth pursuing legal action. They did send some cease-and-desist letters, including to other potential infringers, but those did not yield the desired results. The COO added: *“It seemed that the infringement wasn't significant enough to throw \$2 million down the drain. So even the trademark protection is actually useless in a way.”*³⁴⁶ From his perspective, trademarks primarily serve the purpose of preventing other firms from registering a similar trademark, but in light of the costs associated with enforcement, they do not necessarily offer substantial protection. The executive also pointed out that in the Czech Republic, trademark protection is probably more viable since litigation costs are significantly lower. Similarly, for an American company, \$2 million in litigation expenses might not be a major concern. However, for a Czech startup without established presence in the United States, potential litigation is very complex and expensive, making it an impractical option.

Moreover, a Czech data-analytics startup, which holds trademarks registered in the EU, UK, and the USA, came across a situation where another entity registered a web domain using their brand name but with the “.ai” domain extension. This entity was a startup based in Japan, developing a completely different product. In response, the Czech startup sent an informal cease

³⁴⁶ Interview with anonymous executive, 8.8.2023, translation by the author. Please note that since all interviews were conducted in Czech, a translation was needed. Despite minor editorial changes, the translation should faithfully reflect the speaker’s expression.

and desist letter, suggesting that if the Japanese company had intentions of expanding beyond Japan, they might need to consider changing their company's name. Ultimately, the Japanese startup did change their name. Another respondent of my interview mentioned encountering a case of cybersquatting³⁴⁷ while preparing for an expansion into foreign markets. However, this individual chose not to purchase the domains involved.

I was surprised to learn that Czech startups also encounter patent trolls. Two startups targeting the global market, and in turn the American market, shared their experiences with patent trolls. The COO of a startup specializing in data extraction, who previously described their experience with trademark infringement, mentioned that their startup was frequently targeted by patent trolls. Such trolls typically wield very broad and generic patents, often covering something as vague as “a generic patent for downloading content from the internet”. In this instance, the startup received a letter demanding a \$50,000 payment, citing infringement of such a patent. What is interesting is that the patent trolls did not threaten to sue the startup directly but instead targeted their clients who were using a product supposedly infringing on the patent. Fearing harm to their clients, the startup decided to pay, although they negotiated and settled on a significantly reduced amount of \$5,000, which ultimately satisfied the trolls. No further attacks occurred following this. Additionally, the CEO of a startup providing a SaaS solution for management of people, equipment, and compliance for SMEs shared a critical perspective on the patent system. He perceives the patent system as flawed, as its original purpose of protecting inventors has been subverted by large companies to create entry barriers. Additionally, patent trolls exploit patent lawsuits as a legitimate business model. His company also fell victim to patent trolls with a generic patent related to a “system integrating client information,” a description broad enough to cover virtually any CRM system solution. Due to the exorbitant cost of litigation, estimated at up to \$2 million, the company was forced to withdraw from the United States market. To address this challenge, they hired a renowned law firm, which successfully forced the patent troll to back down. Following this experience, the startup made the strategic decision to join two patent associations, which pool a large number of patents among its members to combat patent trolls.

These stories underscore the fact that the intellectual property rights system does not always function as initially envisioned in theory. Notably, the substantial financial costs linked to

³⁴⁷ Cybersquatting refers to the act of registering an internet domain name with the malicious intent of profiting from the goodwill or trademark of someone else. Typically, cybersquatters demand a hefty payment in exchange for the domain name.

enforcing these rights pose a significant barrier to effective protection. While the issue of patent trolls has been extensively discussed in academic literature, concrete actions to address this problem remain elusive. Considering the software startups' relatively low assessment of the effectiveness of patents, a legitimate question emerges: does the patent system, in certain sectors, potentially do more harm than good?

In summary, the data reveals that Czech software startups heavily use copyright and secrecy. In contrast, there is a low inclination to patent among these startups, with only two startups out of seventeen reporting patent filings. Notably, these two startups seek patent protection in the United States, their primary market. Internally, Czech software startups actively implement copyright assignment through contractual clauses in employment and contractor agreements. They also frequently utilize NDAs, although their effectiveness and enforceability raise doubts among respondents. Additionally, anecdotal evidence emphasizes the high litigation costs that can severely impede cost-constrained startups from effectively protecting their intellectual property.

5.3.3 Importance of Various Appropriability Methods

I had a particular interest in understanding how Czech software startups approach the challenge of appropriating value from their innovations and how this aligns with the findings of previous research. First, respondents were asked whether they view formal or informal methods of protection as more efficient in securing competitive advantage. All respondents indicated that overall, informal methods were instrumental to their success and prevailed over formal mechanisms of protection. Second, following the approach of the Berkeley survey, I asked the respondents to rate the importance of selected appropriability methods in capturing competitive advantage from their startup's technology innovations: first mover advantage over competitors; secrecy; patents; copyrights; trademarks; difficulty of reverse engineering; and other production, implementation, or marketing capabilities (complementary assets). The results are presented below.

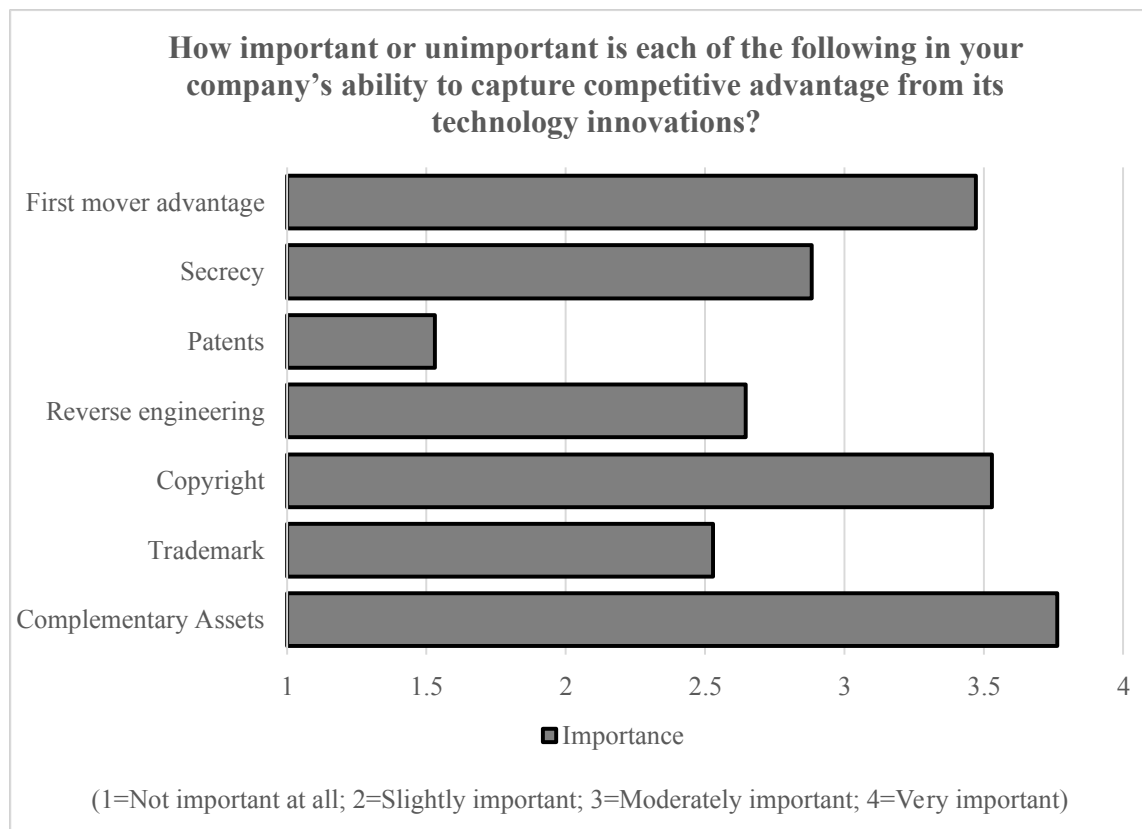


Figure 14 Capturing Competitive Advantage from Technology by Czech Software Startups

Clearly, Czech software startups view complementary assets as the most important factor in capturing value from their innovations. Many startups have explicitly noted that particularly marketing and sales are of utmost importance to them. The COO of a startup focusing on data extraction stressed that their startup is operating in a new market that is growing quite rapidly. They compete with a maximum of ten other startups globally. While each startup deploys a slightly distinct solution to address the problem and may focus on somewhat different client demographics, there are shared similarities in these solutions. *“It's a matter of who took the best approach and who has the best sales and marketing skills. Particularly marketing is of paramount importance to us. We rely heavily on online marketing for our sales efforts and invest significantly in acquiring customers through this channel. This internal knowledge is highly valuable to us, and we are actively cultivating it. We don't engage with any external online marketing agency for this purpose. It's a fundamental aspect of our business, and we are committed to building and developing an in-house team to handle it,”*³⁴⁸ he added. The CEO of an open-source AI developer tools startup also noted that they operate in a market that is exceptionally new, as the landscape practically reset in 2023 with the introduction of large

³⁴⁸ Interview with anonymous executive, 3.8.2023, translation by the author.

language models. This unique position enables them to evolve alongside the field and influence the market's direction. In this context, community building holds immense significance. He stated: "*Distribution is a significant advantage, it alone doesn't guarantee success, but it's much easier to test a new product feature when you have a thousand developers in the community.*"³⁴⁹

Copyright follows as the second most important appropriability method. This is closely related to the widespread use of intellectual property assignment clauses in employment and contractor contracts, as well as the fact that investors are concerned about this issue. Generally, the interviews indicate that startups consider the assignment of copyright as essential, but they do not necessarily view copyright as a means of protection against competitors. Copyright's value appears to be in establishing a framework for assignment of exclusive rights to the startup and, as Mann argues, in preventing piracy and offering premarket protection.³⁵⁰ Additionally, multiple startups pointed out the importance of securing appropriate licenses for the open-source software they use in developing their software products and ensuring that their customers are provided with appropriate licenses, if applicable.

First mover advantage ranks closely behind copyright in terms of importance. However, in contrast to the Berkeley survey where first mover advantage was rated as the most crucial appropriability method, some software startups in my interviews highlighted that while being the first in the market can provide an advantage, it is effective execution that truly matters. Many first movers make mistakes, and followers can capitalize on those errors by introducing improved products and customer service. Nevertheless, first mover advantage is viewed as an important factor in appropriating the benefits of technology innovation.

Secrecy, difficulty of reverse engineering, and trademarks all fall within the range of slightly to moderately important as rated by these startups. Patents, however, are not viewed as even slightly important.³⁵¹ The relatively low importance assigned to secrecy and difficulty of reverse engineering is not surprising and aligns with the opinion that such methods are relatively

³⁴⁹ Interview with anonymous executive, 25.9.2023, translation by the author. The user community holds paramount significance for numerous software startups, particularly for early-stage open-source startups. In such instances, a community can be perceived as a complementary asset. See DAHLANDER, Linus and WALLIN, Martin W. A man on the inside: Unlocking communities as complementary assets. *Research Policy*. 2006, Vol. 35, no. 8, pp. 1243–1259. DOI: 10.1016/j.respol.2006.09.011

³⁵⁰ MANN, *supra* note 200, pp. 1015–1020.

³⁵¹ Reasons for forgoing patenting will be addressed separately in a subsequent analysis.

ineffective in establish long-lasting protection for software startups.³⁵² Generally, the interviewed executives supported the perception that if a software product is not based on groundbreaking new technology, its functionality can be replicated. However, several founders mentioned that even if their software is copied, it may not necessarily harm their business. They emphasized that building a successful business involves many other factors such as sales, customer support, and growing a user base, which cannot be easily replicated by competitors. In contrast, it is worth noting that some startups in my sample highlighted the importance of the difficulty of reverse engineering as a strategic element, particularly those introducing genuinely novel technologies or relying on industry know-how. Few startups also noted that they use technical means of protection – including software event logging and source code access control.

On the other hand, it was surprising to discover that some startups operate with complete transparency. Specifically, they rely on an open-source approach, making the source code of their product publicly available.³⁵³ In my interviews, I encountered two startups offering developer tools that adopted this approach. Neither of them was particularly worried about possibility of copying from third parties, arguing that their internal know-how and execution are the keys to their success.³⁵⁴ Rather, they explained that adopting an open-source approach has multiple advantages. Primarily, embracing open-source is quite common among developer tools startups. In this competitive landscape where products can be very similar, the choice between open-source and closed-source alternatives becomes pivotal. As such, the inclination towards open-source is viewed as a competitive advantage, because it offers greater transparency, flexibility and is heavily focused on community. Importantly, building a community is essential for the whole business model. Open-source startups typically embrace a bottom-up strategy, commencing with the adoption by individual developers within an organization, which in turn leads to signing large enterprise clients. This strategy is fundamentally rooted in great user experience. In terms of monetization, it is typical to use

³⁵² MANN, *supra* note 200, p. 1020.

³⁵³ One of the founders explained their approach. The entirety of their code is available in a single folder on their GitHub repository. Despite the existence of an enterprise version within their startup, the code related to this version is also available on GitHub. However, it is accompanied by a note specifying that it is subject to the enterprise license and cannot be used without it. The founder views this approach as economically reasonable because it saves overhead costs associated with managing multiple repositories.

³⁵⁴ However, as noted by one of the founders, it is important to choose correct licensing arrangements for distinct segments of code to preempt potential competitors from forking the code and building a competing solution.

either an open-core business model, characterized by a free core product and monetization of advanced features, or providing the product completely open-source with optional paid software services such as cloud hosting and customer support.

Overall, when comparing the results of my interviews with those reported in the Berkeley survey, notable differences are observable. While the general trend is similar – with complementary assets and first mover advantage viewed as particularly important – the results differ in other aspects considerably.³⁵⁵ For example, why is copyright not rated higher in importance in the Berkeley survey? Why are many appropriability methods viewed as more important by Czech startups? And why do Czech software startups rely so heavily on complementary assets? While it is expectable that patents would be rated lower in importance due to the limited patentability of software in the European Union, it is difficult to explain the variance in other answers. In the case of copyright, it is plausible that respondents in the Berkeley survey may have predominantly evaluated the importance of copyright within the context of protecting against competitors. They might not have given as much weight to its role in managing the assignment of rights and providing internal protection against potential threats, including actions by employees and contractors, as well as addressing software piracy.

Other differences in responses, including the higher ratings for various methods except patents and trademarks compared to the Berkeley survey, could be attributed to the different research method employed. Conducting interviews, as opposed to simply distributing surveys, may have influenced these responses. The prior discussion and direct engagement with an interviewer with a legal background could have introduced a desirable response bias. Drawing from the interviews, however, I am skeptical towards this interpretation. The interviews seem to provide a coherent picture. The data regarding the utilization of various intellectual property rights and the surrounding discussion on commercialization strategies align with the individual answers of respondents concerning the importance of selected appropriability methods. It is, however, conceivable that sample selection may have also played a role – the sample is small and largely consists of high-potential venture-backed startups, which might possess greater competence in preparing their innovation protection strategy. Given the fact that all these startups expand to foreign markets, they may find it imperative to ensure robust protection. Finally, the Berkeley survey was conducted in 2008 – and contemporary startups might have a

³⁵⁵ Notably, it is challenging to discern the factors contributing to the change in the perceived order of importance between complementary assets and first mover advantage, as observed in the results of my research compared to those of the Berkeley survey.

different perspective on the importance of appropriability methods. The startup landscape has matured significantly since then and present-day startups are likely more knowledgeable about appropriability strategies and their importance. Conducting a study with a sample of European and American software startups might provide some answers regarding these disparities in findings.

Finally, a majority of the respondents expressed their perception of adhering to a conventional approach in appropriability strategy selection compared to their peers in the software startup sector. When confronted with this decision, startups typically gravitate toward best practices or adopt decisions founded upon their specific needs, often without the employment of a formalized framework. They tend to optimize for growth and future exit plans. However, it is worth highlighting that all the startups in my sample make sure that copyright assignment is secured. It is clear to me from legal practice that this is not a given.

On the whole, this study reveals that, in the software startup sector, informal appropriability methods are deemed more effective in securing competitive advantage from innovations compared to formal methods. Among these, complementary assets, copyright, and first mover advantage are rated as the most important appropriability strategies. Other methods follow with a considerable gap, with patents rated dead last, not even considered “slightly important”. It is noteworthy that, in contrast to the Berkeley survey, the software startups in this study place higher importance on copyright. Moreover, it is essential to recognize that there is no one-size-fits-all approach to appropriating value from innovations in the software industry. Specific strategies may vary based on the nature of the software product and the startup’s unique circumstances. For instance, cybersecurity startups may find patenting crucial, while others may opt for transparency through open-source approaches. Success in appropriating returns can be achieved through various approaches, and the choice depends on the specific goals and characteristics of each startup.

5.3.4 Motives for Patenting

Given that only two startups in the sample chose to pursue patents for their innovations, the data regarding their motivations for patenting is inconclusive. Therefore, this thesis does not aim to present detailed data related to startups’ motivations for patenting. However, it is worth noting the unique context of these patenting startups. Both operate in the B2B space, specifically in the fields of artificial intelligence and cybersecurity, where patenting tends to be more prevalent due to the association with radical innovations. This contrasts with for example

fintech or proptech startups, where radical innovations are typically not as common. In these high technology sectors, patenting is frequently regarded as an industry norm and a requisite practice, as mentioned by the CTO of the cybersecurity startup. This CTO highlighted the defensive function of patents. Patents can serve as a defensive measure against competitors and patent trolls by providing assurance that the startup's technology is indeed unique and does not infringe on existing patents. Additionally, patents can be used for cross-licensing to avoid litigation. On the other hand, the COO of the AI startup viewed patents as providing a competitive advantage, creating barriers to potential competitors who might seek to replicate their innovative solutions.

5.3.5 Reasons to Forgo Patenting

Given the notable rate of non-patenting among software startups in this study, it will be insightful to chart the reasons that startups provide for their decision to not pursue patents. However, before delving into this analysis, it is necessary to address a few key points. When designing the questions for this section, I operated with the knowledge that since computer programs *per se* are not patentable under the European Patent Convention, patenting would be a limited option for Czech software startups. However, it is worth noting that some startups may meet the threshold for patent eligibility by introducing programs with a “further technical effect” or by seeking patent protection in the United States or other jurisdictions. Importantly, I did not disclose any information about differing patent regimes to the startups that I was interviewing. During the interviews, it quickly became apparent that only a select few startups possessed excellent knowledge concerning the operation of the patent system, patentability criteria in both the European Union and the United States, as well as the associated costs of patenting and enforcing patents. Nevertheless, nearly everyone acknowledged the perception that patenting criteria seem to be more lenient in the United States. Considering that startups operating solely in the European Union will be subject to the regime established by the European Patent Convention, whereas startups operating globally can potentially also patent their solutions in the United States or other jurisdictions, I present the data separately for these groups of startups.

Unlike the Berkeley survey, I have examined the reasons for forgoing patenting only among startups that do not seek any patents.³⁵⁶ Out of fifteen non-patenting startups, all but one

³⁵⁶ While the authors of the Berkeley survey asked all respondents about the reasons behind their decision to forgo patenting their last innovation, I opted for a simpler approach. I was unsure whether respondents would be able to

provided answers in this section of the interview.³⁵⁷ Respondents were asked to indicate which of the following reasons influenced their decision not to apply for patent protection: did not want to disclose information; cost of getting the patent; competitors could have invented around; believed trade secret was adequate protection; cost of enforcing the patent; believed technology was not patentable; no need for patenting outside Czechia.³⁵⁸ However, respondents were not restricted solely to these options and could provide other reasons that influenced their decision.

Among six startups operating regionally within the European Union, one combined the use of software and hardware and even actively considered patenting its solution.³⁵⁹ The remaining startups were not highly technologically intensive and were unlikely to obtain patents under the regime applicable in the European Union. This is also evident in the results presented below; all startups believed that their technology was not patentable. While other reasons were cited, such as the high costs associated with obtaining patents, it is worth noting that most of these startups had not conducted any analysis of the potential patentability of their innovations and were not aware of the fact that patenting of computer programs per se is not possible under the European Patent Convention. Their responses, instead, reflect a layman's view of the patent system.

differentiate between various patentable subject-matters within their innovative solutions, as early-stage startups typically offer a single product. I thus only approached non-patenting respondents with this question. For details about the research method employed by the Berkeley survey, *see* GRAHAM et al., *supra* note 4, p. 1309.

³⁵⁷ One executive, specifically in the role of CFO, was not privy to the reasons for the startup's decision to forgo patenting and, therefore, declined to respond.

³⁵⁸ The last reason was edited compared to the option provided in the Berkeley survey. It reflects the fact that patenting of computer programs is generally not feasible in the European Union but might be possible in other jurisdictions.

³⁵⁹ As the respondent explained, uncertainty about whether they would be granted a patent led them to decide not to file a patent application after all.

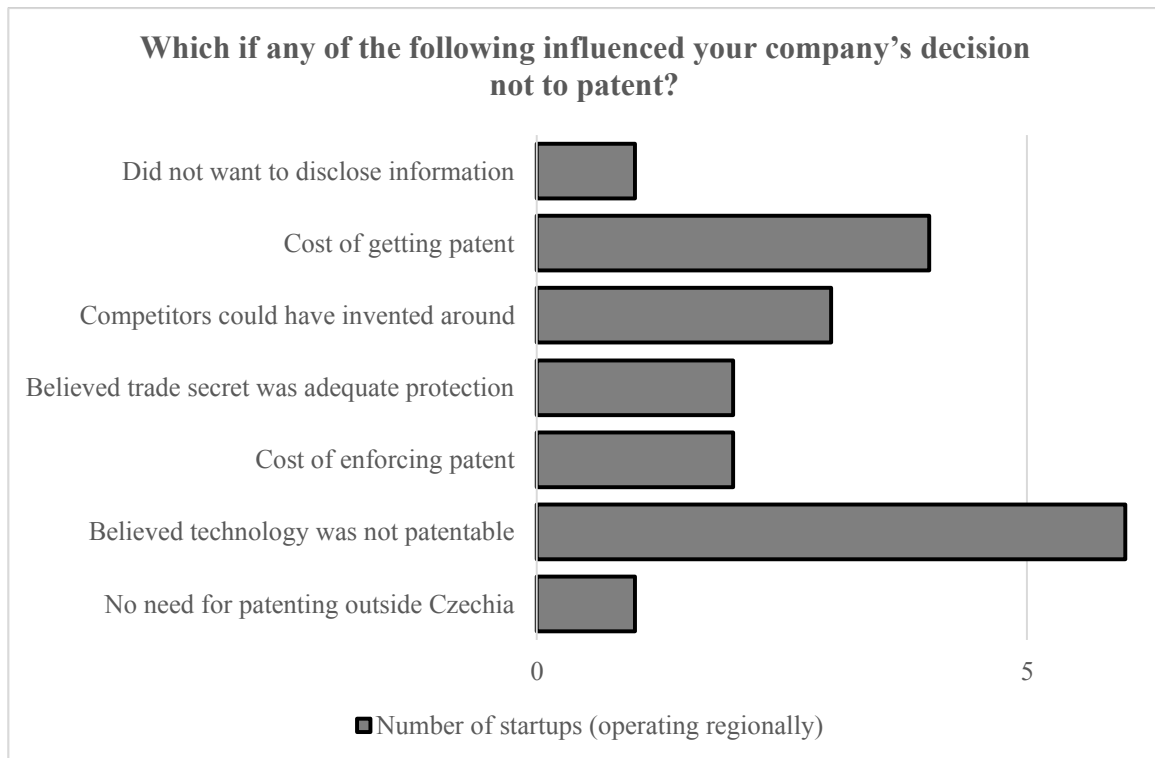


Figure 15 Reasons for Forgoing Patenting of Czech Software Startups Operating Regionally

Out of eight non-patenting startups operating on the global market, five stated that they believed their technology was probably not patentable. In the case of the three startups that did not attribute this as a reason for not pursuing patents, their decisions were driven by a range of other considerations, some of which fell outside the scope of the predetermined options provided to the respondents. The CEO of a startup focusing on algorithmic trading stated that they did not want to disclose information about their invention. He also mentioned that even if they chose to pursue patents, they would face challenges in monitoring potential infringements. They lack the resources necessary to effectively track and detect any violations of their patents, and there is currently no system in place to aid them in this process. Another respondent, the CEO of an AI developer tools startup, explained that patents are not typically pursued in the developer tools industry. From his perspective, patents do not confer any advantage to a young startup. When asked about the most important reasons for not seeking a patent, he further explained his reasoning: *“I would pick the cost of enforcing the patent [as the most important reason], but I would reframe it a little bit – as the ability to enforce the patent. In which I would include both the financial cost, the time cost, but also essentially the sensibility of such a move for a startup that needs to move rapidly and gain a position in the marketplace and would instead be dealing*

with legal issues.”³⁶⁰ He also listed easiness of inventing around as a reason for not seeking patent protection. Finally, the CEO of a data analytics startup noted that for them, the primary reason for not pursuing patents is the perception that very few individuals in the software community do so, making it an odd choice.

Other reasons for forgoing patenting cited by globally operating startups, that is besides the belief that the technology is not patentable, were not as common. The figure mapping their answers is presented below.³⁶¹ Interestingly, globally operating startups less frequently cited costs as a limitation compared to regionally operating startups. This suggests that they might be better capitalized. It is worth noting that even among the group of startups that believe their innovation might be potentially patentable in the United States, none have conducted any further analysis. While globally operating startups were generally aware of the option to patent software in the United States, patentability of computer programs in the European Union was not discussed.

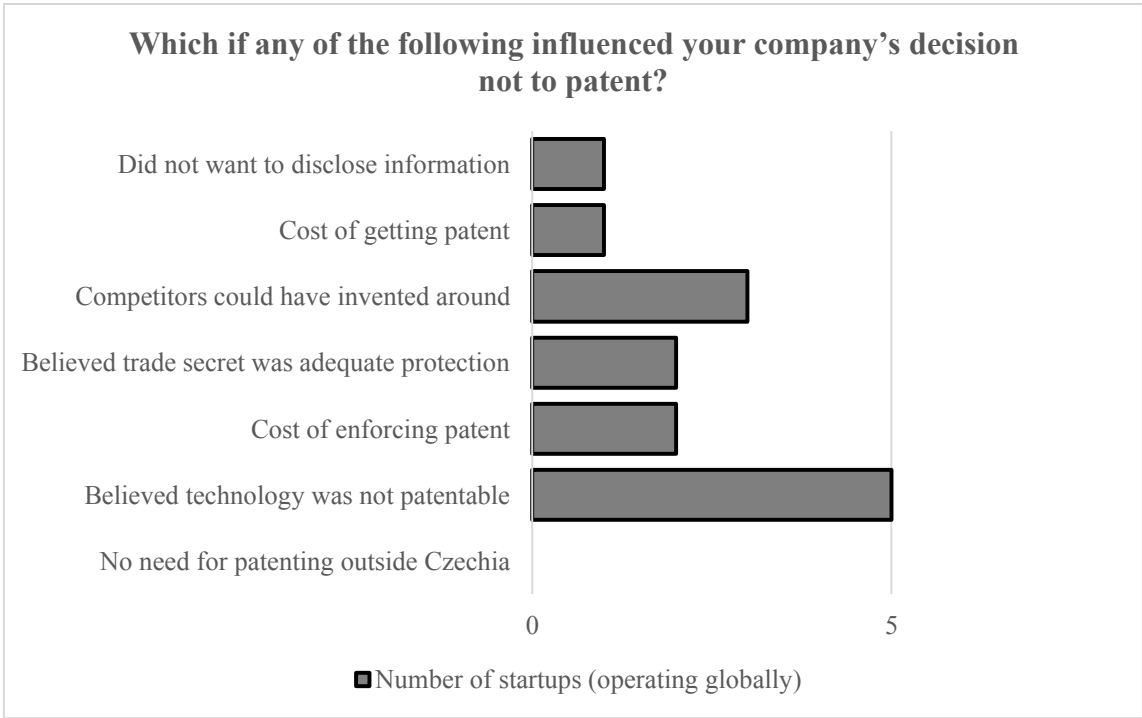


Figure 16 Reasons for Forgoing Patenting of Czech Software Startups Operating Globally

³⁶⁰ Interview with anonymous executive, 25.9.2023, translation by the author.

³⁶¹ Please note that the figure does not include data on reasons for not seeking patents that were not part of the predefined options presented to respondents. Such responses are presented in the text above.

To obtain even more detailed data, all respondents were asked about the single most important reason for not patenting their innovation. Out of all startups, both those operating regionally and globally, six stated that it was their lack of belief that their technology was patentable. Other reasons were scattered, with a single startup selecting each. Overall, these results are at odds with the findings reported by the Berkeley survey, where costs were found to be the main reason driving the decision to forgo patenting, with the belief that the technology is not patentable only reported by 42% of software startups.³⁶² The primary reason for not pursuing patents, as perceived by the entrepreneurs in this study, is the lack of patentable subject-matter. This reason is more commonly cited by startups operating solely within the European Union, which aligns with the stricter patentability criteria. However, it is conceivable that project quality plays a role, since more radical innovators may be more likely to focus on the global market.

Although it might be anticipated that startups operating exclusively within the EU would frequently perceive their innovations as non-patentable due to the existing patenting regime, however the results here presented are significant in the context of startups with global operations, as they have the potential to secure patents in the United States. It is plausible that contemporary startups perceive the patent system in the United States as more stringent than in 2008, particularly due to the introduction of the *Alice/Mayo* test. This could explain the finding that even globally operating startups often cited the lack of patentable subject-matter as a major reason for not pursuing patents, leading to a contrast with the Berkeley survey results where this reason was less common. It is worth noting that the limited size of the research sample might have also influenced the results. Further research would be needed to explore these factors in greater detail.

Caution is needed when interpreting the data on reasons for not pursuing patents in this study. Many respondents had limited knowledge of the patent system and its legislative framework, which may limit the explanatory power of the results concerning patentability rates, cost sensitivity, and other factors. Nevertheless, a similar objection could be raised regarding the Berkeley study, which used a comparable methodology, albeit without the benefit of additional context obtained through interviews.

All in all, considering the aforementioned limitations, two conclusions can be drawn with reasonable confidence given the additional context provided by these interviews. First, it is evident that Czech software startups generally possess limited knowledge about the patent

³⁶² GRAHAM et al., *supra* note 4, p. 1313.

system, with the majority not even contemplating patenting. The second conclusion closely relates to the first, as the majority of software startups believe their innovations are not patentable. This perception is the primary reason behind their decision not to pursue patents for their innovations.

5.3.6 The Relationship Between Intellectual Property Protection and Financing of Startups

Finally, respondents were asked about their experience with fundraising and its connection to intellectual property protection. Notable, every startup in the sample secured investments, commonly from a combination of multiple sources. Detailed data is available below.

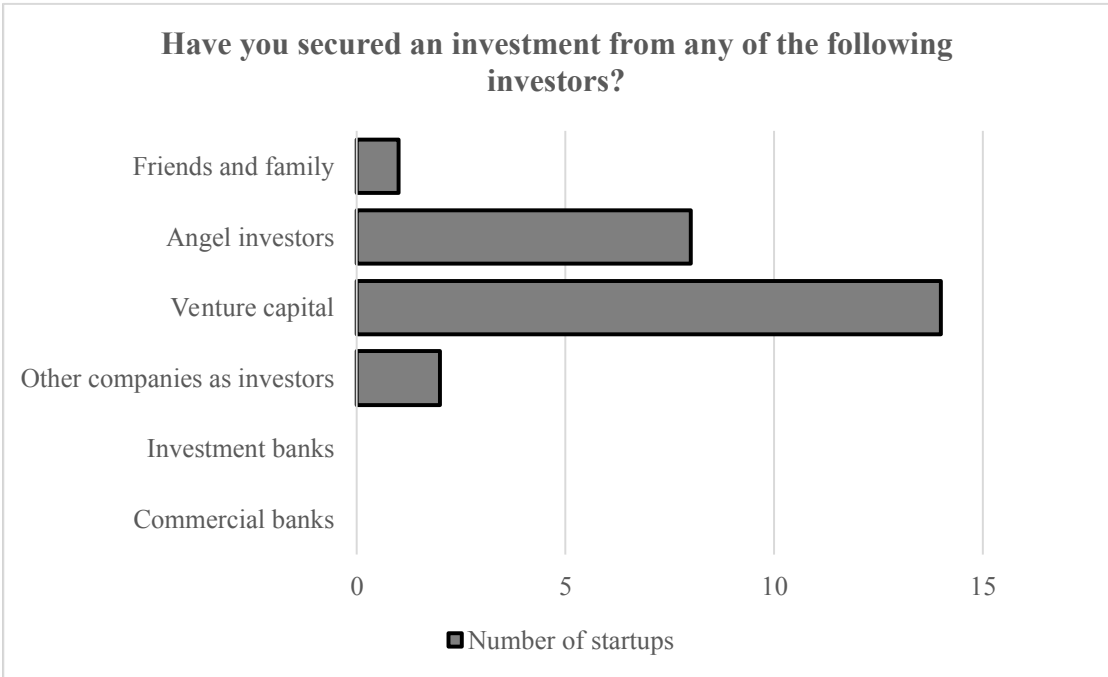


Figure 17 Investment Sources of Czech Software Startups

Only two startups from the sample were queried about patenting their invention during investment negotiations, but both startups reported that it was not an important factor in the investor’s funding decision.³⁶³ One startup, presently in the process of filing patent applications, indicated its intention to handle patenting independently to its venture capital investors. These results contrast markedly with those of the Berkeley survey, where 59% of venture-backed

³⁶³ One of these startups raised capital from angel investors, the other from venture capitalists.

software firms indicated that patents were important to venture capitalists.³⁶⁴ Although this is just a single anecdotal account, it is noteworthy that the CEO of a Czech highly promising data analytics startup explicitly inquired of their American investor about the necessity of patenting, to which the investors replied by stating that patents are not useful or valuable. Why are the results so markedly different? While reduced interest in patents by investors could be attributed to the differences in legal regimes between the European Union and the United States, it is key to stress that more than half of the startups in this sample are targeting the global market, with the United States often at the forefront of their interests. Additionally, many startups have international investors. In light of this, one might anticipate higher interest from investors in patents.

Perhaps the competitive landscape has changed significantly during the past seventeen years, and patents are simply not crucial in winning the market for software startups. Moreover, in light of recent case law that has considerably tightened the patenting requirements in the United States, many software startups might not meet the criteria for patent protection, despite developing highly innovative products. This topic warrants further research. Conducting a study among investors to assess potential shifts in their attitudes toward patents, whether as indicators of project quality or as effective defensive tools, would be a valuable addition to the current state of knowledge.

Furthermore, respondents revealed that intellectual property protection is typically addressed during due diligence. Investors regularly seek assurance that the company has proper copyright assignments, leading to careful examination of employment and contractor agreements. Several startups acknowledged that they had to revise their contracts due to the investment process. However, intellectual property protection is not commonly a prominent subject in negotiations between founders and investors and likely does not signal project quality; instead, discussions revolve around scalability, key performance indicators and market potential.

Overall, my findings indicate that investors do not view patents as important in their decision to invest in software startups. This result sharply contrasts with the findings of the Berkeley survey. I propose that further research into this topic is warranted. However, it is worth noting that investors do routinely check that all copyright is properly assigned during due diligence.

³⁶⁴ GRAHAM et al., *supra* note 4, p. 1308.

5.4 Discussion and Conclusions

This research contributes to the relatively understudied topic of appropriability regimes used by startups and provides new insights on questions surrounding the use of various intellectual property rights. The results yield several significant findings. First, Czech software startups are ordinarily expanding internationally and frequently establish corporations in their target markets. Second, copyright and trade secrets are heavily used by these startups, and over half of the respondents use trademarks. While patenting is relatively uncommon, I find that some startups seek patents in the United States. Internally, intellectual property assignment clauses and non-disclosure agreements are frequently employed. Third, informal appropriability methods are considered more important by startups than formal methods. Complementary assets, copyright, and first mover advantage are rated as the most important, while patents are ranked last. Anecdotal evidence suggests that a range of appropriability strategies can effectively secure appropriation of return for startups, including the adoption of a fully transparent open-source approach. Fourth, startups generally lack knowledge about the patent system, with most not even considering patenting. The belief that their technology is not patentable is cited as the primary reason for not seeking patents. Fifth, investors do not consider patents as a significant factor in their investment decision regarding software startups. Investors do, however, verify copyright assignments during the due diligence exercise.

My research reveals several novel findings, including an insight into the international ambitions of Czech software startups and the legal steps that follow, as well as the utilization of intellectual property rights and internal protection mechanisms among Czech software startups. While the frequency of use of intellectual property rights at the firm level has been examined by several research papers, the topic remains largely unexplored within the realm of software companies, particularly startups. A notable discovery is the limited engagement in patenting among Czech software startups, as contrasted with data obtained among their American counterparts in previous research.³⁶⁵ Nevertheless, I also find that a small subset of Czech software startups does pursue patents in the United States. Furthermore, the rating of importance of various appropriability methods by software startups in this study provides a basis for comparison with results reported by the Berkeley survey. Both studies reveal a common preference for informal methods. However, it is worth noting that Czech software startups rate copyright as nearly “very important”, which contrasts with the significantly lower

³⁶⁵ See MANN, *supra* note 200.; GRAHAM et al., *supra* note 4.

rating of copyright in the Berkeley study and in other papers, including the one by Blind et al.³⁶⁶ This warrant further investigation into the role played by copyright. It is possible that respondents of prior studies may have primarily assessed the significance of copyright in the context of shielding against competitors, rather than considering its importance for safeguarding assignment of exclusive rights. Czech software startups emphasize the significant role of intellectual property assignment clauses. Internal intellectual property protection is deemed crucial, despite being a relatively overlooked topic in the existing literature. Moreover, Czech software startups, particularly those operating solely within the EU, cite the belief that their technology is not patentable as the primary reason for not filing for patents. Interestingly, the absence of patentable subject-matter is a prominent reason for not pursuing patents even among Czech software startups with global aspirations who might consider seeking patents in the United States. These findings contrast with the results of the Berkeley study, where cost was identified as the primary reason for not pursuing patents. Lastly, my research unveils that investors do not place much importance on patents in their investment decisions, a finding strikingly opposing the results of the Berkeley survey.

These results, of course, have inherent limitations. Notably, the sample in this study is relatively small, and it primarily comprises venture-backed software startups known for their high project quality. Consequently, the generalizability of these findings to other software startups may be affected. However, it is important to recognize that the Czech startup ecosystem is not as extensive as in more mature regions, and this study likely encompasses a significant portion of it. To address sample size concerns, a more comprehensive study could be conducted across various European countries with similar legal environments. Such study might reveal if the trends observed here translate to other environments, for example whether software startups from various European countries share incentives for international expansion, particularly to the United States.

In terms of future research, it would be valuable to conduct a comparative study involving a sample of both European and American startups, focusing on appropriability strategies, patent adoption rates, and the influence of patents on investor decision-making. Such an approach would yield directly comparable results thanks to uniform methodology. The results would also be unaffected by changes in legal frameworks and business environments over time. Additionally, employing econometric methods could provide deeper insights into the findings.

³⁶⁶ See BLIND, Knut. Intellectual Property in Software Development: Trends, Strategies and Problems. *Review of Economic Research on Copyright Issues*. 2007, Vol. 4, no. 1, pp. 15–25. ISSN 1698-1359.

Lastly, it is evident from anecdotal evidence that there is no one-size-fits-all commercialization strategy for software startups. Appropriability strategies might significantly differ among subsectors such as cybersecurity, fintech, or developer tools. Therefore, further exploration of the various appropriability and commercialization strategies within these subsets is warranted.

6 Conclusion

The analysis conducted, which encompasses the examination of law and economics justifications as well as critiques of intellectual property rights, an overview of intellectual property legal frameworks in the European Union and the United States, coupled with a comprehensive literature review of studies providing empirical data on the use of appropriation methods among startups, in addition to my original research involving Czech software startups, collectively aims to offer valuable insights into the practical approaches which startups employ for appropriating returns from innovation. Furthermore, it seeks to shed light on the significance of intellectual property rights in the context of these companies.

In my research, I focus specifically on a sample of Czech software startups and make the following analytical contributions. The results of my research show that Czech software startups, similarly to their American counterparts, heavily rely on informal appropriability methods such as complementary assets and first mover advantage. However, among formal appropriability methods, copyright is rated very highly in my sample. An important and novel finding is that software entrepreneurs place particular emphasis on intellectual property assignment clauses in contracts with employees and contractors, an instrument that is also systematically required by investors. This supports the thesis that the primary role of copyright for software startups is to secure internal protection, rather than serving as direct protection against competitors. Patents, in contrast, are consistently rated as relatively unimportant. Nevertheless, a few Czech software startups do pursue patents in the United States. Notably, respondents also indicate that investors do not consider patents as a significant factor in their investment decision. This includes prestigious international venture capital funds that invest in Czech entities.

Although this topic lies beyond the scope of this thesis, the relative unimportance of patents for emerging software innovators, coupled with the potential barriers to entry posed by patent thickets³⁶⁷ and susceptibility of certain software startups to patent trolls, provoke a question whether we would not be better off without the patent system. It is, however, important to note that the applicability of such proposition is context specific – patenting is a key strategy for innovators in other industries, such as biotechnology and IT hardware. Finally, anecdotal evidence from interviews with respondents shows that the costs of intellectual property rights enforcement are exorbitant, casting a shadow of doubt on the substantive protection that this

³⁶⁷ See COCKBURN and MACGARVIE, *supra* note 160, pp. 26–28.

institute realistically offers to young technology companies, a topic worthy of further investigation.

To conclude, although my research is limited by certain factors like the modest sample size of interviewed startups and a limited quantitative analysis, I hope that the preceding discussion and investigation have contributed to an understanding of appropriability methods employed by software startups, particularly in the context of European entities. I do not consider the results of my work to be all-encompassing, on the contrary, I see possible avenues for further research and an opportunity to focus on policy implications for legislators. If we want to promote an innovative society and technological growth, it is in our interest to address these topics.

List of Abbreviations

AI	Artificial intelligence
B2B	Business-to-business
Berkeley survey	GRAHAM, Stuart J.H. et al. High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey. Berkeley Technology Law Journal. 2009, Vol. 24, no. 4, pp. 1255–1327. ISSN 1086-3818
Berne Convention	Berne Convention for the Protection of Literary and Artistic Works, September 9, 1886, as revised and amended
CEE	Central and Eastern Europe
CEO	Chief executive officer
CFO	Chief financial officer
CMO	Chief marketing officer
Computer Programs Directive	Directive 2009/24/EC of the European Parliament and of the Council of 23 April 2009 on the legal protection of computer programs
COO	Chief operations officer
CRM	Customer relationship management
DACH	The DACH region refers to the countries of Germany (D), Austria (A), and Switzerland (CH)
EPO	European Patent Office
EU	European Union
European Patent Convention	Convention on the Grant of European Patents (European Patent Convention), October 5, 1973, as revised and amended
InfoSoc Directive	Directive 2001/29/EC of the European Parliament and of the Council of 22 May

	2001 on the harmonisation of certain aspects of copyright and related rights in the information society
IP	Intellectual property
IPO	Initial public offering
IT	Information technology
Lanham Act	Lanham (Trademark) Act of 1946, 15 U.S.C. § 1051 et seq. (2021) (United States of America)
NDA	Non-disclosure agreement
Nice Agreement	Nice Agreement Concerning the International Classification of Goods and Services for the Purposes of the Registration of Marks, June 15, 1957, as revised and amended
Paris Convention	Paris Convention for the Protection of Industrial Property, March 20, 1883, as revised and amended
Patent Act	Patent Act of 1952, 35 U.S.C. § 1 et seq. (2021) (United States of America)
SaaS	Software as a service
SME	Small and medium-sized enterprises
Trade Secrets Directive	Directive (EU) 2016/943 of the European Parliament and of the Council of 8 June 2016 on the protection of undisclosed know-how and business information (trade secrets) against their unlawful acquisition, use and disclosure
TRIPS Agreement	Agreement on Trade-Related Aspects of Intellectual Property Rights, April 15, 1994, as amended
UK	United Kingdom
US	United States

USA

United States of America

U.S.C.

United States Code

VC

Venture capital

WIPO

World Intellectual Property Organization

YIC

Young innovative company

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Intellectual Property Protection for Startups: A Law and Economics Perspective

Abstract

This thesis examines the appropriability methods used by startups to appropriate returns from their innovation. The theoretical part of this work delves into the classical law and economics theory of intellectual property, scrutinizing the intricate balance between incentivizing innovation and enabling broader access to knowledge. It also examines critiques of the intellectual property system and explores alternative incentive mechanisms. Additionally, an analysis of the fundamental attributes of selected intellectual property rights is provided. This evaluation considers the legal frameworks of both the United States and the European Union, along with the corresponding theories in the field of law and economics. The subsequent literature review presents a comprehensive analysis of the existing body of knowledge based on empirical studies of appropriability methods used by startups.

In the empirical part of this thesis, the results obtained from research conducted on the importance of appropriability strategies utilized by seventeen Czech software startups are presented. It becomes evident that these startups place significant emphasis on informal appropriability methods, notably leveraging complementary assets and first mover advantage to capture competitive advantage from their technological innovations. A noteworthy revelation of this research is the role attributed to copyright, rated as the most important formal appropriability method. This is linked to the widespread adoption of intellectual property assignment clauses in contracts with employees and suppliers. Additionally, investors also routinely require startups to include such assignment clauses in contracts. The interviews conducted reveal that copyright primarily serves as a mechanism for internal protection, especially to safeguard the startup's ability to exercise exclusive rights over the works created by employees and contractors.

Conversely, other formal appropriability methods, such as patents, are considered significantly less important. Patents received the lowest overall rating in terms of importance, not even regarded as "slightly important". It is important to highlight that despite this, a few Czech software startups do pursue patents in the United States. Nevertheless, the respondents suggest that the possession of patents does not significantly influence investors' decisions to invest. Finally, this thesis offers insights into various other topics, including patent trolling, the

costs associated with enforcing intellectual property rights, and the diverse commercial strategies adopted by software startups.

Key words: startup; intellectual property; appropriability method; innovation protection; software; law & economics

Startupy a ochrana duševního vlastnictví pohledem ekonomické analýzy práva

Abstrakt

Tato práce zkoumá metody přivlastňování, které startupy používají k zajištění výnosů ze svých inovací. Teoretická část práce se zabývá klasickou teorií duševního vlastnictví z pohledu ekonomické analýzy práva a analyzuje rovnováhu mezi zajištěním motivace k inovaci a umožněním přístupu ke znalostem. Zkoumá také kritiku systému duševního vlastnictví a alternativní motivační mechanismy. Dále je prostor věnován výkladu o základních atributech vybraných práv duševního vlastnictví, zohledňujíc právní rámce Spojených států amerických i Evropské unie spolu s teoriemi v oblasti ekonomické analýzy práva. Navazující recenze literatury poskytuje komplexní analýzu současného stavu poznání v oblasti empirických studií o metodách přivlastňování používaných startupy.

V empirické části práce jsou prezentovány výsledky výzkumu o důležitosti různých metod přivlastňování výnosů z inovací využívaných českými softwarovými startupy. Je zřejmé, že tyto startupy kladou značný důraz na neformální metody přivlastňování, zejména na využívání komplementárních aktiv a výhody prvního na trhu, aby získaly konkurenční výhodu ze svých technologických inovací. Pozoruhodným poznatkem tohoto výzkumu je role, která je přisuzována autorským právům, jež jsou hodnocena jako nejdůležitější formální metoda přivlastňování. To souvisí s rozsáhlým využíváním doložek o postoupení či licencování práv duševního vlastnictví v kontraktech se zaměstnanci a dodavateli. Kromě toho i investoři běžně požadují, aby startupy takové doložky v kontraktech používaly. Z provedených rozhovorů vyplývá, že autorská práva slouží především jako mechanismus interní ochrany, zejména k zajištění možnosti startupu výlučně vykonávat autorská práva k dílům vytvořeným zaměstnanci a dodavateli.

Naopak jiné formální způsoby přivlastnění, jako jsou patenty, jsou považovány za podstatně méně důležité. Patenty získaly nejnižší celkové hodnocení z hlediska důležitosti, nebyly považovány ani za „mírně důležité.“ Je důležité zdůraznit, že navzdory tomu několik českých softwarových startupů o patenty usiluje ve Spojených státech. Přesto respondenti naznačují, že vlastnictví patentů nijak významně neovlivňuje rozhodování investorů během investičního procesu. Tato práce rovněž nabízí vhled do dalších témat, včetně aktivit patentových trollů, nákladů spojených s vymáháním práv duševního vlastnictví a rozličných strategií komercializace inovací užívaných softwarovými startupy.

Klíčová slova: startup; duševní vlastnictví; metoda přivlastnění; ochrana inovace; software; právo a ekonomie