

THE PROMISE OF PATENT-BACKED FINANCE FOR SMES
AND UNIVERSITIES, AND SHIFTING PATENT ELIGIBLE
SUBJECT MATTER

by

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This Article reviews and addresses some of the problems concerning adequate capital to develop patented inventions and products, and inhibiting the widespread use of patents to raise financing. The Article divides the IP finance market into three separate, but interrelated markets and analyzes problems, including U.S. patent-eligible subject matter doctrine, within those markets impeding patent-backed financing. The Article provides numerous proposals, some of which are in the literature, and calls for additional research for addressing the issues.

Introduction	58
I. Background	58
A. <i>Need for Additional Capital</i>	61
B. <i>Dangers and Benefits of Intellectual Property-Backed Finance</i>	66
II. Markets for Intellectual Property	69
A. <i>Creation and Development of Intellectual Property</i>	69
1. <i>General Issues and Funding Sources</i>	70
2. <i>Need for Stable and Certain Rights</i>	70
3. <i>Patent-Eligible Subject Matter</i>	74
B. <i>The Commercialization Market for Patents</i>	89
1. <i>Valuation Difficulties</i>	90
2. <i>Human Capital</i>	92
3. <i>Due Diligence</i>	92

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4. <i>Other Transaction Costs</i>	95
5. <i>The Role of Nonpracticing Entities and Patent Assertion Entities</i>	96
C. <i>Intellectual Property and Finance</i>	99
III. Discussion and Proposals for Improving Patent-Backed Finance.....	102
A. <i>Recommendations for Legal Doctrine and Procedure</i>	102
B. <i>Suggested Non-Legal Actions</i>	103
C. <i>Calls for Further Research</i>	106
Conclusion.....	110

INTRODUCTION

This Article addresses the use of intellectual property, particularly patents, to secure financing by Small-Medium Sized Entities (SMEs) and universities with means beyond equity finance and conventional loans. Patent-backed finance is dependent upon three interrelated markets: (1) the market for intellectual property creation; (2) the market for transferring that intellectual property to those who can develop and commercialize it; and (3) the intellectual property financial market—the market for collateralization and securitization to secure financing for additional research and development.

Some of the issues related to utilizing patents for financing are discussed such as the legal uncertainty resulting from the unstable U.S. patent-eligible subject matter doctrine and from poor patent quality. A number of key non-legal issues affecting patent-backed finance are also raised such as the illiquidity of the asset, the information deficit associated with it and the challenges related to its valuation. The Article sets forth proposals and calls for further discussion and research, some from the literature, relating to improving the conditions for using intellectual property to secure financing especially for universities and SMEs.

I. BACKGROUND

The ability to use intellectual property, particularly patents, to attract capital or finance is becoming increasingly important particularly in light of the current economic crisis brought on by the COVID-19 global pandemic and the soon-to-be post-stimulus era.¹ Investment and growth in Organization of Economic Cooperation and Development (OECD) economies is increasingly driven by investment in

¹ “In the context of IP, collateral can be defined as a borrower’s pledge of specific property, such as future Cash Flows from existing IP assets, or rights to the underlying IP itself, in order to provide recourse for the lender in the event of loan default.” See Bruce W. Burton, Emma Bienias & Candice K. Quinn, *Financing Alternatives for Companies: Using Intellectual Property as Collateral*, STOUT, RISIUS & ROSS (2014), <https://www.hilcoglobal.com/docs/librariesprovider10/default-document-library/financing-alternatives-for-companies---using-intellectual-property-as->

intangible assets also known as knowledge-based capital (KBC).² In many OECD countries, firms now invest as much or more in KBC as they do in physical capital such as machinery, equipment, and buildings.³ However, even as intellectual property rights and intangibles make up two-thirds of corporate net worth,⁴ the market for using such assets as collateral to raise finance has arguably not reached its full potential.⁵ This certainly points to some current weaknesses of this asset class, but

collateral.pdf?sfvrsn=2.

² Trademarks have been successfully utilized as collateral. *E.g.*, Keith Naughton, *Freeing Ford's Logo from Debtor's Prison*, BLOOMBERG BUSINESSWEEK, (May 17, 2012), <https://www.bloomberg.com/news/articles/2012-05-17/freeing-fords-logo-from-debtors-prison>; Sam Gustin, *How Ford Earned Its Blue Oval Back*, TIME (May 25, 2012), <http://business.time.com/2012/05/25/how-ford-earned-its-blue-oval-back/>; Alan Marco, Amanda Myers, Stuart Graham & Kristen Apple, *The USPTO Trademark Assignment Dataset: Descriptions and Insights*, 2 (U.S. Pat. & Trademark Off., Working Paper No. 2014-2, 2014), https://www.uspto.gov/sites/default/files/documents/WP2014-2_USPTO%20Trademark%20Assignment%20Dataset_27Feb15.pdf (“Trend analysis suggests intensifying trademark collateralization as the number of trademarks recorded as collateral to secure debt has increased in absolute terms and relative to the stock of live registrations.”); Max Adams, *Most Innovative Securitization Deal of the Year – Goldman Sachs, Vanderbilt University Trademark Royalty Securitization*, Global Capital (May 16, 2019, 8:30 PM), <https://www.globalcapital.com/article/b1ff3jn12rzrt/most-innovative-securitization-deal-of-the-year-goldman-sachs-vanderbilt-university-trademark-royalty-securitization> (describing a 2018 trademark royalty securitization deal resulting in a 30% increase to Vanderbilt University’s endowment, which in 2018 was around \$4.6 billion). Copyrights have also been successfully used in royalty securitization deals. *See* Liz Moyer, *Artists Are Striking Gold by Selling Their Music Rights. How Investors Can Cash In.*, BARRON’S (Dec. 10, 2020, 11:53 AM), <https://www.barrons.com/articles/artists-and-investors-strike-gold-with-music-rights-sales-51607619180> (“Most funds that invest in music rights are geared for private equity or institutional money. But two are publicly traded: Hipgnosis Songs Fund (SONG.UK) and Round Hill Music Royalty Fund (RHM), both trade on the London Stock Exchange. Hipgnosis, with \$1.6 billion of assets, is about two years old and returned 6.7% last year, according to Morningstar. . . . The Round Hill fund just launched last month. . . . The IPO raised \$282 million, and it plans to invest in songs from Round Hill’s first private fund, including titles by the Beatles, Celine Dion, Louis Armstrong and the Rolling Stones.”).

³ Org. for Econ. Co-operation & Dev. [OECD], *Enquiries into Intellectual Property’s Economic Impact*, at 63 (2015), <http://www.oecd.org/sti/ieconomy/KBC2-IP.Final.pdf>; Martin Brassell & Kelvin King, UK Intell. Prop. Off., *Banking on IP?: The Role of Intellectual Property and Intangible Assets in Facilitating Business Finance* 21 (Nov. 6, 2013), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/312008/ipresearch-bankingip.pdf.

⁴ *Intangible Opportunities*, ECONOMIST (June 15, 2006), <http://www.economist.com/node/7068382>.

⁵ Professor William Mann noted:

I show that 16% of patents produced by US corporations have been pledged as collateral at some point, and the companies pledging them performed 20% of research and development expense (R&D) and patenting in Compustat in 2013. These facts are surprising, given that innovative firms generally feature low tangibility and are thus often assumed to lack access

there are convincing arguments indicating the possibility of the international legal framework to address such shortcomings and to accommodate sound integration of intellectual property securitization within the financial market.⁶

Patents have been perceived as relatively illiquid assets that do not readily lend themselves to securitization; this can be observed in the case of single assets as well as across asset portfolios.⁷ From the financial standpoint, the role of patents is, however, undergoing a process of alteration. While the original idea of the monopoly over an invention was solely one of providing economic incentive with public disclosure in return, current international law progresses towards the conceptualizing of patents as commodities and further towards accentuating the asset function.⁸

SMEs are poised to play a vital part in a well-functioning intellectual property market.⁹ SMEs are widely recognized as the backbone of many developed economies, and their ability to grow is a key determinant of future economic health.¹⁰ As

to collateral. Patent portfolios are evidently an important exception to this rule. This observation suggests in turn that policy initiatives to increase the pledgeability of patents could alleviate financial constraints on innovation.

William Mann, *Creditor Rights and Innovation: Evidence from Patent Collateral*, 130 J. FIN. ECON. 25, 25 (2018). Relecura, a company which provides intelligence reports concerning intellectual property, studied IP-backed financing deals concerning U.S. patents by examining patent assignments involving lenders between 2009 and 2014. RELECURA, RELECURA IP INTELLIGENCE REPORT: IP BACKED FINANCING: OVERVIEW OF TRENDS 4–5 (2015), <https://relecura.com/2020/04/15/ip-backed-financing-overview-of-trends/>. Relecura found over 800,000 transactions involving over 300,000 patent applications. *Id.* at 5. Notably, the industries most involved in IP-backed financing involved digital, transportation, and telecommunications related industries. *Id.* at 10. The pharmaceutical industry was also involved to a notable extent. *Id.* General Motors, Dell, Alcatel-Lucent, Chrysler, Seagate, and Freescale were all in the top ten entities raising funds through IP-backed financing. *Id.* at 7. Notably, the lenders for most transactions included J.P. Morgan, Bank of America, Wells Fargo, Deutsche Bank, and Credit Suisse. *Id.* at 12.

⁶ See Rochelle Dreyfuss & Susy Frankel, *From Incentive to Commodity to Asset: How International Law Is Reconceptualizing Intellectual Property*, 36 MICH. J. INT'L. L. 557 (2015); Grace Sweeney, *Patent-Backed Securitization for Innovation and Economic Growth in the Life Sciences: A Proposal for Incremental Securities Law Reform*, 11 CAN. J.L. & TECH. 283 (2013).

⁷ See Michael Risch, *Patent Portfolios as Securities*, 63 DUKE L.J. 89, 91–94 (2013); Dov Solomon & Miriam Bitton, *Intellectual Property Securitization*, 33 CARDOZO ARTS & ENT. L.J. 125 (2015).

⁸ Dreyfuss & Frankel, *supra* note 6, at 557–59. Notably, a patent does not always provide a monopoly-like right due, in part, to the potential for non-infringing substitutes.

⁹ Securitization of intellectual property provides benefits as a means of finance over venture capital investment because securitization does not require giving up managerial control and equity in the company. See Solomon & Bitton, *supra* note 7, at 134. Moreover, the time horizon for venture capital is much shorter than asset-backed securities. *Id.* at 135.

¹⁰ See U.N. ECON. COMM'N FOR EUR., INTELLECTUAL PROPERTY COMMERCIALIZATION: POLICY OPTIONS AND PRACTICAL INSTRUMENTS, at 59, U.N. Doc. ECE/CECI/12, U.N. Sales No. 11.II.E.16 (2011) [hereinafter, U.N. ECON. COMM'N], <https://unece.org/fileadmin/DAM/>

noted in a 2013 publication from the Intellectual Property Office of the United Kingdom, “In recent years, businesses of all sizes have been investing more in intangible assets, in particular intellectual property, than in fixed or physical assets.”¹¹ It is therefore assumed that the development of a patent securitization market will depend upon the extent to which it is possible for SMEs to wield these assets to secure the finance they need for company strategy and growth.¹² The following Section discusses the need for additional capital, and the dangers and benefits of intellectual property-backed finance.

A. *Need for Additional Capital*

The use of intellectual property to attract capital is important because of several issues the United States and Europe are struggling to address.¹³ First, in terms of

ceci/publications/ip.pdf (“Empirical data show that small and medium-sized enterprises (SMEs) represent over 90% of businesses in most countries worldwide. SMEs also typically account for a large share of overall employment, often over 60%.”). The importance of the relationship between IP and SMEs was recently highlighted by the World Intellectual Property Organization’s focus on SMEs for the 2021 World IP Day. See *World Intellectual Property Day 2021 – “IP and SMEs: Taking Your Ideas to Market,”* WORLD INTELL. PROP. ORG.: WIPO MEDIA CENTER (Apr. 21, 2021), https://www.wipo.int/pressroom/en/articles/2021/article_0004.html (discussing importance of SMEs and the relationship with IP).

¹¹ Brassell & King, *supra* note 3, at 13.

¹² *Id.* Jeffrey Sweeney notes, “According to the 2017 Pepperdine Private Capital Markets Report, . . . nearly 88% of privately owned businesses report having the enthusiasm to execute growth strategies; yet just 51% report having the necessary financial resources to successfully execute growth strategies.” See Jeffrey Sweeney, *Banking on IP: An Insider’s Perspective*, ABL ADVISOR (Sept. 19, 2017, 7:00 AM), <https://www.abladvisor.com/blogs/12633/banking-on-ip-an-insiders-perspective>. Dov Solomon and Miriam Bitton state, “On average only 10% of small businesses manage to successfully raise funds in the market and bring an innovative idea into commercialization. The majority of small businesses fail.” See Solomon & Bitton, *supra* note 7, at 128. The United Nations Economic Council for Europe found that “[f]or countries with economies in transition, . . . only roughly 10% of medium-sized enterprises, and no small or micro enterprises” demonstrated “good” innovation performance.” See U.N. ECON. COMM’N, *supra* note 10, at 63 (citing World Intell. Prop. Org. [WIPO], Div. for Certain Countries in Eur. & Asia, *Recommendations for Strengthening the Role of Small and Medium-Sized Innovation Enterprises in Countries of the Commonwealth of Independent States* (2010), https://www.wipo.int/edocs/pubdocs/en/wipo_pub_transition_6.pdf). A better functioning patent market may help smaller companies by allowing them to secure capital from larger companies while continuing as a going concern—and thus, obviating any issues with respect to antitrust with a merger. See Robert P. Merges, *Patent Markets and Innovation in the Era of Big Platform Companies*, 35 BERKELEY TECH. L.J. 53, 56–57 (2020).

¹³ Notably, in Asia, securitization and collateralization of intellectual property has been progressing as well. See, e.g., Kevin Kwang, *Malaysia Sets Up \$65M IP Financing Scheme*, ZDNET (May 28, 2013), <https://www.zdnet.com/article/malaysia-sets-up-65m-ip-financing-scheme/> (“Malaysia is committing 200 million ringgit (US \$65.4 million) for its intellectual property (IP) financing initiative, which is meant to make it easier for small and midsize businesses

real dollars there is likely less funding for research and development from the government.¹⁴ Historically, in the United States, the government has supplied a rela-

(SMBs) to get capital by putting up their patents as collaterals. According to Bernama's report Tuesday . . . Ministry of Finance Deputy Secretary-General for Policy Datuk Mat Noor Nawi said the IP financing scheme will be offered through Malaysian Debt Ventures and the 200 million ringgit is just the start. He added the government will also offer a 2 percent interest rate subsidy and a 50 percent guarantee through Credit Guarantee Corp Malaysia."); INTELL. PROP. OFF. SING., INTELLECTUAL PROPERTY FINANCING SCHEME: INFORMATION SHEET, <https://www.ipos.gov.sg/docs/default-source/Growing-your-business-with-IP/funding-assistance/ipfs-information-sheet.pdf> (last visited Mar. 13, 2022) ("The IP Financing Scheme is a Singapore government initiative to help Singapore-based [IP rich] companies' monetise their IP for business growth and expansion. The Singapore Government will share the risk of the IP loan with the Participating Financial Institution (PFI) to encourage financial institutions to accept IP assets as collateral in support of the loan. PFIs will undertake the due diligence process in assessing the credit worthiness and the business case of the applicants."); *China's Securitization of Intellectual Property Takes a New Step Forward*, 8 DECIMAL BLOG (Dec. 17, 2018), <https://medium.com/8-decimal-blog/chinas-securitization-of-intellectual-property-takes-a-new-step-forward-180c549a2938> ("Over the past three years, Cultural Technology Leasing has provided more than 8 billion Yuan of financing support to more than 400 cultural and technological enterprises through intellectual property financing leasing. This business accounted for nearly 40% of the company's investment, much higher than the current commercial banks. However, these loans account for less than 0.1% of those issued by banks, of which Small and Medium Enterprise (SME) projects account for more than 75%, and private enterprises account for 92%."); Liao Shumin, *Ping An Issues China's First Asset-Backed Security on Shenzhen Bourse*, YICAI GLOBAL (Dec. 28, 2019), <https://www.yicai.com/news/ping-an-issues-china-first-ip-asset-backed-security-on-shenzhen-bourse> ("Ping An Securities, the brokerage under China's largest insurer by market cap Ping An Insurance Group, issued its first intellectual property-backed security product on the Shenzhen Stock Exchange yesterday, Shanghai Securities News reported. The IP rights of some 15 private companies have been added to the asset-backed security with a value of CNY124 million (USD17.8 million), the report said. The firms have pledged future cash flows from existing IP assets or rights to the IP itself in order to secure financing at a 5 percent interest rate."); Schmitt & Orlov, *Chinese Government Encourages the Use of IP Assets for Collateral*, LEXOLOGY (July 25, 2019), <https://www.lexology.com/library/detail.aspx?g=1cc64bfe-4f52-4758-8ad2-a840f4e15fd7> ("As small businesses have struggled to raise sufficient capital for loans, central government has begun to encourage the use of intangible assets for loan collateral."); Rouse, *CNIPA and Other Two Departments Issued the Action Plan for Intellectual Property Pledge Financing to Benefit Enterprises (2021-2023)*, LEXOLOGY (June 24, 2021), <https://www.lexology.com/library/detail.aspx?g=a07d0604-feb0-420a-bbf4-c49ab16bab97> ("The Plan proposes that by the end of 2023, the accessibility of intellectual property pledge financing policies and service will be greatly improved, the popularity of intellectual property pledge financing services in industrial parks will be significantly expanded, the implementation rate of pledged patents to be significantly increased, the annual growth rate of the number of intellectual property pledges and pledge financing amount in more than 100 industrial parks will be more than 20%, and many new small, medium and micro enterprises to have used intellectual property . . . for financing.").

¹⁴ See RSCH. UNIVS. FUTURES CONSORTIUM, THE CURRENT HEALTH AND FUTURE WELL-

tively large amount of funding for research, particularly basic research, to universities and private companies. Moreover, research universities have been struggling due to various causes, such as declining funding by states, decreasing endowments, more competition nationally and internationally, and an increase in regulatory compliance costs.¹⁵ Indeed, some research universities may be shoring up inadequate research grants and contracts with tuition revenue.¹⁶ Additionally, in the United States, revenue from foreign student enrollment has been decreasing.¹⁷ Importantly,

BEING OF THE AMERICAN RESEARCH UNIVERSITY 44 (2012), https://www.elsevier.com/data/assets/pdf_file/0004/53185/Research-Universities-Futures-Consortium.pdf (“Since the 1960s, federal funding of research has declined as a percentage of national GDP, and state support for research, in the form of infrastructure and faculty and staff compensation, has also been reduced as a percentage of their budgets.”); NAT’L RSCH. COUNCIL, RESEARCH UNIVERSITIES AND THE FUTURE OF AMERICA: TEN BREAKTHROUGH ACTIONS VITAL TO OUR NATION’S PROSPERITY AND SECURITY 4 (2012), <http://nap.edu/13299> (“Federal funding for university research has been unstable and, in real terms, declining at a time when other countries have increased funding for research and development.”); Norman R. Augustine, *Preface to NAT’L ACAD. OF SCI., ENG’G, & MED., MAKING MEDICINES AFFORDABLE: A NATIONAL IMPERATIVE*, at xiii, xviii (Norman R. Augustine, Guru Madhavan, & Sharyl J. Nass, eds., 2018), <http://nap.edu/24946/> (“[T]he federal government has been significantly reducing its investment in biomedical research while at the same time industries that indirectly support the biopharmaceutical sector, responding to market pressures for short-term returns, have also been reducing their investment in research (but not development). As a result, the United States has fallen to seventh place in its overall investment in basic research as a fraction of gross domestic product.”). The U.S. Senate has passed the U.S. Innovation and Competition Act which, among other things, provides over \$100 billion in funding for research and development over five years. *See* U.S. Innovation and Competition Act of 2021, S. 1260, 117th Cong. 56, 928. This legislation would be a welcome improvement to the current state of funding for research.

¹⁵ RSCH. UNIV. FUTURES CONSORTIUM, *supra* note 14, at 9 (“Today the future of the American research university is more uncertain than it has been in the last 50 years. . . . [N]ever before have research universities faced the combined pressures of: declining federal funding, record reductions in state funding, erosion of endowments, soaring tuition costs reaching unaffordable limits, intensifying, internal as well as global competition, increasing compliance and reporting requirements, as well as the loss of political and public confidence in the value of university-based research.”).

¹⁶ *See* AM. ASS’N OF UNIV. PROFESSORS, RECOMMENDED PRINCIPLES TO GUIDE ACADEMY-INDUSTRY RELATIONSHIPS 40 (2014) (“According to the journal *Nature*, ‘[U]niversities are increasingly subsidizing grants from their own funds. . . . Between 1969 and 2009, the proportion of research funding supported by institutional money rose from 10% to 20%, according to the US National Science Foundation. Public universities and all but the wealthiest private ones are increasingly taking money from tuition fees.’”).

¹⁷ *See* Stephanie Saul, *As Flow of Foreign Students Wanes, U.S. Universities Feel the Sting*, N.Y. TIMES (Jan. 2, 2018), <https://www.nytimes.com/2018/01/02/us/international-enrollment-drop.html> (“Nationwide, the number of new foreign students declined an average of 7 percent this past fall, according to preliminary figures from a survey of 500 colleges by the Institute of International Education.”); Elisabeth Redden, *International Student Numbers Decline*, INSIDE HIGHER EDUC. (Nov. 16, 2020), <https://www.insidehighered.com/news/2020/11/16/survey-new-international->

government resources tend to substantially fund research in universities compared to private funding.¹⁸ Thus, universities may have a reduced amount of funding to continue basic research.¹⁹ Moreover, the United States and Europe likely do not have a supply issue with respect to capital—the issue is how to deploy capital to certain productive uses.²⁰

Second, SMEs, while a major part of the economies of the United States and Europe, may not have sufficient access to finance to grow and expand and to perform more research and development.²¹ As Sviataslau Sivagrakau has noted in the pharmaceutical industry:

enrollments-drop-43-percent-fall (“The total number of international students studying at U.S. universities, whether from within the U.S. or online from abroad, decreased by 16 percent this fall, while enrollments of new international students decreased by 43 percent, according to a new survey of more than 700 colleges conducted by 10 major higher education organizations.”).

¹⁸ AM. ASS’N OF UNIV. PROFESSORS, *supra* note 16 at 39 (“According to 2008 statistics from the National Science Board (NSB), the federal government continues to contribute 60 percent (or \$51.9 billion) of American university R&D funding. . . . The 2008 figures showed private sources providing only roughly six percent (or \$2.9 billion) of R&D funding overall.”).

¹⁹ Interestingly, China has had “the sharpest increase in R&D spending (public and private) from 2007 to 2012 – 313%.” See Sviataslau Sivagrakau, *Financing Pharmaceutical Innovation, in VALUE CREATION IN THE PHARMACEUTICAL INDUSTRY: THE CRITICAL PATH TO INNOVATION* 81, 83 (Alexander Schuhmacher, Markus Hinder & Oliver Gassmann eds., 2016). Near the same time period, “[f]rom 2006 to 2013 venture capital (VC) financing in biotechnology changed from \$3.9 to \$4.3 billion in the United States and from \$2.1 to \$1.5 billion in Europe.” *Id.* at 84. “Chinese growth, however, provides a sharp contrast to decreasing private spending in the United States and Europe, where the decline during the same 2007-2012 period has been 15 and 4% correspondingly.” *Id.* at 92. Interestingly, the U.S. Tax Cuts and Jobs Act “eliminated the research and development (R&D) tax deduction (starting in 2022).” See Jeffery A. Maine, *Tax Cuts and American Innovation*, ME. L. MAG., Winter 2018–19, at 24, 24. “[T]he U.S. has dropped among nations from No. 1 in 1990 in terms of R&D tax incentive generosity, to No. 25 in 2016.” *Id.* The U.S. Tax Cuts and Jobs Act may result in significantly less spending on research and development in the near future in the United States. Professor Jeffrey Maine predicts that more research will be moved offshore as a result of the lack of competitiveness of U.S. tax policy concerning research. *Id.*

²⁰ Sviataslau Sivagrakau notes that, “US public spending for biomedical research is at least twice as big as in Europe, while the economy of the European Union marginally exceeds that of the United States in terms of gross domestic product (GDP).” See Sivagrakau, *supra* note 19, at 83.

²¹ This can be particularly troublesome for small and medium sized companies attempting to fund translational research. See MILKEN INST., *FIXES IN FINANCING: FINANCIAL INNOVATIONS FOR TRANSLATIONAL RESEARCH 2* (2012) (“Traditional investors in translational research—large- and medium-cap biopharmaceutical companies and life science-focused venture capital funds—are become increasingly risk adverse in the face of escalating challenges in the early stages of the drug development process.”). Indeed, “[t]he Valley of Death is growing wider.” *Id.* at 4.

Access to finance for smaller firms, however, is vastly important for the performance of the entire industry, for these firms are major contributors to innovation in the sector. In the United States, Germany, France, Canada, and Australia, one-half to two-thirds of scientifically novel medicines originate outside of traditional large pharmaceutical firms. Instead they came from small pharmaceutical companies or biotechnology companies or were university-discovered and then transferred to biotechnology companies. . . . In the biologics segment the dominance of smaller firms is even stronger: in the United States only about 10% of all therapeutic biologics came from large pharmaceutical companies.²²

Ultimately in the European Union and the United States, SMEs are essential to economic growth, a tax base, and employment. Again, much of the value in today's companies is not in tangible assets, but in intangible assets.

Third, some valuable patented technology is not being commercialized—with the significance that the benefits of that technology are not reaching the public and society at large.²³ Fourth, a lack of trust has developed in the United States and Europe concerning the current state of the economy. Increasingly, there is a wider gap in wealth and a disappearance of certain employment opportunities that some tie to globalization and technological development. Moreover, the Great Recession arose from the collapse of the real estate market involving mortgage-backed securities.²⁴ Mortgage-backed securities were basically securities that were sold based on bundles of residential loan promissory notes and mortgages.²⁵ The risk of the underlying promissory notes and mortgages—assets—could not be properly assessed, resulting in an income producing asset which was unstable and unsecure, and which

²² See Sivagrakau, *supra* note 19, at 98–99.

²³ See Ted Sichelman, *Commercializing Patents*, 62 STAN. L. REV. 341, 362–64 (2010); Sweeney, *supra* note 12 (“[C]ompanies actively use on average just 10–15% of their patent portfolios, largely due to ineffective IP management. This means companies will often have valuable portfolios of unexploited, unlicensed patents that can be used as collateral for debt finance.”). Brian Cummings, *The Changing Landscape of Intellectual Property Management as a Revenue-Generating Asset for U.S. Research Universities*, 21 GEO. MASON L. REV. 1027, 1031 (2014) (“[M]ore than 70 percent [of patents funded by the government] will sit on ‘university shelves’ and never be licensed—which is still better than the more than 90 percent of U.S. patents that never make any money and will remain idle in the U.S. Patent and Trademark Office.”). Solomon and Bitton discuss resources noting that some unlicensed patents are considered “high quality” or valuable. See Solomon & Bitton, *supra* note 7, at 157–58.

²⁴ See John V. Duca, *Subprime Mortgage Crisis: 2007–2010*, FED. RSRV. HIST. (Nov. 22, 2013), <https://www.federalreservehistory.org/essays/subprime-mortgage-crisis>; Solomon & Bitton, *supra* note 7, at 164 (noting “asset securitization has been challenged by two serious economic crises: the collapse of the corporate giant Enron in 2001 and the global credit crisis of 2008”).

²⁵ Duca, *supra* note 24; Solomon & Bitton, *supra* note 7, at 143.

ultimately failed.²⁶ This caused investors, including institutional investors such as banks and pension funds, to lose a significant amount of funds.²⁷ Finally, the COVID-19 pandemic has created an enormous amount of uncertainty concerning the state of the world economy after stimulus efforts have subsided.

B. *Dangers and Benefits of Intellectual Property-Backed Finance*

Intellectual property-backed finance may provide a solution to address these problems, but includes dangers as well.²⁸ Generally, intellectual property-backed finance is the use of intellectual property to generate additional funding which may be used to aid businesses to expand, create new employment, and perform additional research and development.²⁹ This can create a virtuous circle of investment in research and development in producing intellectual property and technology: intellectual property and technology is used to secure new funding, which in turn is used for research that produces more intellectual property and technology. This is a continuous cycle of the reinvestment of capital to secure more technological advancements, and importantly to create employment opportunities and a robust tax base.

²⁶ See Aleksandar Nikolic, *Securitization of Patents and Its Continued Viability in Light of the Current Economic Conditions*, 19 ALB. L.J. SCI. & TECH. 393, 407 (2009) (There is “a lack of confidence in investment valuation methods, creating a domino effect where all banks have tightened lending standards for commercial and industrial loans for large and midsize firms, effectively leading to an overall freezing of securities sold on secondary markets. Nonetheless, markets for some asset-backed securities have started to rebound.”); Solomon & Bitton, *supra* note 7, at 166 (“[T]he inability of third parties to assess default risks can be seen in the collapse of the market of securities backed by sub-prime mortgages at the end of 2007 and the subsequent global credit crisis.”).

²⁷ John Weinberg, *The Great Recession and Its Aftermath*, FED. RESRV. HIST. (Nov. 22, 2013), <https://www.federalreservehistory.org/essays/great-recession-and-its-aftermath>.

²⁸ Intellectual property financing methods may include use of intellectual property as collateral for a loan; intellectual property as collateral enhancement; intellectual property royalty securitization; and intellectual property sales and license-back deals. Burton et al., *supra* note 1, at 1–4.

²⁹ See Naina Khanna, *The Securitization of IP Assets: Issues and Opportunities*, 23 J. INTELL. PROP. RTS. 94, 94–95 (2018) (India) (“IP securitization comes along with certain benefits, first being the easy and immediate raising of cash as the owner would get a lump-sum amount for the future cash flow from an IP i.e. it is a source of ready capital for development of the product and expansion of market-increased liquidity. This gives a huge support to investment in R&D, innovation, and creativity. Another advantage is that since these bonds are treated as a loan and not a sale, the income is excluded from being taxed. . . . [T]he assets to be securitised are not counted on the balance sheets of the originator (off-balance sheet financing) thereby not affecting the debt-to-equity ratio for it.”); Nikolic, *supra* note 25, at 405 (“Effective use of patent securitization can 1) provide companies with funds for expansion, additional research, and working capital; 2) provide non-profit organizations and universities with a lump sum payment rather than waiting for future royalties; or 3) give inventors immediate cash in exchange for the upside potential of their patent.”).

Moreover, such an approach separates the value of the underlying intellectual property from business and management risk or incompetence.³⁰

The evident question that emerges from this context is why intellectual property finance is not used to a greater extent.³¹ There may be several reasons. In the United States and perhaps in the European Union, there is skepticism about the value of patents.³² For example, one of the common criticisms is that intellectual property rights, except in certain industries, such as the biotechnology and pharmaceutical industries, are unnecessary to incentivize and commercialize inventions. Moreover, there is a deadweight loss to society based on the failure of people to access the product covered by intellectual property because of monopoly pricing.³³ This problem is exemplified by concerns with access to life saving pharmaceuticals.³⁴ A combination of trademark protection, trade secrecy, and first mover advantage may provide enough incentive to invent, but not in some industries.

The uncertainties and doubts regarding intellectual property law have led to extensive public and scholarly critiques both in the United States and Europe. For example, scholars have criticized patent-eligible subject matter and argued that it is

³⁰ An advantage is that creditworthiness of the business may be less important. See Burton et al., *supra* note 1, at 4. This may lead to lower borrowing costs when the financing is made based upon the value of the intellectual property. *Id.* One issue with intellectual property collateralization is the risk that there will be a default resulting in the failure of the company. *Id.*

³¹ Jeffrey Sweeney points to “the persistent retreat to a more risk-averse and conservative banking environment” and notes the “economy has been gradually shifting one in which intangible assets represent a greater share of the overall value of job-creating companies.” Sweeney, *supra* note 12. IP licenses may also be used as security. See Andrea Tosato, *Secured Transactions and IP Licenses: Comparative Observations and Reform Suggestions*, 81 L. & CONTEMP. PROBS. 155, 179 (2018) (emphasizing “that States have taken markedly different normative stances towards this integral issues” and “[s]ome jurisdictions rely on general property law doctrines to determine whether IP licenses can be encumbered; others regard transferability as the decisive factor, while others still allow the unreserved taking of security in these assets”).

³² See, e.g., Michele Boldrin & David K. Levine, *The Case Against Patents*, 27 J. ECON. PERSPS. 3, 3 (2013) (“[T]here is no empirical evidence that [patents] serve to increase innovation and productivity, unless productivity is identified with the number of patents awarded—which, as evidence shows, has no correlation with measured productivity. This disconnect is at the root of what is called the ‘patent puzzle’: in spite of the enormous increase in the number of patents and in the strength of their legal protection, the US economy has seen neither a dramatic acceleration in the rate of technological progress nor a major increase in the levels of research and development expenditure.”).

³³ See Aidan Hollis, *An Efficient Reward System for Pharmaceutical Innovation* 4 (Feb. 7, 2004) (unpublished manuscript), <https://www.who.int/intellectualproperty/news/en/Submission4.pdf> (“The welfare loss caused by this is called by economists the ‘deadweight loss’ of monopoly pricing, since there is a value lost to society when consumers do not obtain a product which they value more than the cost of producing it.”).

³⁴ *Id.*

too broad.³⁵ Moreover, there is criticism concerning the scope and strength of trademark and copyright law as too powerful and potentially chilling free speech and competition. Trade secrecy is also critiqued for harming competition.³⁶ Also, recently, the enforcement costs concerning intellectual property have been in focus, such as so-called patent trolls,³⁷ copyright trolls,³⁸ and trademark bullies.³⁹ These entities arguably may take advantage of litigation costs, unclear rights, and other factors to abuse the intellectual property system and provide arguably little public benefit. Moreover, the United States⁴⁰ and Europe⁴¹ are experiencing a health care cost crisis—and some of this crisis is attributable to the high cost of pharmaceuticals, particularly biologics.⁴² Indeed, the current COVID-19 global pandemic has highlighted the importance of the pharmaceutical and biotechnology industries as well as access issues throughout the world. Additional issues concern the lack of experience with intellectual property-backed lending by lenders⁴³ and the inability of intellectual property to map onto a product or technology directly.⁴⁴ For example,

³⁵ See, e.g., Michael J. Meurer, *Business Method Patents and Patent Floods*, 8 WASH. U. J.L. & POL'Y 309, 310 (2002) (“My favored solution is reversal of *State Street Bank & Trust Co. v. Signature Financial Group, Inc.* and restoration of the business method exception.”).

³⁶ See, e.g., Andrea Contigiani & David H. Hsu, *How Trade Secrets Hurt Innovation*, HARV. BUS. REV. (Jan. 29, 2019), <https://hbr.org/2019/01/how-trade-secrets-hurt-innovation> (“Overall, our study suggests that, while firms lobby for a strengthened trade secrecy environment, this may ultimately backfire in the long run by leading to lower innovation.”).

³⁷ See, e.g., Christopher A. Cotropia, *The Individual Inventor Motif in the Age of the Patent Troll*, 12 YALE J.L. & TECH. 52, 55–56 (2009).

³⁸ See, e.g., Brad A. Greenberg, *Copyright Trolls and Presumptively Fair Uses*, 85 U. COLO. L. REV. 53, 53 (2014).

³⁹ See, e.g., Leah Chan Grinvald, *Shaming Trademark Bullies*, 2011 WISC. L. REV. 625.

⁴⁰ See ERIN BALOGH, MARGIE PATLAK & SHARYL J. NASS, INST. OF MED., DELIVERING AFFORDABLE CANCER CARE IN THE 21ST CENTURY: WORKSHOP SUMMARY 5 (2013), <https://www.ncbi.nlm.nih.gov/books/NBK202468/> (“Despite spending nearly twice as much on health care as many other developed countries, the United States is not reaping more benefits in terms of increasing life expectancy or lowering infant mortality . . .”).

⁴¹ See Carmen Paun, *Europe's Health Systems on Life Support*, POLITICO (Sept. 30, 2016, 11:53 AM), <https://www.politico.eu/article/europe-health-care-systems-on-life-support-special-report-drug-pricing-medicines-public-services/> (“Highly specialized medicines for diseases like cancer are entering the market at sky-high prices, forcing governments to choose between the need to treat their citizens and the need to spend wisely.”).

⁴² See W. HEALTH & GALLUP, THE U.S. HEALTHCARE COST CRISIS 27 (2019), <https://news.gallup.com/poll/248081/westhealth-gallup-us-healthcare-cost-crisis.aspx?thank-you-report-form=1> (estimating, based on a survey of U.S. households, that about 15 million Americans each year do not purchase medicine due to high cost).

⁴³ See Solomon & Bitton, *supra* note 7, at 131–33 (describing the deficiencies of the banking system).

⁴⁴ See Michael J. Burstein, *Patent Markets: A Framework for Evaluation*, 47 ARIZ. ST. L.J. 507, 513 (2015) (“But where the fit between patents and technologies is imperfect, there is ample

there may be many different types of intellectual property covering a particular product, such as trade secrets and know-how,⁴⁵ and the timing of life cycle of the technological market covered by the intellectual property. Moreover, there may not be sufficient potential buyers for the underlying intellectual property, which by its very nature should be unique.⁴⁶

II. MARKETS FOR INTELLECTUAL PROPERTY

This Article argues that taking advantage of intellectual property-backed finance requires addressing three main, interrelated markets: (1) the market for creating intellectual property; (2) the market for transferring that intellectual property to those who can develop and commercialize it; and (3) the intellectual property financial market—the market for collateralization and securitization to secure financing for additional research and development.⁴⁷ This Article progresses from the more general view that the intellectual property rights market consists of the intellectual property rights asset market and the intellectual property rights financial market (i.e., intellectual property rights asset market + intellectual property rights financial market = intellectual property rights market) towards the perspective that there are three interdependent markets. The main reason for this is the particular emphasis on patents: substantial research and development investments, research infrastructure, and time are required to create and develop this type of asset, and it should therefore be seen as a market without which the two other markets would not exist. This Part will discuss those markets in turn.

A. *Creation and Development of Intellectual Property*

The market for creating intellectual property is a complicated problem. The

room for strategic behavior. A liquid market may exacerbate rather than ameliorate those behaviors because the pricing mechanism in a liquid market may more easily and quickly incorporate information about litigation value than commercialization value. In those circumstances, patents become inefficient assets. Their value in a market fails to reflect the value of the underlying technology.”).

⁴⁵ See Peter Lee, *Transcending the Tacit Dimension: Patents, Relationships, and Organizational Integration in Technology Transfer*, 100 CALIF. L. REV. 1503, 1523–24 (2012) (“However, even where patent disclosure satisfies statutory and doctrinal requirements, it is often incomplete. In particular, much useful knowledge about patented inventions remains ‘tacit’ or personal to the inventor. Transferring this tacit knowledge represents a central challenge of university-industry technology transfer.”).

⁴⁶ See Burton et al., *supra* note 1, at 4.

⁴⁷ An expert report analyzed creating an EU intellectual property rights (IPR) financial asset market utilizing a somewhat similar structured analysis concerning dividing issues by markets with regard to specific issues applicable to the European Union. See *Final Report for EU Tender No. 3/PP/ENT/CIP/10/A/NO2S003 on Creating a Financial Market for IPR* (Dec. 6, 2011), <https://op.europa.eu/en/publication-detail/-/publication/afdc8beb-866f-400e-913b-23f4c018e58b>.

following Section discusses general issues and funding sources, the need for stable and certain rights, and patent-eligible subject matter.

1. *General Issues and Funding Sources*

First, as discussed above, there are issues concerning the need for intellectual property rights: the complexity of funding for research and development of products, and the decrease in public funding for research in the United States. There is a fundamental question as to whether we even need intellectual property or, perhaps, strong intellectual property rights. At the very least, we can say that intellectual property rights, particularly patents, are needed in only some industries. Moreover, the market is complicated because funding to develop intellectual property can come from a mix of sources, such as government and private sources. The funding can also be external or internal. The funding may be routed through or originate from universities, states in the United States, NGOs, or various countries, which may have different values and goals than private entities. The funding can be mixed for single projects and involve multiple inventors. Additionally, multiple parties may have various types of inputs, such as prior-created intellectual property rights necessary to develop a particular product.

2. *Need for Stable and Certain Rights*

Second, for this market and other markets to work, arguably countries need relatively stable and certain rights.⁴⁸ In the United States, patent rights are constantly changing. Some economists describe patent protection as a pendulum—it either historically swings too far in favor of strong protection or too far in favor of weak protection.⁴⁹ The optimal level of protection has been historically difficult to determine. Arguably, the United States experienced strong patent protection in the 1980s to early 2000s—coincidentally during important years of the development of the software and biotechnology industries. During that time period, the United States created the U.S. Court of Appeals for the Federal Circuit—a single, unified

⁴⁸ Pharmaceutical development is fraught with risk and a very long temporal research, development, and regulatory pathway. See Sivagrakau, *supra* note 19, at 87 (“For all 113 first-in-class drugs approved by the FDA from 1999 to 2013, the median time from the first publication of the therapeutic concept, target, or chemotype to FDA approval was 22 years, while the initiation of drug discovery activities may have occurred several years before any such publication. . . . In the 1990s, only the top 30% of the drugs were profitable. . . .”). Moreover, the “7% chance of a preclinical compound to become a marketed drug, clearly, is not an attractive risk/reward profile for a bank or an institutional investor.” *Id.* at 100. Some may add that “strong” patents are needed for innovation as well. See Bruce Berman, ‘*Strong Patents Matter to Protect Innovation*,’ Says Gina Raimondo, U.S. Secretary of Commerce, IP CLOSEUP (May 22, 2021), <https://ipcloseup.com/2021/05/22/strong-patents-matter-to-protect-innovation-says-gina-raimondo-u-s-secretary-of-commerce/>.

⁴⁹ ADAM B. JAFFE & JOSH LERNER, INNOVATION AND ITS DISCONTENTS: HOW OUR BROKEN PATENT SYSTEM IS ENDANGERING INNOVATION AND PROGRESS, AND WHAT TO DO ABOUT IT 97 (2004).

patent appeals court.⁵⁰ The U.S. Congress passed the Bayh–Dole Act, which allowed nonprofits such as universities and private companies to take title to government-funded inventions.⁵¹ U.S. courts issued opinions which expanded patent-eligible subject matter and utility, and weakened the nonobviousness requirement.⁵² The United States and most of the rest of the world adopted the Trade-Related Aspects of Intellectual Property Rights Agreement which raised intellectual property standards throughout the world.⁵³ Venture capital markets continued to mature in the United States.⁵⁴ Finally, globalization continued to move forward.

Since the mid and late 2000s, the United States began to experience some of the downsides of strong protection, such as overenforcement of unclear intellectual property rights resulting in harm to competition—the primary driver of innovation—and free speech. The United States then made a strong move toward less protection for patents. First, in the U.S. Supreme Court cases *Mayo Collaborative Services v. Prometheus Laboratories*,⁵⁵ *Association for Molecular Pathology v. Myriad Genetics*,⁵⁶ and *Alice Corp. v. CLS Bank International*,⁵⁷ patent-eligible subject matter was generally constricted. The United States raised the requirements to demonstrate utility and written description of patentable inventions for biotechnology inventions.⁵⁸ The United States also made it easier to obtain attorney’s fees against poor quality lawsuits.⁵⁹ The U.S. Congress enacted the America Invents Act which allows enhanced administrative challenges to issued patents through covered business-method patent reviews, post-grant procedures, and *inter partes* review proceedings.⁶⁰ The U.S. Supreme Court, in *eBay v. MercExchange*, made it more difficult to

⁵⁰ *Court Jurisdiction*, U.S. CT. OF APP. FOR THE FED. CIR., <https://cafc.uscourts.gov/home-the-court/about-the-court/court-jurisdiction/> (last visited Mar. 13, 2022).

⁵¹ See generally University and Small Business Patent Procedures (Bayh-Dole) Act of 1980, Pub. L. No. 96-517, 94 Stat. 3015 (codified as amended at 35 U.S.C. §§ 200–211 (2000)).

⁵² See, e.g., *Diamond v. Chakrabarty*, 447 U.S. 303 (1980) (patent-eligible subject matter); *State St. Bank & Tr., Co. v. Signature Fin. Grp., Inc.*, 149 F.3d 1368 (Fed. Cir. 1998) (patent-eligible subject matter); *In re Brana*, 51 F.3d 1560 (Fed. Cir. 1995) (utility requirement); *In re Dembiczak*, 175 F.3d 994 (Fed. Cir. 1999) (obviousness).

⁵³ See *Overview: The TRIPS Agreement*, WORLD TRADE ORG., https://www.wto.org/english/tratop_e/trips_e/intel2_e.htm (last visited Mar. 13, 2022).

⁵⁴ See generally Martin Kenney, *How Venture Capital Became a Component of the US National System of Innovation*, 20 INDUS. & CORP. CHANGE 1677 (2011), <https://kenney.faculty.ucdavis.edu/wp-content/uploads/sites/332/2018/03/how-venture-capital-became-a-component-of.pdf>.

⁵⁵ *Mayo Collaborative Servs. v. Prometheus Lab’ys, Inc.*, 566 U.S. 66 (2012).

⁵⁶ *Ass’n for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576 (2013).

⁵⁷ *Alice Corp. Pty. Ltd. v. CLS Bank Int’l*, 573 U.S. 208 (2014).

⁵⁸ See *In re Fisher*, 421 F.3d 1365 (Fed. Cir. 2005) (utility); *Regents of the Univ. of Cal. v. Eli Lilly & Co.*, 119 F.3d 1559 (Fed. Cir. 1997) (written description); *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336 (Fed. Cir. 2010) (written description).

⁵⁹ *Octane Fitness, L.L.C. v. ICON Health & Fitness, Inc.*, 572 U.S. 545 (2014).

⁶⁰ *Leahy-Smith America Invents Act*, Pub. L. No. 112-29, 125 Stat. 284 (2011) (codified as

obtain injunctions.⁶¹ Moreover, U.S. courts made the prospect of higher damage awards more difficult based on a patent covering a component of that product.⁶² Finally, the U.S. Supreme Court arguably made it easier to demonstrate that a patent is obvious.⁶³ These are some of the steps taken to reduce the arguably negative effects of patents.

In more recent years, U.S. courts have made several moves to strengthen patents, as demonstrated in the *Enfish v. Microsoft* case⁶⁴ and the *Halo Electronics v. Pulse Electronics* decision.⁶⁵ The specific point is that patent rights have been relatively unstable due to changes to the rules of the game. Some of this change could be because of the difficulty of defining real world inventions with words—which can lead to uncertainty. Moreover, the development of new technologies makes it difficult to define and determine patent eligibility and nonobviousness. Additionally, gamesmanship, wherein people or entities—such as patent trolls and entities filing petitions for *inter partes* review and shorting stocks—exploit the uncertainty of patent law for financial gain may result in a lack of confidence in the system. All these factors contribute to a lack of certainty and stability concerning patent rights—this creates uncertainty in trading intellectual property rights and using them to obtain additional financing⁶⁶—not to mention the problem of a lack of public confidence. The narrative over the years of change concerning patent law has become “improving patent quality.” Patent examiners are heavily burdened with tedious prior art searches and need access to all available tools, including algorithmic searching solutions, to allow them to focus on higher level tasks.⁶⁷ Better quality patents will allow for more certain valuations, clearer rights for potential licensees

amended in scattered sections of 35 U.S.C.).

⁶¹ *eBay Inc. v. MercExchange*, L.L.C., 547 U.S. 388, 390–91 (2006).

⁶² *See, e.g., Uniloc USA, Inc. v. Microsoft Corp.*, 632 F.3d 1292, 1315–18 (Fed. Cir. 2011).

⁶³ *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 419–20 (2007).

⁶⁴ *Enfish, L.L.C. v. Microsoft Corp.*, 822 F.3d 1327 (Fed. Cir. 2016).

⁶⁵ *Halo Elecs., Inc. v. Pulse Elecs.*, 136 S. Ct. 1923 (2016).

⁶⁶ *See, e.g., Solomon & Bitton, supra note 7*, at 167–68 (discussing how “all IP rights can be challenged and invalidated based on different grounds”). In a review of literature and analysis, Professor Bronwyn H. Hall found that “in most technology-intensive sectors, patent applications (granted or not) are associated with a number of good outcomes: they help with obtaining VC funding, they increase the amount of funding thus obtained, and they are positively associated with future growth and survival.” Bronwyn H. Hall, *Is There a Role for Patents in the Financing of New Innovative Firms?*, 28 INDUS. & CORP. CHANGE 657, 670 (2019). Professor Hall also notes that “fewer than half the firms in the relevant sample had any patent applications So the question of whether these patents are simply a proxy for the quality of the underlying firm and its technology, or whether they have value arising from the patent right, becomes important.” *Id.* at 671.

⁶⁷ Udi Cohen, *Artificial Intelligence Will Help to Solve the USPTO's Patent Quality Problem*, IPWATCHDOG (Nov. 23, 2019), <https://www.ipwatchdog.com/2019/11/23/artificial-intelligence-will-help-solve-usptos-patent-quality-problem/id=116302>.

to rely on, and better notice, and thus, provide a better asset that can be used for financing.

The lack of certainty with respect to patent-eligible subject matter in the United States may have caused significant issues with respect to investment and development.⁶⁸ Again, for intellectual property finance to operate well, patent rights should be as certain as possible. Such rights do not necessarily have to be broad, but they should not be vague—or, at least, should be as clear as possible. This is difficult because of the inherent uncertainty associated with the boundaries of the intangible as well as the nature of patent law, which is supposed to protect the new and non-obvious—what ordinarily is previously unknown. Additionally, strategic approaches to claim and patent drafting attempt to create ambiguity to acquire a broad scope of claims while at the same disclosing as little information as possible consistent with the requirements of patent law. Another problem is the cost of enforcement of patents.

Issues with respect to basic patent quality have proved to be difficult to overcome, especially concerning new technologies where prior art may be difficult to obtain. The uncertainty issue is exacerbated by the instability in the law itself—the United States is continuously changing its law. Today’s good patent may be worthless tomorrow because of changes in patent law doctrine. For example, many DNA-related patents became instantly valueless after changes in case law.⁶⁹ This is perhaps the most troubling issue concerning patents and their use as devices to obtain financing—even though financing does appear even considering this inherent uncertainty within the patent system. A validity opinion used to mitigate risk of patent

⁶⁸ In a panel organized by IPWatchdog, Adam Gill, Founder and Managing Director of GLS Capital, “responded that he typically does not take on cases that have significant Section 101 patent eligibility risks, since if he cannot explain how a case will win, it will not meet the underwriting standards.” *Panelists Weigh in on the Future of Patent Monetization*, IPWATCHDOG (Oct. 1, 2020), <https://www.ipwatchdog.com/2020/10/01/panelists-weigh-future-patent-monetization/id=125781>. One panelist did note that there was some increasing certainty surrounding standard-essential patents (SEPs) and fair, reasonable, and non-discriminatory (FRAND) obligations outside the United States. *Id.* The recent Ninth Circuit decision concerning Qualcomm may provide some certainty in the United States. *See Federal Trade Comm’n v. Qualcomm Inc.*, 969 F.3d 974 (9th Cir. 2020). The European Commission is exploring an initiative concerning SEPs. *See Intellectual Property – New Framework for Standard-Essential Patents*, EURO. COMM’N: LAW, https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13109-Intellectual-property-new-framework-for-standard-essential-patents_en (last visited Mar. 13, 2022) (“A patent that protects technology essential to a standard is called a standard-essential patent (SEP). Patent-holders commit to licence their SEPs to users of the standard on fair, reasonable and non-discriminatory terms and conditions. However, the system for licensing SEPs is not transparent, predictable and efficient. This initiative will create a fair and balanced licensing framework and may combine legislative and non-legislative action.”).

⁶⁹ *See Ass’n for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576 (2013).

invalidity, for example, may be worthless if the law continues to change.⁷⁰ However, infringement enforcement insurance and defense cost reimbursement insurance remains a valuable hedge against risk.⁷¹

There is arguably no area in patent law that is more unclear and uncertain than the doctrine of patent-eligible subject matter. The next Section will discuss issues related to patent-eligible subject matter and its evolving nature.

3. Patent-Eligible Subject Matter

The doctrine of patent-eligible subject matter has been in disarray for years in the United States. The U.S. Court of Appeals for the Federal Circuit's *State Street Bank & Trust Co. v. Signature Financial Group, Inc.* decision, which recognized business method patents,⁷² resulted in ridicule for failing to police patentable subject matter effectively, along with other arguable contributing missteps at the U.S. Patent and Trademark Office.⁷³ The market may dictate which patents are important and valid based on the decisions of interested parties to spend resources on enforcement.⁷⁴ However, there were many assertions that patents were being enforced which would arguably fail to promote the progress of the useful arts.⁷⁵ This led to many policy decisions and proposals to limit the enforcement of patents, including poor quality patents.⁷⁶

In an attempt to rein in the scope of what is patentable, the U.S. Supreme Court issued a number of decisions, including *Bilski v. Kappos*,⁷⁷ *Mayo Collaborative Services v. Prometheus Laboratories*,⁷⁸ *Association for Molecular Pathology v. Myriad*

⁷⁰ See Burton et al., *supra* note 1, at 5 (discussing validity opinions to mitigate risk).

⁷¹ See *id.* at 2 (discussing insurance to mitigate risk).

⁷² *State St. Bank & Tr., Co. v. Signature Fin. Grp., Inc.*, 149 F.3d 1368 (Fed. Cir. 1998).

⁷³ See, e.g., Robert P. Merges, *As Many as Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform*, 14 BERKELEY TECH. L.J. 577, 579–81, 579 n. 4 (1999).

⁷⁴ See Mark A. Lemley, Essay, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV. 1495 (2001); cf. John R. Thomas, *The Responsibility of the Rulemaker: Comparative Approaches to Patent Administration Reform*, 17 BERKELEY TECH. L.J. 727 (2002).

⁷⁵ See generally FED. TRADE COMM'N, PATENT ASSERTION ENTITY ACTIVITY: AN FTC STUDY (2016), https://www.ftc.gov/system/files/documents/reports/patent-assertion-entity-activity-ftc-study/p131203_patent_assertion_entity_activity_an_ftc_study_0.pdf [<https://perma.cc/YQV8-RYC8>]; *Fact Sheet: White House Task Force on High-Tech Patent Issues*, WHITE HOUSE: OFF. OF PRESS SEC'Y (June 4, 2013), <http://www.whitehouse.gov/the-press-office/2013/06/04/fact-sheet-white-house-task-force-high-tech-patent-issues> [<https://perma.cc/TVY7-4V7J>].

⁷⁶ See *Fact Sheet: White House Task Force on High-Tech Patent Issues*, *supra* note 75.

⁷⁷ *Bilski v. Kappos*, 561 U.S. 593 (2010).

⁷⁸ *Mayo Collaborative Servs. v. Prometheus Lab'ys, Inc.*, 566 U.S. 66 (2012).

Genetics,⁷⁹ and *Alice Corp. v. CLS Bank International*.⁸⁰ *Bilski* actually represented a decision which could be read to expand rights beyond the U.S. Court of Appeals for the Federal Circuit's attempt to control software and business method patents with the "machine-or-transformation" test.⁸¹ *Mayo Collaborative Services* essentially held that the claims directed to a way to determine the amount of medication that should be applied by a doctor was not patent-eligible subject matter.⁸² *Alice Corp.* involved software claims and basically laid out a two-part test to determine patent eligibility: (1) Is the claim directed to an abstract idea or natural phenomena? (2) If the answer to question 1 is yes, then determine whether there is an inventive concept in the claim.⁸³ This test essentially conflates the elements concerning an inquiry of non-obviousness and novelty into the decision of patent eligibility. One of the supposed benefits of this test is certainty in that the patent-eligible subject matter decision could be made early by a court in a litigation matter. Thus, potential early resolution of the case may mitigate issues associated with Patent Assertion Entities. However, it is difficult to reconcile the *Alice Corp.* test with the U.S. Supreme Court's *Diamond v. Diehr* case, which recognized that an abstract idea can be applied practically to achieve a new and useful result even without an inventive concept in the claims.⁸⁴ The *Myriad Genetics* case held that isolation and purification of DNA without some other human intervention was not patentable.⁸⁵ However, the *Myriad Genetics* Court recognized that cDNA could be patentable in apparent disregard for the *Mayo Collaborative Services* decision requirement of some inventive concept in the claim.⁸⁶ Arguably, the distinction between the cases may be based on a natural product analysis and the *Diamond v. Chakrabarty* case that there is a marked difference between naturally occurring DNA and cDNA⁸⁷—although the latter argument is not very strong.

The U.S. Court of Appeals for the Federal Circuit has been tasked with interpreting the U.S. Supreme Court decisions on patent-eligible subject matter, particularly the so-called *Mayo/Alice* test. Unfortunately, the Federal Circuit case law has resulted in arguably inconsistent opinions leading to what some have asserted is a lack of certainty with respect to patentability that may result in less investment.⁸⁸

⁷⁹ *Ass'n for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576 (2013).

⁸⁰ *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 573 U.S. 208 (2014).

⁸¹ *Bilski*, 561 U.S. at 612–13.

⁸² *Mayo Collaborative Servs.*, 566 U.S. at 72, 74.

⁸³ *Alice Corp.*, 573 U.S. at 217–18 (citing *Mayo Collaborative Servs.*, 566 U.S. at 72–73).

⁸⁴ *Diamond v. Diehr*, 450 U.S. 175 (1981).

⁸⁵ *Myriad Genetics*, 569 U.S. at 580.

⁸⁶ *Id.* at 594–95.

⁸⁷ See *Diamond v. Chakrabarty*, 447 U.S. 303 (1980) (discussing markedly distinct nature of human modified bacterium).

⁸⁸ Indeed, U.S. Court of Appeals for the Federal Circuit Senior Circuit Judge S. Jay Plager criticizes the *Alice* test's examination of a claim for an "abstract idea" and states that the "inventive

An important Federal Circuit decision concerning patent-eligible subject matter is the *Enfish v. Microsoft Corp.* case.⁸⁹ In that case, the Federal Circuit moved toward finding software implemented inventions as patent eligible.⁹⁰ The Federal Circuit focused on the “directed to” language in the first step of the *Mayo/Alice* test.⁹¹ In another decision supporting broad subject matter, *Berkheimer v. HP*, the Federal Circuit noted that a determination of “well-understood, routine and conventional” activity is a factual question.⁹² The factual nature of the inquiry makes resolution of that question less likely to occur near the beginning of litigation.⁹³ Other Federal Circuit decisions arguably push back against broad patent-eligible subject matter and some decisions include significant disagreements among panels, such as in *American Axle & Manufacturing v. Neapco Holdings*.⁹⁴

In the first Federal Circuit *American Axle & Manufacturing* opinion, Judge Dyk, writing for the majority, determined that method claims were directed to an abstract idea because they failed to “specif[y] the means of how to implement the concept.”⁹⁵ Judge Moore wrote a scathing dissent criticizing Judge Dyk’s approach stating:

[The majority] reduces [the *Alice/Mayo* test] to a single inquiry: If the claims are directed to a law of nature (even if the court cannot articulate the precise law of nature) then the claims are ineligible and all evidence of non-conventionality will be disregarded or just plain ignored. The majority rejects the notion that claims which contain an “inventive concept” survive the gate-keeper.⁹⁶

A petition for rehearing was granted, and Judge Dyk, again writing for the majority, found most of the patent claims ineligible subject matter and arguably introduced, for the first time, some type of enablement requirement for claims.⁹⁷ In another sharply worded dissent, Judge Moore stated:

The majority’s decision expands § 101 well beyond its statutory gate-keeping function and collapses the *Alice/Mayo* two-part test to a single step—claims

concept” analysis is “unworkable.” See *Interval Licensing, L.L.C. v. AOL, Inc.*, 896 F.3d 1335, 1348–53 (Fed. Cir. 2018) (Plager, J., concurring-in-part, dissenting-in-part).

⁸⁹ *Enfish, L.L.C. v. Microsoft Corp.*, 822 F.3d 1327 (Fed. Cir. 2016).

⁹⁰ *Id.*

⁹¹ *Id.* at 1335, 1339.

⁹² *Berkheimer v. HP, Inc.*, 881 F.3d 1360 (Fed. Cir. 2018).

⁹³ See *id.*

⁹⁴ *Am. Axle & Mfg., Inc. v. Neapco Holdings, L.L.C.*, 939 F.3d. 1355 (Fed. Cir. 2019), *reh’g granted, opinion withdrawn*, 966 F.3d 1294 (Fed. Cir. 2020), *and opinion modified and superseded on reh’g*, 967 F.3d. 1285 (Fed. Cir. 2020).

⁹⁵ *Id.* at 1365–66.

⁹⁶ *Id.* at 1368–69 (Moore, J., dissenting).

⁹⁷ *Am. Axle & Mfg., Inc. v. Neapco Holdings, L.L.C.*, 967 F.3d. 1285 (Fed. Cir. 2020).

are now ineligible if their performance would involve application of a natural law. The majority makes three critical errors of law and in doing so, has inflated § 101 beyond the statutory language and Supreme Court precedent. First, the majority finds claims *directed to* natural laws, yet they clearly contain no such natural law. The majority creates a new test for when claims are *directed to* a natural law despite no natural law being recited in the claims, the *Nothing More* test. . . . Second, the majority refuses to consider the unconventional claim elements. Third, the majority has imbued § 101 with a new superpower—enablement on steroids. The majority’s blended 101/112 analysis expands § 101, converts factual issues into legal ones and is certain to cause confusion for future cases.⁹⁸

The fractured nature of the Federal Circuit concerning patent-eligible subject matter law is exemplified by the denial of rehearing en banc.⁹⁹ In that denial of the petition for rehearing en banc, six judges voted for denial and six judges for accepting the petition.¹⁰⁰ In an amicus brief, the Biotechnology Innovation Organization (BIO) stated:

BIO’s members are concerned that, more than seven years after the Supreme Court decided *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289 (2012), there continues to be unabated uncertainty about the patent eligibility of inventions across an expanding range of technologies, including biotechnology.

The unstable state of patent-eligibility jurisprudence affects modern biotechnologies ranging from biomarker-assisted methods of drug treatment to companion diagnostic tests, fermentation products, industrial enzyme technology, and marker-assisted methods of plant breeding. As developers of, and investors in, such advanced technologies, BIO members have a strong interest in clear and predictable rules of patent-eligibility and their delineation to other requirements of patentability such as 35 U.S.C. § 112.¹⁰¹

In an amicus brief in support of a petition for writ of certiorari to the U.S. Supreme Court in *American Axle*, BIO and AUTM (formerly the Association of University Technology Managers) expressed considerable concern regarding the Federal Circuit’s application of *Mayo/Alice* and the conflation of enablement with § 101.¹⁰² BIO stated:

⁹⁸ *Id.* at 1304–05 (Moore, J., dissenting).

⁹⁹ *Am. Axle & Mfg., Inc. v. Neapco Holdings, L.L.C.*, 966 F.3d 1347 (Fed. Cir. 2020).

¹⁰⁰ *Id.*

¹⁰¹ Brief for Biotechnology Innovation Organization as Amicus Curiae Supporting Appellant’s Combined Petition for Rehearing or Rehearing En Banc at 5, *Am. Axle & Mfg., Inc. v. Neapco Holdings, L.L.C.*, 939 F.3d 1355 (Fed. Cir. 2019) (No. 18-1763).

¹⁰² Brief for Biotechnology Innovation Organization & AUTM as Amici Curiae Supporting Petitioner, *Am. Axle & Mfg., Inc. v. Neapco Holdings, L.L.C.*, 141 S. Ct. 2594 (2021) (Mem.)

[B]y defining the scope of the invention as a natural law and nothing more at step one, the court collapsed *Mayo*'s two steps into a single inquiry that could, without this Court's intervention, be used to characterize any invention an ineligible law of nature, natural phenomenon, or abstract idea, including as happened here, methods of manufacturing that have been considered patent eligible since the beginning of the U.S. patent system.¹⁰³

BIO also stated:

[T]he Federal Circuit did not just misapply the Court's two-step framework. It conflated the inquiry for subject matter eligibility with the enablement requirement of 35 U.S.C. § 112. Section 101 should not be used to do the work that other sections are intended to do and better equipped to handle. Such a result only further obscures the law. The *Amici*'s members work in a field with well-developed case law defining the scope and application of Section 112, and they expend great effort during patent prosecution to meet the written description and enablement requirements of the statute. Accordingly, the *Amici*'s members are concerned about the apparent ease with which a written description or enablement analysis can be misapplied under the guise of a Section 101 analysis, as happened in this case. Indeed, the decision at issue here illustrates the principal concern expressed by the Court in *Mayo* that Section 101 would be subsumed by the other statutory requirements for patentability, except that it is now Section 101 that subsumes the other sections. Clarification of the law is needed to prevent its further degradation and to ensure consistency in its application.¹⁰⁴

In a case in the biotechnology field, the Federal Circuit issued the *Ariosa Diagnostics v. Sequenom* decision which also demonstrates difficulty with applying the *Mayo/Alice* test.¹⁰⁵ The Federal Circuit stated:

The method at issue here amounts to a general instruction to doctors to apply routine, conventional techniques when seeking to detect cffDNA. Because the method steps were well-understood, conventional and routine, the method of detecting paternally inherited cffDNA is not new and useful. The only subject matter new and useful as of the date of the application was the discovery of the presence of cffDNA in maternal plasma or serum.¹⁰⁶

Thus, in this case, a novel discovery was made; however, it was not patentable because the application of that discovery did not include additional steps that were an inventive concept.¹⁰⁷ In a concurring opinion, Judge Linn stated: "It is hard to

(No. 20-891).

¹⁰³ *Id.* at 4.

¹⁰⁴ *Id.* at 3–4.

¹⁰⁵ *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371 (Fed. Cir. 2015).

¹⁰⁶ *Id.* at 1377.

¹⁰⁷ *Id.* at 1378–80.

deny that Sequenom's invention is truly meritorious."¹⁰⁸

In another biotechnology case which involved diagnostic methods to determine a neurological disorder by detecting antibodies, *Athena Diagnostics v. Mayo Collaborative Services*, the Federal Circuit decided that the claims at issue were directed to an abstract idea: "We conclude that claims 7–9 are directed to a natural law because the claimed advance was only in the discovery of a natural law, and that the additional recited steps only apply conventional techniques to detect that natural law."¹⁰⁹ Moreover, the Federal Circuit found that the second step of *Alice/Mayo* was also not satisfied as "only requir[ing] standard techniques to be applied in a standard way."¹¹⁰ In a strongly worded dissent, Judge Newman stated: "This court's decisions on the patent-ineligibility of diagnostic methods are not consistent, and my colleagues today enlarge the inconsistencies and exacerbate the judge-made disincentives to development of new diagnostic methods, with no public benefit."¹¹¹ Numerous concurring and dissenting opinions were filed on the denial of the petition en banc by the Federal Circuit.¹¹² In a concurrence to the denial of the petition en banc, Judge Hughes noted:

The multiple concurring and dissenting opinions regarding the denial of en banc rehearing in this case are illustrative of how fraught the issue of § 101 eligibility, especially as applied to medical diagnostics patents, is. I agree that the language in *Mayo*, as later reinforced in *Alice*, forecloses this court from adopting an approach or reaching a result different from the panel majority's. I also agree, however, that the bottom line for diagnostics patents is problematic. But this is not a problem that we can solve. As an inferior appellate court, we are bound by the Supreme Court.

I, for one, would welcome further explication of eligibility standards in the area of diagnostics patents. Such standards could permit patenting of essential life saving inventions based on natural laws while providing a reasonable and measured way to differentiate between overly broad patents claiming natural laws and truly worthy specific applications. Such an explication might come from the Supreme Court. Or it might come from Congress, with its distinctive role in making the factual and policy determinations relevant to setting the proper balance of innovation incentives under patent law.¹¹³

¹⁰⁸ *Id.* at 1381 (Linn, J., concurring).

¹⁰⁹ *Athena Diagnostics, Inc. v. Mayo Collaborative Servs., L.L.C.*, 915 F.3d 743, 751 (Fed. Cir. 2019), *cert. denied*, 140 S. Ct. 855 (2020).

¹¹⁰ *Id.* at 753.

¹¹¹ *Id.* at 757 (Newman, J., dissenting).

¹¹² *Athena Diagnostics, Inc. v. Mayo Collaborative Servs., L.L.C.*, 927 F.3d 1333 (Fed. Cir. 2019).

¹¹³ *Id.* at 1337 (Hughes, J., concurring).

In concurring with the denial, Judge Dyk stated:

Although the Supreme Court's decision in *Mayo* did not make all diagnostic claims patent ineligible, as we previously held in *Ariosa*, 788 F.3d at 1376–77, *Mayo* left no room for us to find typical diagnostic claims patent eligible, absent some inventive concept at *Mayo* step two. The panel here correctly concluded that *Mayo* controls.¹¹⁴

In a dissent to the denial, Judge Moore stated:

This is not a case in which the judges of this court disagree over whether diagnostic claims, like those at issue in *Athena*, should be eligible for patent protection. They should. None of my colleagues defend the conclusion that claims to diagnostic kits and diagnostic techniques, like those at issue, should be ineligible. The only difference among us is whether the Supreme Court's *Mayo* decision requires this outcome. The majority of my colleagues believe that our hands are tied and that *Mayo* requires this outcome. I believe *Mayo* does not. The Patent Act renders eligible the invention or discovery of any new and useful process. 35 U.S.C. § 101. And the patent system exists to promote exactly this sort of specific, targeted application of a life-saving discovery, which is characterized by extraordinarily high initial market entry costs. The claims in this case should be held eligible, and they are distinguishable from *Mayo*.¹¹⁵

In a recent case, *Yu v. Apple*, Judge Newman criticized the majority's arguably broad approach to the *Alice/Mayo* test:

The majority states that this digital camera is ineligible for consideration for patenting because “claim 1 is directed to the abstract idea of taking two pictures (which may be at different exposures) and using one picture to enhance the other in some way.” Maj. Op. at 1042–43. I repeat: claim 1 is for a digital camera having a designated structure and mechanism that perform specified functions; claim 1 is not for the general idea of enhancing camera images. The camera of the '289 patent may or may not ultimately satisfy all the substantive requirements of patentability, for this is an active field of technology. However, that does not convert a mechanical/electronic device into an abstract idea.

...

In the current state of Section 101 jurisprudence, inconsistency and unpredictability of adjudication have destabilized technologic development in important fields of commerce. Although today's Section 101 uncertainties have arisen primarily in the biological and computer-implemented technologies, all fields are affected. The case before us enlarges this instability in all fields,

¹¹⁴ *Id.* at 1339 (Dyk, J., concurring).

¹¹⁵ *Id.* at 1352 (Moore, J., dissenting).

for the court holds that the question of whether the components of a new device are well-known and conventional affects Section 101 eligibility, without reaching the patentability criteria of novelty and nonobviousness.¹¹⁶

Notably, in the face of lack of stability, 67.6% of patent-eligible subject matter challenged patents in federal court have been found invalid up to April 2017 since *Alice*.¹¹⁷ That means that the U.S. Patent and Trademark Office found that a claim should issue, but the claim was later overturned in the courts based on *Mayo/Alice*.

Since *Alice v. CLS Bank*, the U.S. Patent and Trademark Office has completed exemplary work on attempting to clarify an approach for patent examiners post-*Mayo/Alice*. Unfortunately, the U.S. Patent and Trademark Office has had to revise those guidelines numerous times because of new Federal Circuit case law and has struggled to distinguish arguably inconsistent case law issued by the Federal Circuit.¹¹⁸ However, a recent study by the U.S. Patent and Trademark Office titled, *Adjusting to Alice: USPTO Patent Examination Outcomes After Alice Corp. v. CLS Bank International*, reported a decrease in patent-eligible subject matter rejections by examiners after clarifying material and training was provided in 2019:

- The likelihood of receiving a first office action with a rejection for patent-ineligible subject matter increased by 31% in the 18 months following the U.S. Supreme Court decision in *Alice Corp. v. CLS Bank International* in 33 “*Alice*-affected” technology areas.
- For these technologies, uncertainty in patent examination—measured as variability in patent subject matter eligibility determinations across examiners in the first action stage of examination—increased by 26% in the 18 months following the *Alice* decision.
- One year after the United States Patent and Trademark Office issued its January 2019 Revised Patent Subject Matter Eligibility Guidance (2019 PEG), the likelihood of *Alice*-affected technologies receiving a first office action with a rejection for patent-ineligible subject matter had decreased by 25%.

¹¹⁶ *Yu v. Apple Inc.*, 1 F.4th 1040, 1047, 1049 (Fed. Cir. 2021) (Newman, J., dissenting).

¹¹⁷ Robert Sachs, *#AliceStorm: April Update and the Impact of TC Heartland on Patent Eligibility*, FENWICK: BILSKI BLOG (June 1, 2017), <https://www.fenwick.com/bilski-blog/alicestorm-april-update-and-the-impact-of-tc-heartland>. Additionally, the U.S. district courts may struggle with claim construction under *Alice*. See, e.g., *Free Stream Media Corp. v. Alphonso Inc.*, 996 F.3d 1355 (Fed. Cir. 2021) (reversing district court’s decision concerning patent eligibility).

¹¹⁸ 2019 Revised Patent Eligibility Subject Matter Eligibility Guidance, 84 Fed. Reg. 50 (Jan. 7, 2019); see Richard D. Kelly, *In re Rudy and the PTO 101 Guidance*, OBLON (Apr. 22, 2021), <https://www.oblon.com/in-re-rudy-and-the-pto-101-guidance> (noting an inconsistency between Federal Circuit case law and PTO guidance example).

- Uncertainty in patent examination for *Alice*-affected technologies decreased by 44% in the 12 months following the issuance of the 2019 PEG.¹¹⁹

Numerous intellectual property organizations have offered proposals to revise § 101 of the U.S. patent law by essentially dismantling the U.S. Supreme Court's recent decisions concerning patent-eligible subject matter. The American Intellectual Property Law Association (AIPLA) and the Intellectual Property Owners Association (IPO) released a joint reform proposal in May 2018.¹²⁰ The proposal states:

Eligible Subject Matter

(a) Whoever invents or discovers, and claims as an invention, any useful process, machine, manufacture, composition of matter, or any useful improvement thereof, shall be entitled to a patent therefor, subject only to the conditions and requirements set forth in this title.

Sole Exceptions to Subject Matter Eligibility

(b) A claimed invention is ineligible under subsection (a) if and only if the claimed invention as a whole (i) exists in nature independently of and prior to any human activity or (ii) is performed solely in the human mind.

Sole Eligibility Standard

(c) The eligibility of a claimed invention under subsections (a) and (b) shall be determined without regard to:

- (i) the requirements or conditions of sections 102, 103, and 112 of this title;
- (ii) the manner in which the claimed invention was made or discovered; or
- (iii) whether the claimed invention includes an inventive concept.¹²¹

The AIPLA proposal creates sole exceptions to subject matter eligibility which do not include the abstract idea, natural phenomena, and law of nature exceptions and

¹¹⁹ ANDREW A. TOOLE & NICHOLAS A. PAIROLERO, U.S. PATENT & TRADEMARK OFF., ADJUSTING TO *ALICE*: USPTO PATENT EXAMINATION OUTCOMES AFTER *ALICE CORP. V. CLS BANK INTERNATIONAL* 1 (2020), https://www.uspto.gov/sites/default/files/documents/OCE-DH_AdjustingtoAlice.pdf. In response to a request by two U.S. Senators, the USPTO will offer a voluntary program to allow examiners to engage in sequential examination—basically the examiner will consider patent-eligible subject matter issues last in their examination. See Letter from Andrew Hirshfeld, Under Sec'y of Com. for Intell. Prop. & Dir. of the U.S. Pat. & Trademark Off., to Sen. Thom Tillis & Sen. Tom Cotton (Apr. 20, 2021), <https://ipo.org/wp-content/uploads/2021/04/Response-to-Sens.-Tillis-Cotton-on-Sequenced-Examination.pdf>.

¹²⁰ *Joint AIPLA-IPO Proposal on Patent Eligibility*, AM. INTELL. PROP. LAW ASS'N (May 2018), <https://www.aipla.org/advocacy/legislative/joint-aipla-ipo-proposal-on-patent-eligibility>.

¹²¹ *Id.*

removes the inventive concept test.¹²² Importantly, the proposal ensures that courts and the Patent Office examine patent claims based on the claim as a whole.¹²³

The American Bar Association Intellectual Property Law Section provided another proposal for § 101 reform:

§ 101. Conditions for patentability: eligible subject matter.

(a) Eligible Subject Matter.- Whoever invents or discovers any useful process, machine, manufacture, or composition of matter, or any useful improvement thereof, shall be entitled to obtain a patent on such invention or discovery, absent a finding that one or more conditions or requirements under this title have not been met.

(b) Exception.- A claim for a useful process, machine, manufacture, or composition of matter, or any useful improvement thereof, may be denied eligibility under this section 101 on the ground that the scope of the exclusive rights under such a claim would preempt the use by others of all practical applications of a law of nature, natural phenomenon, or abstract idea. Patent eligibility under this section shall not be negated when a practical application of a law of nature, natural phenomenon, or abstract idea is the subject matter of the claims upon consideration of those claims as a whole, whereby each and every limitation of the claims shall be fully considered and none ignored. Eligibility under this section 101 shall not be negated based on considerations of patentability as defined in Sections 102, 103 and 112, including whether the claims in whole or in part define an inventive concept.¹²⁴

The ABA proposal removes the inventive concept and preserves exceptions.¹²⁵ However, those exceptions must preempt “all practical applications” of the exception and consider the claim as a whole.¹²⁶ These proposals propose a further “sea change” to patent-eligible subject matter, but in some ways provide additional certainty even though they arguably lead to much broader patent-eligible subject matter which may provide negative downstream effects.¹²⁷

Importantly, the U.S. Congress recently held hearings concerning reforming patent-eligible subject matter law with a proposed law.¹²⁸ The proposed law would

¹²² See *id.*

¹²³ See *id.*

¹²⁴ Letter from Donna P. Suchy, Section Chair, Section of Intell. Prop. Law, Am. Bar Ass’n, to Michelle K. Lee, Under Sec’y of Com. for Intell. Prop. & Dir. of the U.S. Pat. & Trademark Off. (Mar. 28, 2017), https://www.americanbar.org/content/dam/aba/administrative/intellectual_property_law/advocacy/advocacy-20170328-comments.pdf.

¹²⁵ See *id.*

¹²⁶ See *id.*

¹²⁷ See *id.*

¹²⁸ See Natalie Ryang & Sam Vallejo, *Congress Attempts to Remove Ambiguity in Favor of Patent Holders*, WHITE & CASE: TECH. NEWSFLASH (June 26, 2019), <https://www.>

basically eradicate the current U.S. Supreme Court’s approach. First, members of the U.S. Senate and House of Representatives released a framework following meetings between congresspersons and industry stakeholders concerning patent-eligible subject matter reform.¹²⁹ The framework states:

DRAFT OUTLINE OF SECTION 101 REFORM

- Keep existing statutory categories of process, machine, manufacture, or composition of matter, or any useful improvement thereof.
- Eliminate, within the eligibility requirement, that any invention or discovery be both “new and useful.” Instead, simply require that the invention meet existing statutory utility requirements.
- Define, in a closed list, exclusive categories of statutory subject matter which alone should not be eligible for patent protection. The sole list of exclusions might include the following categories, for example:
 - Fundamental scientific principles;
 - Products that exist solely and exclusively in nature;
 - Pure mathematical formulas;
 - Economic or commercial principles;
 - Mental activities.
- Create a “practical application” test to ensure that the statutorily ineligible subject matter is construed narrowly.
- Ensure that simply reciting generic technical language or generic functional language does not salvage an otherwise ineligible claim.
- Statutorily abrogate judicially created exceptions to patent eligible subject matter in favor of exclusive statutory categories of ineligible subject matter.
- Make clear that eligibility is determined by considering each and every element of the claim as a whole and without regard to considerations properly addressed by 102, 103 and 112.¹³⁰

The congresspeople who released the framework then issued a draft bill.¹³¹ The draft bill states:

whitecase.com/publications/article/congress-attempts-remove-ambiguity-favor-patent-holders (discussing Congressional reform efforts).

¹²⁹ Press Release, Thom Tillis: U.S. Sen. for N.C., Sens. Tillis and Coons and Reps. Collins, Johnson, and Stivers Release Section 101 Patent Reform Framework (Apr. 17, 2019), <https://www.tillis.senate.gov/2019/4/sens-tillis-and-coons-and-reps-collins-johnson-and-stivers-release-section-101-patent-reform-framework>.

¹³⁰ *Draft Outline of Section 101 Reform*, THOM TILLIS: U.S. SEN. FOR N.C. (2019), <https://www.tillis.senate.gov/services/files/3491a23f-09c3-4f4a-9a93-71292704c5b>.

¹³¹ Press Release, Thom Tillis: U.S. Sen. for N.C., Sens. Tillis and Coons and Reps. Collins,

Section 100:

(k) The term “useful” means any invention or discovery that provides specific and practical utility in any field of technology through human intervention.

Section 101:

Whoever invents or discovers any useful process, machine, manufacture, or composition of matter, or any useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Eligibility under this section shall be determined only while considering the claimed invention as a whole, without discounting or disregarding any claim limitation.

Section 112:

(f) Functional Claim Elements –

An element in a claim expressed as a specified function without the recital of structure, material, or acts in support thereof shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

Additional Legislative Provisions:

- The provisions of section 101 shall be construed in favor of eligibility.
- No implicit or other judicially created exceptions to subject matter eligibility, including “abstract ideas,” “laws of nature,” or “natural phenomena,” shall be used to determine patent eligibility under section 101, and all cases establishing or interpreting those exceptions to eligibility are hereby abrogated.
- The eligibility of a claimed invention under section 101 shall be determined without regard to: the manner in which the claimed invention was made; whether individual limitations of a claim are well known, convention or routine; the state of the art at the time of the invention; or any other considerations relating to sections 102, 103, or 112 of this title.¹³²

The draft bill represents very broad eligible subject matter also potentially raising problems with downstream innovation. The draft bill has not been passed by the U.S. Congress.

In a series of congressional testimony concerning patent law, many experts testified either for or against the current approach to patent eligibility. On one hand, many experts state that the current approach is rife with uncertainty. Some assert that the *Mayo/Alice* test is inherently unstable because of the inability to determine

Johnson and Stivers Release Draft Bill Text to Reform Section 101 of the Patent Act (May 22, 2019), <https://www.tillis.senate.gov/2019/5/sens-tillis-and-coons-and-reps-collins-johnson-and-stivers-release-draft-bill-text-to-reform-section-101-of-the-patent-act>.

¹³² *Draft Bill Text to Reform Section 101 of the Patent Act*, THOM TILLIS: U.S. SEN. FOR N.C. (2019), <https://www.tillis.senate.gov/services/files/E8ED2188-DC15-4876-8F51-A03CF4A63E26>.

what is an abstract idea¹³³—a problem that has plagued the patent system since the *Freeman-Walter-Abele* test.¹³⁴ According to those experts, the current test results in less investment, particularly in software, artificial intelligence, and health-related technologies. Some have stated that the United States is at a competitive disadvantage to other countries because capital is moving to countries with arguably broader and more certain patent-eligible subject matter law, such as China and countries in the European Union.¹³⁵ Additionally, a recent report on artificial intelligence by the U.S. National Security Commission states that patent-eligible subject matter should be reformed:

Implement comprehensive intellectual property (IP) policies and regimes. The United States must recognize IP policy as a national security priority critical for preserving America’s leadership in AI and emerging technologies. This is especially important in light of China’s efforts to leverage and exploit IP policies. The United States lacks the comprehensive IP policies it needs for the AI era and is hindered by legal uncertainties in current U.S. patent eligibility and patentability doctrine. The U.S. government needs a plan to reform IP policies and regimes in ways that are designed to further national security priorities.¹³⁶

Patent expert Robert Armitage reviews the uncertainty associated with the current Federal Circuit law by pointing to three cases in which Federal Circuit judges have reached inconsistent results in panels—essentially judges disagreeing in part at

¹³³ See *The State of Patent Eligibility in America: Part I: Hearing on S. 101 Before the Subcomm. on Intell. Prop. of the S. Comm. on the Judiciary*, 116th Cong. 9 & n.23 (2019) (statement of Henry Hadad, President, Intellectual Property Owners Association), <https://judiciary.senate.gov/imo/media/doc/Hadad%20Testimony.pdf> (noting China and the European Union have expanded patent-eligible subject matter in 2017 and 2018, respectively); *The State of Patent Eligibility in America: Part I: Hearing on S. 101 Before the Subcomm. on Intell. Prop. of the S. Comm. on the Judiciary*, 116th Cong. 2–3 (2019) (statement of Adam Mossoff, Professor, George Mason University), <https://www.judiciary.senate.gov/imo/media/doc/Mossoff%20Testimony.pdf> (“China and European countries are now the ones forging ahead and securing reliable and effective patents in innovation that the U.S. no longer protects due to the closing of its patent system under the *Alice-Mayo* framework.”); *The State of Patent Eligibility in America: Part I: Hearing on S. 101 Before the Subcomm. on Intell. Prop. of the S. Comm. on the Judiciary*, 116th Cong. 6 (2019) (statement of Patrick Kilbride, U.S. Chamber of Commerce), <https://www.judiciary.senate.gov/imo/media/doc/Kilbride%20Testimony.pdf> (“The [USPTO] guidelines and their subsequent application widen the gap between U.S. practice and that in other jurisdictions, such as the European Union, Australia, and Japan where, for instance, purified genomic DNA and proteins are patentable.”).

¹³⁴ See Steven M. Greenberg, *The Inconsistent Treatment of Computer Software as Patentable Subject Matter*, 11 FLA. J. TECH. L. & POL’Y 77, 77–85 (2006).

¹³⁵ See sources cited *supra* note 133.

¹³⁶ NAT’L SEC. COMM’N ON A.I., FINAL REPORT 12 (2021), <https://www.nscai.gov/wp-content/uploads/2021/03/Full-Report-Digital-1.pdf>.

least with other judges on the panel.¹³⁷ Additionally, organizations from BIO, the Cleveland Clinic, the American Bar Association, Johnson and Johnson, Novartis, Genentech, InterDigital, Nokia, Qualcomm, IBM, the Association of American Universities, and the Intellectual Property Owners Association have argued for adopting the draft bill and others in whole or in part to encourage investment in their relative fields.¹³⁸

On the other hand, other experts point out that the proposed approach would lead to patents that stifle innovation and will lead to high pharmaceutical prices.¹³⁹ Importantly, Christopher A. Mohr of the Software and Information Industry Association noted, “Fixed investment into intellectual property products is decidedly on

¹³⁷ *The State of Patent Eligibility in America: Part I: Hearing Before the Subcomm. on Intell. Prop. & the S. Comm. on the Judiciary*, 116th Cong. 12–13 (2019) (statement of Robert A. Armitage), <https://www.judiciary.senate.gov/imo/media/doc/Armitage%20Testimony.pdf>.

¹³⁸ See *The State of Patent Eligibility in America: Part II: Hearing Before the S. Comm. on the Judiciary & the Subcomm. on Intell. Prop.*, 116th Cong. 2–3, 11 (2019) (statement of Hans Saur, Deputy General Counsel and Vice President for Intellectual Property, Biotechnology Innovation Organization), <https://www.judiciary.senate.gov/imo/media/doc/Sauer%20Testimony.pdf>; *The State of Patent Eligibility in America: Part II: Hearing Before the Subcomm. on Intell. Prop. & the S. Comm. on the Judiciary*, 116th Cong. (2019) (statements of Scott Partridge, Past Chair, American Bar Association’s Section of Intellectual Property Law; Rick Brandon, Associate General Counsel, University of Michigan, Association of American Universities; Henry Hadad, President, Intellectual Property Owners Association), <https://www.judiciary.senate.gov/meetings/the-state-of-patent-eligibility-in-america-part-ii> (scroll down and click “Download Testimony” for each respective witness); *The State of Patent Eligibility in America: Part III: Hearing Before the Subcomm. on Intell. Prop. of the S. Comm. on the Judiciary*, 116th Cong. (2019) (statements of Peter O’Neill, Executive Director, Cleveland Clinic Innovations; Robert Deberadine, Chief Intellectual Property Counsel, Johnson & Johnson; Corey Salsberg, Vice President and Global Head Intellectual Property Affairs, Novartis; Laurie Hill, Vice President of Intellectual Property, Genentech, Inc.; Kimberly Chotkowski, VP, Head of Licensing Strategy and Operations, InterDigital; Byron R. Holz, Senior Intellectual Property Rights Licensing Counsel, Nokia; Laurie C. Self, Senior Vice President and Counsel, Governmental Affairs, Qualcomm, Inc.; Manny Schecter, Chief Patent Counsel, International Business Machines Corporation), <https://www.judiciary.senate.gov/meetings/the-state-of-patent-eligibility-in-america-part-iii> (scroll down and click “Download Testimony” for each respective witness).

¹³⁹ See *The State of Patent Eligibility in America: Part II: Hearing Before the Subcomm. on Intell. Prop. & the S. Comm. on the Judiciary*, 116th Cong. 2–3 (2019) (statement of Jeffery K. Francer, Senior Vice President and General Counsel, Association for Accessible Medicines), <https://www.judiciary.senate.gov/imo/media/doc/Francer%20Testimony.pdf>; *The State of Patent Eligibility in America: Part II: Hearing Before the Subcomm. on Intell. Prop. & the S. Comm. on the Judiciary*, 116th Cong. 3–4 (2019) (statement of Kate Ruane, Senior Legislative Counsel, Washington Legislative Office, American Civil Liberties Union), <https://www.judiciary.senate.gov/imo/media/doc/Ruane%20Testimony.pdf>; *The State of Patent Eligibility in America: Part II: Hearing Before the Subcomm. on Intell. Prop. & the S. Comm. on the Judiciary*, 116th Cong. 5 (2019) (statement of Williams Jenks, The Internet Association), <https://www.judiciary.senate.gov/imo/media/doc/Jenks%20Testimony.pdf>.

an upward slope that has steepened since the Alice decision.”¹⁴⁰ He further noted that “in 2016, venture capital raised \$41 billion for startups, the highest amount in 10 years.”¹⁴¹ Indeed, Mr. Mohr stated, “Rather than expend resources on defensive filings, technology firms are instead pushing those resources back into innovation.”¹⁴² Irrespective of both positions, the important point is that a higher degree of certainty—whether broader or narrower—should be a goal. Indeed, David W. Jones of the High Tech Inventors Alliance argues that “[u]pending the existing eligibility rules creates a significant risk of unintended consequences and would involve enormous uncertainty, disruption, and cost.”¹⁴³

Certainty in this context refers to patent-eligible subject matter and does not refer to the necessity to exercise march-in rights for government funded inventions or other compulsory licensing for public health needs. A compromise could be made with respect to narrower patent-eligible subject matter, so long as that approach would be relatively certain. For example, the U.S. Congress could take a narrow approach to patent-eligible subject matter. Congress could draft a law keeping the current system but providing specific examples in the legislation of valid and invalid patent-eligible subject matter. This would allow Congress to specifically accept or reject past U.S. Supreme Court and Federal Circuit decisions. Congress could also create new examples based on industry, university research, and other stakeholder testimony. Congress could revisit the issue every three to five years. Congress could clarify that enablement is not part of the patent-eligible subject matter analysis. Notably, U.S. Patent and Trademark Office efforts on clarifying patent-eligible subject matter appear to have aided in clearing up confusion. The U.S. Supreme Court could also accept certiorari in more patent-eligible subject matter cases, providing more guidance to the lower courts.

Even though broad patent-eligible subject matter may lead to financing, it may also lead to behaviour which may ultimately stifle innovation instead of promoting it and limit access to inventions. Potential transaction costs associated with the valuation and analysis of patents—including, for example, license fees in other transactions—may lead to difficulty in acquiring the necessary rights to promote additional invention and commercialization, although new entities devoted to reducing

¹⁴⁰ *The State of Patent Eligibility in America: Part II: Hearing Before the Subcomm. on Intell. Prop. & the S. Comm. on the Judiciary*, 116th Cong. 5 (2019) (statement of Christopher A. Mohr, Vice President for Intellectual Property and General Counsel, Software and Information Industry Association), <https://www.judiciary.senate.gov/imo/media/doc/Mohr%20Testimony.pdf>.

¹⁴¹ *Id.*

¹⁴² *Id.* at 6.

¹⁴³ *The State of Patent Eligibility in America: Part II: Hearing Before the Subcomm. on Intell. Prop. & the S. Comm. on the Judiciary*, 116th Cong. 2 (2019) (statement of David W. Jones, Executive Director, High Tech Inventors Alliance), <https://www.judiciary.senate.gov/imo/media/doc/Martz%20Testimony.pdf>.

those costs may become effective. Additionally, other doctrines such as nonobviousness, infringement, disclosure requirements and claim definiteness could be used to cabin broad patent-eligible subject matter.¹⁴⁴ Indeed, Professors Mark A. Lemley and Dan Burk have argued that policy levers used by judges could be used to take into account the differences in innovation of specific industries.¹⁴⁵ Notably, Professor Lemley testified, “The current 101 rules are bad for life sciences but might be good for software . . . [and e]liminating patentable subject matter doctrines needs to be balanced with new doctrines to protect against patent abuse.”¹⁴⁶ However, the downside is that utilizing those doctrines may lead to issues with respect to resolving litigation early.¹⁴⁷

B. *The Commercialization Market for Patents*

The next market this Article will analyze enables commercialization of patents by transferring such rights to actors who can commercialize or utilize the invention. This market has experienced several problems that hinder its development. The following Section discusses multiple problems such as valuation issues, need for human

¹⁴⁴ Patent portfolios may mitigate the risk of individual patents becoming invalidated for a lack of patent-eligible subject matter. See Gregory Rosenthal, Reinhard Knauer & Robert Bailey, *Building High-Quality Patent Portfolios in the United States and Europe: Part I – Intervening Prior Art*, IPWATCHDOG (Sept. 2, 2021), <https://www.ipwatchdog.com/2021/09/02/building-high-quality-patent-portfolios-united-states-europe-part-i-intervening-prior-art/id=137260/> (discussing strategic concerns across jurisdictions for creating patent portfolios); Solomon & Bitton, *supra* note 7, at 168 (“While it is easier to challenge one patent or trademark, challenging a hundred-patent portfolio is harder.”); Risch, *supra* note 7, at 103 (“Portfolios . . . increase the patent-holder’s leverage even if the additional patents are of dubious quality. . . . Further, even if one patent is removed from the equation due to invalidity or noninfringement, there are many more patents in the portfolio.”).

¹⁴⁵ Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575 (2003).

¹⁴⁶ *The State of Patent Eligibility in America: Part I: Hearing Before the Subcomm. on Intell. Prop. & the S. Comm. on the Judiciary*, 116th Cong. 1, 3 (2019) (statement of Mark A. Lemley, Director, Program in Law, Science & Technology, Stanford University School of Law), <https://www.judiciary.senate.gov/imo/media/doc/Lemley%20Testimony.pdf>.

¹⁴⁷ Two additional proposed laws, The Prevent Abuse of the Legal System Act (PALS Act) and the Support Technology and Research for Our Nation’s Growth and Economic Resilience Patents Act (STRONGER Patents Act), modify U.S. patent law and demonstrate how new laws may change the existing status quo resulting in potentially more or less valuable patents. See Prevent Abuse of the Legal System (PALS) Act, S. 2178, 116th Cong. (2019); Support Technology and Research for Our Nation’s Growth and Economic Resilience (STRONGER) Patents Act of 2019, H.R. 3666, 116th Cong. (2019). The PALS Act requires changes to pleading which may result in less arguably abusive litigation. The STRONGER Patents Act would weaken *inter partes* review of issued patents and create a preference for injunctions, among other things. This could lead to the continuance of patents of dubious quality and enforcement costs. However, on the other hand, it may result in higher valuations of some patents.

capital, difficulty in exercising due diligence, additional transaction costs, and non-practicing entities.

1. *Valuation Difficulties*

For context, patented inventions arise in many different and diverse areas and for various reasons.¹⁴⁸ For example, patents may play different roles in different industries. In the biotechnology and pharmaceutical industry, patents are used to secure, arguably, the close to \$2 billion dollar investment needed in bringing a pharmaceutical to market. Patents may be less important in fast moving industries with short product life cycles such as software or information technology.¹⁴⁹ This leads to potentially different valuations. Moreover, patents are used for different purposes—for example, some patents have value as portfolios and are used as shields against others—so they can be used to trade defensively. Similarly, patent portfolios can be used to obtain freedom-to-operate in a field.¹⁵⁰ Some patents are helpful to develop and commercialize products to sell, some patents are obtained to block others from inventing around other patents covering marketed technology, and others are used to deceive—to make competitors think that you are moving in one direction, but you plan to go in another. One problem is that value may be contextual.¹⁵¹

Additionally, building confidence in patent as collateral in the finance and commercial sectors has been identified as an essential issue for the pursuit to bolster the opportunities for intellectual property-rich SMEs to raise growth finance.¹⁵² One prerequisite to create such increased confidence is the accurate valuation of patents, which persists as a major impediment to their emergence as a tradable asset

¹⁴⁸ For an extensive discussion of valuation techniques and issues, please see WESTON ANSON, *IP VALUATION AND MANAGEMENT* (2010).

¹⁴⁹ See Solomon & Bitton, *supra* note 7, at 158 (“The findings showed that patents are most useful in the biotechnology and hardware sectors and least useful in software companies.”).

¹⁵⁰ Solomon and Bitton note that mitigating risk can involve “securiti[zing] a patent portfolio rather than just a lone patent.” *Id.* at 170.

¹⁵¹ See Press Release, Aon, *Aon’s New Quality of Intellectual Property Solution Helps Companies Realize Full Value of Their IP Portfolio* (Nov. 10, 2020), <https://aon.mediaroom.com/2020-11-10-Aons-New-Quality-of-Intellectual-Property-Solution-Helps-Companies-Realize-Full-Value-of-their-IP-Portfolio> (“The QoIP solution produces a report that focuses on high-impact themes enabling a company and its advisors to make the IP discussion more tangible in an M&A or capital markets transaction. The report: *Catalogues the IP portfolio*, including patents, trade secrets and trademark / brand assets[;] *Highlights core technologies* that are protected by patents and trade secrets[;] *Identifies competitive advantages* that are enabled by the IP[;] *Defines IP coverage* of existing and future revenue streams[;] and] *Benchmarks IP coverage* and quality against competitor portfolios.”); Solomon & Bitton, *supra* note 7, at 159 (“There are also differences among the various industries’ prioritization of the different potential motivations for patenting.”).

¹⁵² See Brassell & King, *supra* note 3.

class.¹⁵³ There are several generally accepted methods to measure patent value, but a higher degree of transparency in patent valuation procedures and terms is expected to make trade in patent rights substantially more efficient and profitable than the current state of the art.¹⁵⁴

Moreover, the illiquidity of certain types of intellectual property rights amounts to failure from the market standpoint.¹⁵⁵ This deficiency manifests itself in the difficulty in clearly describing the quality and value of intellectual property rights,¹⁵⁶ which makes it hard for parties to agree on the economic value of the asset

¹⁵³ To bolster IP valuations:

The valuation should communicate to lenders the key factors demonstrating the full value of the IP to a lender. These factors include the size and growth expectations of the markets for the inventions, the robustness and diversity of the Cash Flow being generated by the IP, the expected future support (cash, technological, or service) required from the IP owner to collect royalties, and potential liquidation value. According to Mr. Peress, the most valuable IP includes assets that can be utilized across several industries or business models.

See Burton et al., *supra* note 1, at 5. Professor Naina Khanna notes that, “[n]o IP valuation technique takes into account all possible risks associated with the IP.” Khanna, *supra* note 29, at 97.

¹⁵⁴ See Nikolic, *supra* note 26, at 413–19; Roya Gahfele, *A Standard Essential Patent Valuation Perspective on Ericsson v. Samsung*, IPWATCHDOG (Apr. 23, 2021), <https://www.ipwatchdog.com/2021/04/23/standard-essential-patent-valuation-perspective-ericsson-v-samsung/id=132466/> (“The U.S. financial authorities request the disclosure of licensing transactions of significant size, a regulatory framework that is absent in many other parts of the world. . . . However, more can be done to enhance transparency in licensing markets. Markets for patent licensing are still opaque and overshadowed by non-disclosure requirements. More should be done to shed further light on licensing deals.”).

¹⁵⁵ See Paola Giuri, Denise Hirsch, Krystyna Szepanowska-Kozłowska, Hannes Selhofer, John Temple Lang & Nikolaus Thumm, Directorate-General for Res. & Innovation of the European Comm’n, *Report of the Expert Group on Patent Aggregation*, at 5 (2015), <https://euagenda.eu/upload/publications/untitled-63791-ea.pdf> [hereinafter *Report on Patent Aggregation*] (“Establishing a transparent, fair and liquid market for patents and licenses is a challenging task. . . . Most experts and studies consider that the patent market is characterised by a lack of transparency and asymmetry in information, resulting in high transaction costs for trading and licensing patents.”). To demonstrate liquidity, an IP owner, “[i]f the asset is revenue-generating, [may bring forth] established licensing agreements and financial reports detailing the corresponding licensing revenue [that] demonstrates that the IP is viable and creates income against which a loan can be repaid.” Burton et al., *supra* note 1, at 5. Moreover,

Owners are encouraged to provide evidence of use in the marketplace and thus identify potential market buyers. If available, a list of comparable transactions in the marketplace is useful in evidencing demand and establishing pricing expectations to lenders. Borrowers may also want to consider providing potential recovery values for the IP in an event of liquidation.

Id. at 5.

¹⁵⁶ See U.N. ECON. COMM’N, *supra* note 10, at 86 (“Where there is insufficient information on value, IP assets will remain undervalued by capital markets and intellectual property transaction will not progress. Valuation is therefore an important step in determining if the intellectual property transaction is feasible. Particularly in the case of securitization, where the sale price of

to be transferred or licensed.¹⁵⁷ The high degree of opacity thus precludes efficient patent asset market clearing. This tendency appears to be particularly accentuated for assets generated by universities and, in the case of patents, is further aggravated by the difficulty to identify potential patent right buyers.¹⁵⁸ Thus, one expert report notes that some of the main obstacles for a well-functioning patent commercialization market entail: “Difficult acquirer identification[;] Long periods of negotiation[;] Extensive due diligence activities[; and] Sellers and buyers have very differing price expectations.”¹⁵⁹

2. *Human Capital*

Another problem is that patents are not always helpful solely in their own right. It is often the human capital and the know-how associated with patents that is incredibly valuable for practicing and developing a technology.¹⁶⁰ Indeed, sometimes patents do not map well onto a useful technology because of this gap. One risk is the disclosure of know-how or trade secrets resulting in the loss of competitive advantage and potential legal protection. This may devalue patents and portfolios of patents.

3. *Due Diligence*

Finally, as discussed above, an additional problem is the very high cost of due diligence of patents. It is critically important that thorough due diligence is performed.¹⁶¹ This is complicated by global families of patents under different patent

the IP-backed bond is the discounted future earnings, these need to be accurately projected and stressed by consideration of any number of contingencies which will affect the income stream of the IP.”).

¹⁵⁷ The securitization of intellectual property assets may create a secondary market which can provide an additional data point on valuation. See WILLIAM J. KRAMER & CHIRAG B. PATEL, SECURITISATION OF INTELLECTUAL PROPERTY ASSETS IN THE U.S. MARKET 2 (Jan. 2, 2005), https://ipo.org/wp-content/uploads/2013/04/Securitisation_of_IP_in_the_US.pdf (“In this day of questionable accounting, corporations that already include on financial statements significant value for intellectual property assets may have additional support for the valuation by demonstrating that the secondary market is willing to assign a similar value to the intellectual property.”).

¹⁵⁸ See Birgitte Andersen & Federica Rossi, *Inefficiencies in Markets for Intellectual Property Rights: Experiences of Academic and Public Research Institutions*, 30 PROMETHEUS: CRITICAL STUD. IN INNOVATION 5, 8 (2012), https://www.researchgate.net/publication/241736622_Inefficiencies_in_markets_for_intellectual_property_rights_Experiences_of_academic_and_public_research_institutions.

¹⁵⁹ *Final Report on Creating a Financial Market for IPR*, *supra* note 47, at 7.

¹⁶⁰ See *Report on Patent Aggregation*, *supra* note 155, at 26 (“Another challenge for concluding contracts on licenses is often how to organize the transfer of know-how. Often, the commercial exploitation of a patent requires having access to the engineers and scientists who have developed the technology. It can be difficult to agree on the conditions for these exchanges. This is also an important problem for patent pools and funds.”).

¹⁶¹ See Corey Casey & Patrick Woolley, *IP Due Diligence Considerations in*

standards whose value is based on those global markets.¹⁶² Notably, the right to bring an infringement action can vary between countries.¹⁶³ It can be difficult to trace title of patents¹⁶⁴ to ensure that the person who states that they own a patent actually owns it. One study states that 62% of patents have ownership issues.¹⁶⁵

View of Recent US Case Law, IAM (Mar. 31, 2021), <https://www.iam-media.com/ip-due-diligence-considerations-in-view-of-recent-us-case-law> (discussing due diligence issues including inventorship problems).

¹⁶² See Khanna, *supra* note 29, at 97 (“[In the] case of an SPV owning IPs in different countries, each such IP has to be subject to the law of the country in which it is registered. Legal experts may be appointed for such due diligence process which will lead to increased total costs of securitization process.”); Solomon & Bitton, *supra* note 7, at 175 (noting issues for securitizing IP with different legal systems throughout the world); see also Nicholas Tyacke, Eliza Jane Saunders, Alexandra de Zwart & Sab Singh, *Patent Eligibility of Diagnostic Methods in Australia Confirmed: Ariosa Diagnostics, Inc v Sequenom, Inc [2021] FCAFC 101*, DLA PIPER (June 29, 2021), <https://www.dlapiper.com/en/us/insights/publications/2021/06/patent-eligibility-of-diagnostic-methods-in-australia-confirmed/> (noting conflict between the United States’ and Australia’s approaches to patentability of DNA diagnostic); John Whetzel, *Diverging Treatment of Software Patent Applications in the US and China*, LEXOLOGY (July 15, 2021), <https://www.lexology.com/library/detail.aspx?g=e6783ba2-5811-4c9f-a178-305765758060> (noting China’s broader treatment of patent-eligible subject matter in the software field).

¹⁶³ See Jacques de Werra, *Can Exclusive Licensees Sue for Infringement of Licensed IP Rights?: A Case Study Confirming the Need to Create Global IP Licensing Rules*, 30 HARV. J.L. & TECH. 189, 190–91 (2017) (“The application of potentially conflicting local rules [concerning the definition of an exclusive license and who can bring an infringement action] can lead to an undesired fragmentation, which sharply conflicts with the inherently global nature of international IP licensing transactions as well as with the contracting parties’ legitimate expectations.”). Moreover, a purported exclusive licensee may not have all “substantial rights” under U.S. law to confer standing to bring an action. See John C. Paul, D. Brian Kacedon & Paula E. Miller, *Litigation Agent’s Lack of Standing to Sue for Infringement Cannot be Cured by Joining Patent Owner*, FINNEGAN: LES INSIGHTS (May 2, 2017), <https://www.finnegan.com/en/insights/litigation-agent-s-lack-of-standing-to-sue-for-infringement.html>. Moreover, rules concerning ownership of various types of inventions, including academic ownership, may vary country to country adding additional layers of complexity. See Constance E. Bagley & Christina D. Tvarnø, *Promoting “Academic Entrepreneurship” in Europe and the United States: Creating an Intellectual Property Regime to Facilitate the Efficient Transfer of Knowledge from the Lab to the Patient*, 26 DUKE J. COMP. & INT’L L. 1, 52–53 (2015).

¹⁶⁴ Frank Rutgers notes that there are differences in approaches by universities in Holland concerning the ownership of student creations potentially causing issues concerning commercialization. See Frank Rutgers, *Who Owns Intellectual Property Created by Students? An Assessment of the Dutch Legal System*, (July 13, 2017) (L.L.M. thesis, Tilburg University), <http://arno.uvt.nl/show.cgi?fid=144031> (“Research shows that legal ambiguities are one of the main factors that lead to failure of start-ups.”).

¹⁶⁵ See USPTO, *Trial Statistics: IPR, PGR, CBM: Patent Trial and Appeal Board* 11 (June 2020), https://www.uspto.gov/sites/default/files/documents/Trial_Statistics_20200630_.pdf (noting 62% of all final written decisions from *inter partes* proceedings resulted in unpatentability).

Some patented inventions can have joint inventors or assignment agreements which were not obtained or not completed properly.¹⁶⁶ Sometimes patents have been previously licensed or pledged for security.¹⁶⁷ Sometimes maintenance fees have not been paid.¹⁶⁸ In countries with a practice requirement, the invention may not have been practiced.¹⁶⁹ Moreover, a single, complex product may be covered by many patents, and additional complexity is raised by standards that may apply to products without the impacted company being part of development of the standard.¹⁷⁰ Additionally, the patent may be obvious or not novel based on undiscovered prior art. There is also litigation risk—a patent may be invalidated or subject to costly infringement lawsuits.¹⁷¹ Notably, in a due diligence, the merits of any litigation must be analyzed as well as any opinion letters concerning infringement or validity. An additional problem is that a new technology may replace the need for the patented technology, rendering it valueless.¹⁷² Another issue that may develop is the taking of the patented technology by the government for the public good.¹⁷³ Some of this risk may be mitigated by bundling patents in portfolios. However, many SMEs may be unable to afford acquiring a significant number of patents.¹⁷⁴ Due diligence is also complicated, as discussed below, by technologies or products that include not

¹⁶⁶ See Gene Quinn, *Inventorship101: Who are Inventors and Joint Inventors?*, IPWATCHDOG (Mar. 9, 2018), <https://www.ipwatchdog.com/2018/03/09/inventorship-joint-inventors-co-inventors/id=94592/>; *Omni Medsci, Inc. v. Apple Inc.*, 7 F.4th 1148 (Fed. Cir. 2021) (university patent policy did not serve as present assignment).

¹⁶⁷ See David J. Cook, *Post-Judgment Remedies in Reaching Patents, Copyrights and Trademarks in the Enforcement of a Money Judgment*, 9 NW J. TECH. & INTELL. PROP. 128, 142 n.77 (2010) (vividly describing how using patents as collateral could present an ownership issue in the future).

¹⁶⁸ See Sean Daley & Lawrence Jarvis, *Everything You Need to Know About Patent Maintenance Fees*, JDSUPRA (Aug. 14, 2020), <https://www.jdsupra.com/legalnews/everything-you-need-to-know-about-22627/>.

¹⁶⁹ See Marketa Trimble, *Patent Working Requirements: Historical and Comparative Perspectives*, 6 U.C. IRVINE L. REV. 483 (2016).

¹⁷⁰ See *Report on Patent Aggregation*, *supra* note 155, at 28–29.

¹⁷¹ See Khanna, *supra* note 29, at 97 (“A major jeopardising to the process of securitization may happen if later on the IP is hit by suits of infringement etc.”).

¹⁷² See *id.* (“[A] new technology may make a patent [obsolete] in the market and it may not generate any further returns.”).

¹⁷³ See 28 U.S.C. § 1498(a). Moreover, some patented technology developed with government funding is subject to rights retained by the government, which may impact valuation. See University and Small Business Patent Procedures (Bayh-Dole) Act of 1980, Pub. L. No. 96-517, § 203, 94 Stat. 3015, 3022–23. However, we view rights retained by governments as necessary for public confidence in the overall system as well as for providing an opportunity for governments to protect public health.

¹⁷⁴ Some governments offer discounted filing fees for SMEs. Moreover, some governments may provide funding for patent acquisition costs such as attorney’s fees.

only patents covering them but also trade secrets and other intellectual property rights.

4. *Other Transaction Costs*

There are issues with respect to other transaction costs in trading patent rights. First, it may be difficult to find a partner to exploit the patent. For example, there is an issue with respect to asymmetric information. The licensor may have a better understanding of the value of the patented technology as well as how it works; however, potential licensees may not have that information. This makes finding partners difficult. Second, in many licensing transactions, the parties, for strategic reasons, do not want others to know they are dealing, or they want terms confidential and do not want any information shared. This makes transacting difficult. Moreover, encumbrances on title, ownership of improvements, and related grant back clauses in licenses increase costs, particularly with confidential terms. Limitations on the transferability of the licensed patent may also provide problems with transfer.

Various intellectual property exchange platforms have been established over the past decade or so attempting to address the obstacles to a higher degree of market clearance.¹⁷⁵ As an example, IPXI was set up by Ocean Tomo in 2008 with the aim of being a fully transparent patent license exchange enabling companies to buy, sell, and hedge patent rights just like any other asset. The aim was to provide this service simpler, faster, and cheaper than the onerous process of negotiating bilateral licenses for intellectual property. The high cost related to bilateral parleys to a great degree precludes small companies from entering the game, leaving patents unexploited, thus slowing down the pace of innovation.¹⁷⁶ The quintessence of IPXI's approach was to be the unit license right (ULR). Inventions made available for license on the exchange were to be divided into a number of ULRs available for purchase. IPXI ceased to operate in 2015, and it appears that its basic flaw was the assumption that good faith deal-making is what incentivizes both sides in a licensing negotiation. Instead, the current legal environment in the United States favors the potential infringer and not the licensor, which makes it less attractive for potential licensees to negotiate with licensors in good faith rather than waiting for court proceedings.¹⁷⁷ Examples of public or semi-public intellectual property exchange platforms include

¹⁷⁵ This paragraph was adapted from Mattias Karlsson Dinnetz, *IP Exchange and Finance*, at 20–21 (June 14, 2006), http://publications.jrc.ec.europa.eu/repository/bitstream/JRC103597/ip%20exchange%20and%20finance_online.pdf.

¹⁷⁶ *Marketplace of Ideas*, ECONOMIST (May 12, 2012), <http://www.economist.com/node/21554540>.

¹⁷⁷ *See Broken by a System That Encourages Bad Behaviours, IPXI Closes Down*, IAM (June 1, 2015), www.iam-media.com/litigation/broken-system-encourages-bad-behaviours-ipxi-closes-down.

the Japan's Life Science Intellectual Property Platform Fund,¹⁷⁸ France Brevets,¹⁷⁹ Intellectual Discovery (Korea),¹⁸⁰ and the IP Marketplace platform managed by the Danish Patent and Trademark Office.¹⁸¹

5. *The Role of Nonpracticing Entities and Patent Assertion Entities*

Transferring patents in this secondary market is very important. In the context of university technology transfer, AUTM (formerly the Association of University Technology Managers) has asserted that the spinoff of companies from university-developed technology and jobs created kept the United States from falling deeper into the Great Recession.¹⁸² Indeed, many famous U.S. companies such as Google and Genentech originated with university research. Ordinarily, universities do not practice their inventions, but must license them out to be commercialized.¹⁸³ Universities usually need another entity with scientific, management, and financial skills

¹⁷⁸ News Release, Intell. Prop. Strategy Network & Innovation Network Corp. of Japan, Establishment of Japan's First Intellectual Property Fund (Aug. 6, 2010), <http://www.incj.co.jp/PDF/1281073862.01.pdf>.

¹⁷⁹ FRANCE BREVETS, <http://www.francebrevets.com/en> (last visited Mar. 13, 2022).

¹⁸⁰ INTELLECTUAL DISCOVERY, <https://www.i-discovery.com/main> (last visited Mar. 13, 2022).

¹⁸¹ IP MARKETPLACE, <https://ip-marketplace.org/> (last visited Mar. 13, 2022).

¹⁸² See Mike Armstrong, *Recession Can't Dampen University Tech Transfer*, PHILA. INQUIRER (Dec. 27, 2010), https://www.inquirer.com/philly/blogs/phillyinc/Recession_cant_dampen_university_tech_transfer_.html.

¹⁸³ A recent study examined potential commercialization problems experienced by universities and public research organizations in the European Union. See THOMAS BEREUTER, YANN MÉNIÈRE, JEREMY PHILPOTT & ILJA RUDYK, EUR. PAT. OFF., VALORISATION OF SCIENTIFIC RESULTS 3, 7 (2020), [http://documents.epo.org/projects/babylon/eponet.nsf/0/f90b78b96b1043b5c1258626006cce35/\\$FILE/Valorisation_of_scientific_results_en.pdf](http://documents.epo.org/projects/babylon/eponet.nsf/0/f90b78b96b1043b5c1258626006cce35/$FILE/Valorisation_of_scientific_results_en.pdf) [hereinafter, Valorisation Report]. The study found that:

[The] failure to get past the development stage is the main reason why patented inventions are not exploited. This reason is cited for 71% of patented inventions with existing exploitation plans and 46% of inventions for which no such plans exist. The lack of commercial possibilities (55%) is the second most frequent reason. At 66% it is particularly important for patented inventions with existing exploitation plans compared with those without (31%). Both causes of exploitation failure confirm that having a proof of concept for a technology is a crucial step towards successful exploitation. Failure to identify the right partner appears to be another major obstacle to exploitation (38%). Lack of resources was mentioned by around one quarter of respondents, followed by lack of commercial potential (10%).

Id. at 40. The study also noted that:

The cost and complexity of negotiation appears to be the major challenge faced by universities and public research organisations when they successfully exploit a patented invention. Over a third of respondents consider it an important or very important challenge when setting up licensing, selling or co-operation agreements. Identifying the rights partners or contact persons (30%) is the second most relevant challenge, followed, some way back, by lack of internal resources (17%), lack of interest from potential partners (14%) and the need to disclose non-patented know-how (14%).

to bring the technology to market. The ability to transfer patents in the secondary market is essential to getting technology to the public, and thus to creating jobs and tax revenue. Nonpracticing entities can help find licensing partners for universities through litigation. Nonpracticing entities can also provide liquidity to the market by valuation through damages or settlements for royalties. However, this information is not always public and that hurts its importance in valuation. Moreover, evaluating and valuing some early-stage university research may be difficult—even assuming it is patentable. Researchers have developed a method for predicting the future commercial viability of some early-stage research.¹⁸⁴

There are benefits of nonpracticing entities, such as Patent Assertion Entities (PAE), but there are also downsides. While PAEs do provide one way to monetize patents, PAEs that enforce poor quality patents should be discouraged. This Section will also discuss issues related to PAEs. The issues concerning PAEs may be mitigated by the presence of patent infringement, validity, and defense insurance.

One issue driving patent reform is the concern with the enforcement of patents by PAEs.¹⁸⁵ A PAE is an entity that exists for the sole purpose of enforcing a patent. The PAE is not involved in invention or commercialization except to litigate and extract licensing fees from entities that are practicing the invention. The so-called “patent troll” is emblematic of the concern with entities that enforced patents that some argued were of questionable validity. The “troll” fails to invest in developing the invention, merely burdening others who commercialize and utilize the invention. Thus, the patent troll merely taxes innovation instead of promoting it.

One attempt to address questionable patents utilized by patent trolls included the development of means to challenge patents for less cost at the U.S. Patent and Trademark Office. It is still unclear what the impact of some of these developments may be on patent value. Interestingly, *inter partes* review proceedings apply to pharmaceuticals and biologics, which may not have been anticipated.¹⁸⁶ The U.S.

Id. at 42.

¹⁸⁴ Cf. B. Ian Hutchins, Matthew T. Davis, Rebecca A. Meseroll & George M. Santangelo, *Predicting Translational Progress in Biomedical Research*, PLOS BIOLOGY, Oct. 2019, at 1, 14 (“[W]e demonstrate here that a machine learning system can reliably predict the successful transfer of knowledge to clinic applications.”).

¹⁸⁵ See *The State of Patent Eligibility in America: Part II: Hearing Before the Subcomm. on Intell. Prop. & the S. Comm. on the Judiciary*, 116th Cong. 2 (2019) (statement by Stephanie Martz, Senior Vice President, General Counsel, National Retail Federation, United for Patent Reform), <https://www.judiciary.senate.gov/imo/media/doc/Martz%20Testimony.pdf> (outlining examples of NPE patent enforcement).

¹⁸⁶ See Oona Johnstone & Andrew Williams, *Biopharma IPR Trends – 2019 Mid-Year Update*, LIFE SCI. LEADER (Apr. 1, 2019), <https://www.lifescienceleader.com/doc/biopharma-ipr-trends-mid-year-update-0001> (“IPR filings in the biopharma space have been used strategically to help eliminate blocking patents before an abbreviated new drug application (ANDA) or abbreviated biologics license application (aBLA) is even submitted to the FDA. Correspondingly,

Supreme Court and the Federal Circuit have been developing case law around new administrative processes. For instance, the Federal Circuit held that patent-ineligible subject matter can be raised after claims have been amended in *inter partes* review proceedings.¹⁸⁷

Another apparent attempt to address the issue of questionable patents utilized by patent trolls included the *eBay v. MercExchange* decision by the U.S. Supreme Court, which held that injunctive relief was not presumed even if a patent was infringed. The literature concerning the merits versus the demerits of patent trolls is mixed. However, the enforcement of patents is a significant part of encouraging additional financing based on intellectual property. Notably, Paul Morinville of U.S. Inventor states:

[Nonpracticing entities (NPEs)] make up the secondary market for patent assets and a critical part of the patent economy. Inventors can sell their patents directly to NPE's so they can continue inventing. This is a critical outlet because few inventors can effectively commercialize an invention either due to personal disposition or personal desire. Those inventors who wish to commercialize the invention can collateralize patents to attract investment to commercialize the invention. If the company fails, investors often take control of the collateralized patents and either become an NPE and enforce the patents, or they sell the patents to an NPE to return their initial investment and go on investing in other startups. This secondary market of investors and NPE's is critical to a healthy patent system and critical to the capitalization of startups that bring the next big technology to market, thus driving our economy and creating jobs.¹⁸⁸

There likely will be an increase in enforcement to develop licensing markets as a basis of financing. The important point again is that rights should be relatively certain to allow an early and cheap assessment of the validity of a patent—as through *inter partes* review—and to ensure that the patent will have some value in the future because the law will not change later and eviscerate the patent right.

If a PAE asserts a patent that has not been commercialized, then this is in the public interest as they are quite possibly bringing a new invention to market. However, it is unclear as to when a PAE would assert a patent that was not practiced against an entity that was not already practicing the invention. The actual practicing of the invention by the alleged infringer would serve as the basis of infringement. If the invention is already commercialized, then the PAE is only taxing that innovation

for fiscal year 2018, biopharma patents accounted for 11 percent of all petitions filed, which is up considerably from 6 percent for fiscal year 2014.”).

¹⁸⁷ *Uniloc 2017 L.L.C. v. Hulu, L.L.C.*, 966 F.3d 1295 (Fed. Cir. 2020).

¹⁸⁸ *The State of Patent Eligibility in America: Part II: Hearing Before the Subcomm. on Intell. Prop. & the S. Comm. on the Judiciary*, 116th Cong. 11 (2019) (statement of Paul Morinville, U.S. Inventor), <https://www.judiciary.senate.gov/imo/media/doc/Morinville%20Testimony.pdf>.

and making it more expensive, thus harming consumers. This is known as the *ex ante* versus the *ex post* problem. Some of the risks include asymmetric information which leads to bargaining problems, lack of transparency, and high search and negotiation costs.

All of these problems—different contextual reasons for using patents, difficult due diligence issues, underlying uncertainty and shifting law, information asymmetries, and confidentiality, to a name a few—make the valuation and transfer of patents difficult and inherently unstable. This inhibits the full potential of the use of patents for finance.

C. Intellectual Property and Finance

The third issue is the finance applying to intellectual property. For finance applying to intellectual property to operate efficiently, we need stable and relatively certain intellectual property rights. Also, the secondary market for patents needs to operate well, as do the financing methods.

First, there is a problem with education. SMEs often do not understand intellectual property and fail to protect it properly.¹⁸⁹ SMEs also have a funding issue and do not have the resources necessary to adequately secure and protect their intellectual property.¹⁹⁰ Moreover, intellectual property may not always be well understood by bankers and the insurance industry. At least, there may be a disconnect between an attorney's understanding of intellectual property and its value and financiers' understanding. This is evident by examining inconsistent use of terminology and basic issues with respect to accounting practices and rules in the United States and Europe. Additionally, SMEs, banks, and insurers may not always think of intellectual property as proper collateral for loans or for securitization.

¹⁸⁹ See U.N. ECON. COMM'N, *supra* note 10, at 66 (“Various studies have consistently shown that the reasons for the underusage of the formal IPR system, even by potentially or actually innovative SMEs, are primarily twofold: first and foremost, the high costs of protection and enforcement; and, secondly, the lack of awareness by SMEs on how the IPR system works.”). Sivagrakau also notes that “finance has been slowly adapting to a new innovation environment in the field, where most of the new medicines are discovered and originated outside of large pharmaceutical companies. Big firms continue to refinance themselves in equity and debt capital markets.” Sivagrakau, *supra* note 19, at 101.

¹⁹⁰ See U.N. ECON. COMM'N, *supra* note 10, at 66 (“[C]osts are perceived by many SMEs as by far exceeding the prospective benefits that derive from protection, especially when considering that most of these costs are incurred before the products reach the markets and thus before the realization of any income or profits.”). Some of the costs in the U.N. Economic Commission include translation and acquisition costs across E.U. countries; however, the costs include “fees related to application, publication, and maintenance.” *Id.* Importantly, the U.N. Economic Commission further notes that “the cost of patenting [in Western Europe] reaches as much as 2.5 to 3 times that of the United States or Japan.” *Id.* Some of these costs may be reduced by adoption of the unitary patent.

Second, process is an issue. In the United States, perfecting a security interest is somewhat unclear under the law and collateralization may lack clarity.¹⁹¹ Moreover, securitization¹⁹² (or pass-through securities) has an unfavorable reputation and may need more regulation to increase public confidence and usage by institutional investors. A well-known use of securitization in the United States includes the securitization of royalty streams from patents on pharmaceuticals.¹⁹³ Several companies have successfully used pass-through securities to provide funding to universities based on patented university pharmaceuticals. For example, the University of Cali-

¹⁹¹ See generally Xuan-Thao Nguyen, *Collateralizing Intellectual Property*, 42 GA. L. REV. 1 (2007) (pointing to the hidden costs of collateralization, such as loss of the right to prepare derivative works or invent potential infringing improvements, because a security agreement creating a security interest only needs to reference intangibles under revised Article 9 and not specifically reference the intellectual property). See Kyle Tondo-Kramer, Comment, *Increasing Access to Startup Financing Through Intellectual Property Securitization*, 27 J. MARSHALL J. COMPUT. & INFO. L. 613, 616 (2010) (“[C]reditors face questions such as: which state to file the financing statement with and which jurisdiction’s law will govern perfection. Also, even after perfecting a security interest, it is possible that the debtor may relocate to a new jurisdiction and a new financing statement must be filed in the new jurisdiction for the security interest to remain perfected.”); Willa E. Gibson, *The Intersection Between UCC Article 9 and Intellectual Property: The Need for a National, Centralized Filing System for IP*, 15 J. MARSHALL REV. INTELL. PROP. L. 83 (2015) (“Having a perfected security interest in collateral puts a lender in its best position to protect its interest against competing parties; but, the legal uncertainty surrounding perfection of security interests in intellectual property can make lending more costly and less predictive.”); THOMAS M. WARD & STEPHEN M. MCJOHN, *INTELLECTUAL PROPERTY IN COMMERCE* § 2:4 (2021 ed.) (“The current state of the law governing security interests in intellectual property is unsatisfactory. There is uncertainty as to where and how to file, what constitutes notice of a security interest, who has priority, and what property is covered by the security interest. This area of the law is further complicated by the fact that both federal and state law impact on these issues.” (quoting *Copyright Reform Act of 1993: Hearings on H.R. 897 Before the Subcomm. on Intell. Prop. and Jud. Admin. of the H. Comm. on the Judiciary*, 103rd Cong. 161, 163 (1993) (statement of J. Michael Cleary, Partner, Brylawksi, Cleary & Komen, American Bar Association))).

¹⁹² “Securitization – the process of pooling a group of illiquid assets that can then be collateralized and marketed as different tiers of asset-backed instruments to be sold to investors.” See MILKEN INST., *supra* note 21, at 23.

¹⁹³ According to William Kramer and Chirag Patel:

Intellectual property royalty financing in its simplest form is a non-recourse debt financing, where a licensor of intellectual property can take the future cash flow expected from a license agreement and receive a cash payment up front, representing the present value of the future cash flow. Intellectual property royalty financing allows the owner of the intellectual property to keep an equity interest in the intellectual property, and thus, the owner of such property can still profit from the upside value of such an asset beyond the security interest on the debt. As intellectual property royalty financing is non-recourse to the borrower, it does not affect the risk profile of the borrower, and the borrower is not restricted by covenants found in traditional bank loans or other corporate securities.

KRAMER & PATEL, *supra* note 157, at 2.

fornia, Los Angeles announced it will receive around \$520 million for research, development and scholarships based on a securitization deal.¹⁹⁴ Companies such as Royalty Pharma¹⁹⁵ and DRI Capital¹⁹⁶ perform these securitizations. Dov Solomon and Miriam Bitton stress the benefits of securitization, noting that “using securitization as a financing tool is highly beneficial for companies with relatively low credit ratings but high quality assets that produce predictable cash flows” because financing costs through a lower interest rate are available.¹⁹⁷

The Milken Institute describes a royalty monetization deal concerning Ohio University:

In February 2011, Ohio University, a faculty member, and a graduate student sold partial royalty income rights to their license for the growth hormone antagonist Somavert®, a drug approved for the treatment of acromegaly in 2003. The buyer, DRI Capital set up a five-year agreement with the university that includes a minimum lump sum payment of \$39 million for five years’ worth of royalty revenue, with an option to receive an additional \$13 million if the Somavert market grows. Ohio University plans to invest funds in new translational research programs and efforts to commercialize technologies.¹⁹⁸

Additionally, a large problem remains with respect to increased use of collateralization and securitization of intellectual property: the development of a bubble based on overblown valuations of those assets.¹⁹⁹ If the assets are overvalued because

¹⁹⁴ Phil Hampton, *UCLA Sells Royalty Rights Connected with Cancer Drug to Royalty Pharma*, UCLA: NEWSROOM (Mar. 4, 2016), <https://newsroom.ucla.edu/releases/ucla-sells-royalty-rights-connected-with-cancer-drug-to-royalty-pharma>; see also Teddy Rosenbluth, *UCLA’s Fight to Patent a Life-Saving Cancer Drug Could Make the Medicine Virtually Unobtainable in India*, L.A. MAG. (January 7, 2020), <https://www.lamag.com/citythinkblog/ucla-xtandi-india/>.

¹⁹⁵ See Andrew W. Lo & Sourya V. Narahariseti, *New Financing Methods in the Biopharma Industry: A Case Study of Royalty Pharma, Inc.*, 12 J. INV. MGMT. (SPECIAL CASE STUDIES) 4 (2014); see also Nathan Vardi, *Billionaire Pablo Legorreta’s Big Royalty Pharma IPO Soars*, FORBES (June 16, 2020, 12:17 PM), <https://www.forbes.com/sites/nathanvardi/2020/06/16/billionaire-pablo-legorretas-big-royalty-pharma-ipo-soars/?sh=5dcd624752d5> (noting that Royalty Pharma acquires interests in pharmaceuticals in the clinical stage and thus supplies capital for development); Sweeney, *supra* note 6, at 298–99.

¹⁹⁶ See Adam Tempkin, *Bonds Backed by Drug-Royalty Cashflows Make a Return*, REUTERS (Mar. 5, 2012), <https://www.reuters.com/article/drug-royalties-abs/bonds-backed-by-drug-royalty-cashflows-make-a-return-idUKL2E8E58LS20120305>; Sweeney, *supra* note 6, at 298–99.

¹⁹⁷ See Solomon & Bitton, *supra* note 7, at 132–33. Moreover, the patent owner maintains ownership which reverts to the owner after the debt is paid off. *Id.* at 162.

¹⁹⁸ See MILKEN INST., *supra* note 21, at 18.

¹⁹⁹ “Generally, for a class of an asset to be securitised, such an asset should have [the] following qualities: 1. stability and certainty of cash flows; 2. availability of large diversified portfolios; and 3. abundance of historical statistical information.” KRAMER & PATEL, *supra* note 157, at 2.

of all the problems discussed then the entire system could collapse, resulting in large financial losses and an increased lack of public confidence. As Professor Burstein has noted, there is a problem of issuing more patents divorced from quality concerns.²⁰⁰ As noted below, credit enhancement to improve the risk profile of monetization deals could include better functioning collateralization or third-party/government guarantees.²⁰¹ Moreover, another danger is that once there are strong investment-backed expectations in IP-based finance, policy makers will be very reluctant to modify those rights to increase public access, particularly to the poor. It also may provide a disincentive to move to new disruptive technology because that may devalue financial investments such as the holdings of public pensions. Finally, the extension of patent rights through practices such as evergreening of pharmaceuticals may be incentivized as firms seek to increase the value of the patents or portfolios which may be subject to securitization.²⁰²

III. DISCUSSION AND PROPOSALS FOR IMPROVING PATENT-BACKED FINANCE

Based on the analysis of existing scholarship and the nature of the problems presented, this Article has revealed a number of obstacles to the proper functioning of intellectual property-backed finance in the United States. This Part makes a number of proposals with the aim to improve this suboptimal situation, which may also be viewed as a call for further research and discussion. The finance under discussion is a complex structure of interdependent markets with divergent types of actors, which also means that the proposed actions will relate to different parts of the system.

A. *Recommendations for Legal Doctrine and Procedure*

The starting point for recommended actions is this Article's main argument that the legal uncertainty resulting from the unstable § 101 is profoundly detrimental to patent-backed finance. It will be very difficult, if not impossible, to build confidence in an asset whose legal status—and therefore financial and strategic value—is unclear, and, moreover, can shift overnight as a result of patent-eligible subject matter-related court decisions.

²⁰⁰ See generally Burstein, *supra* note 44.

²⁰¹ See MILKEN INST., *supra* note 21, at 19. Solomon and Bitton also discuss credit enhancements to reduce risk in transactions. See Solomon & Bitton, *supra* note 7, at 140–41 (discussing external credit enhancements through “banks or insurance companies . . . provid[ing] guarantees or insur[ing] the risk inherent in the securities issued in securitization transactions” as well as internal credit enhancements through over collateralizing and tranching the pool of secured assets).

²⁰² See, e.g., Burstein, *supra* note 44, at 539–40 (analogizing the mortgage crisis to a potential liquid market for patents wherein participants focus on patent numbers and not quality).

This Article takes the view that revision of § 101 is a viable long-term solution in relation to the volatile doctrine of patent-eligible subject matter and that the wording should reflect understanding of technologies underlying entire industrial sectors. Such a revision should thus consider the experiences of various stakeholders. One particular issue at stake is the unspecified referral to laws of nature, which has led to the striking down of patent claims; the *Mayo/Alice* test is inherently unstable, and this particularly harms the protection of inventions and thus associated investment in the fields of software, artificial intelligence and health related technologies.

In the short term, the blow of this doctrinal disarray could possibly be softened by actions related to legal procedure. The U.S. Congress can act to clarify the law. The U.S. Supreme Court can grant *certiorari* in more cases. En banc sessions of the U.S. Court of Appeals for the Federal Circuit could be granted more frequently to hear important and complex cases. There should be quick decisions related to patent-eligible subject matter-related decisions by the U.S. Patent and Trademark Office and continued swift updating of examination guidelines and patent examiner training. The U.S. Patent and Trademark Office has been working hard to provide resources that are beneficial to patentees.

Another patent law doctrine modification to increase patent quality, albeit not directly related to § 101, would be to increase the amount of relevant information disclosed through the specification requirements. Patent quality is also the U.S. Patent and Trademark Office's responsibility, and therefore it is proposed that prior art searches are increasingly automated using developing algorithmic methods, so that overburdened examiners can focus on higher level tasks.

B. Suggested Non-Legal Actions

Besides the above proposals that are directed towards improving certainty of the legal right/asset under discussion, patent-backed finance could also be enhanced via a range of non-legal measures. The following proposals follow from analysis of the research underlying the present work and some are in the literature:

- A standardization of terms concerning intellectual property finance field to facilitate communication and understanding between intellectual property, finance, and insurance professionals. Increased education amongst the groups concerning their respective fields can be built on this standardization.
- Revision of accounting practices and standards to ensure intellectual property assets are not off-balance sheet assets.²⁰³

²⁰³ Bruce Burton, Emma Bienias, and Candice Quinn note:

Unlike tangible assets, where depreciated historical value can typically be determined from a company's balance sheet, internally developed IP is not typically recognized on a company's balance sheet. Rather, expenditures associated with internally generated intangibles are normally expensed in the period incurred through the income statement. On the other hand, purchased intangible assets are typically capitalized and normally appear on the company's

- Creation of a valuation setting/education organization, perhaps government sponsored, that certifies valuation experts and creates standards for intellectual property valuation which will provide consistency in valuation.²⁰⁴
- Distinguish between *ex post* and *ex ante* valuation. *Ex ante* valuation is where patents are not commercialized. This particular patented technology needs to be transferred to the people and entities with the business, financial, and technical expertise to commercialize those inventions. *Ex post* valuation occurs after a technology is commercialized and is currently being used in practice. *Ex post* enforcement does provide some liquidity by finding licensors for the patent and placing a dollar value on the patent. However, as Professor Burstein points out, there is an important difference between litigation and commercialization value.²⁰⁵
- Explore creating an international filing system for recordation of interests in intellectual property. This system may utilize blockchain technology as discussed above.
- Professor Mark A. Lemley and Nathan Myhrvold's proposal to encourage the publication of license and assignment terms could be adopted.²⁰⁶ A compromise

balance sheet, [fn. 3: The primary reason for this difference in generally accepted accounting principles ("GAAP") treatment is that the arms-length value of purchased IP is evident from the purchase transaction itself while the future benefits from internally generated IP are typically much less certain and are often difficult to quantify.] either directly if only the IP was purchased, or as part of the acquirer's requirement to allocate the purchase price amongst the acquired assets in a business acquisition.

Burton et al., *supra* note 1, at 2 (footnote omitted). The UN Economic Commission notes: In particular, it is still not generally possible to activate on balance sheets in a systematic way intellectual property which has been generated in-house, as opposed to having been bought on the market. Clearly, this potentially distorts management decisions and market valuations of companies. . . . It is more difficult to account for patents which are being used internally and which contribute to revenues and profits, but only in combination with the company's other tangible and intangible assets. These and other related issues are often particularly problematic for SMEs.

U.N. ECON. COMM'N, *supra* note 10, at 84.

²⁰⁴ The UN Economic Commission recommends, "Government subsidies may assist the implementation of best practice concerning intellectual property valuation and securitization of intellectual assets." U.N. ECON. COMM'N U.N. ECON. COMM'N, *supra* note 10, at 95. Valuation methods should take into account specific issues related to valuing IP, such as: "Unforeseen technological developments (in the case of drug patent royalties, a new entry into the marketplace could make the patent obsolete; The possibility that the patent will be declared invalid through litigation; Public opinion or fashion trends (especially in the case of music or film royalties); and Moral hazard (inventors or creator's actions will cause a reduced royalty stream)." *Id.* at 90–91.

²⁰⁵ See generally Burstein, *supra* note 44, at 513.

²⁰⁶ See Mark A. Lemley & Nathan Myhrvold, *How to Make a Patent Market*, 36 HOFSTRA L. REV. 257, 257–58 (2007) ("The lack of a real, rational market for patent licenses encourages companies to ignore patent rights altogether, because they cannot make any reasonable forecast of

proposal would entail “requiring parties to patent lawsuits to disclose their settlements, or publicly-traded companies to disclose all their licenses.”²⁰⁷ The encouraging of the publication of royalty information, which is usually kept secret, would also provide greater transparency.²⁰⁸

- Many organizations attempt to create exchanges and marketplaces for patents and technology to partner entities for trading and commercialization. One trusted partner who would not charge fees to matchmake would be helpful. Matchmaking is difficult because parties do not want to provide any information to the other side. A trusted partner can collect the information, matchmake, and perhaps help with due diligence, which is very time consuming and subject to huge litigation risk if the transaction goes bad. Moreover, incentives need to be created for university and SME participation.
- Encouraging the development of insurance markets for intellectual property collateral.²⁰⁹ Creation of government-backed insurance for intellectual prop-

what it would cost them to obtain the licenses they need and because they fear that they will pay too much for a technology their competitors ignore or get on the cheap. At the same time, ignorance of prices permits unscrupulous patent owners to ‘hold up’ companies that make products by demanding a high royalty from a jury that has no way of knowing what the patent is actually worth.”).

²⁰⁷ See *id.* at 258–59.

²⁰⁸ L.M. Brownlee reviews private data sources for valuation. See L.M. BROWNLEE, *INTELLECTUAL PROPERTY DUE DILIGENCE IN CORPORATE TRANSACTIONS: INVESTMENT, RISK ASSESSMENT, MANAGEMENT* 999–1000 (2021). China has adopted an open licensing program wherein license information, such as fee amount, will be publicly disclosed. See Li Jianzhong & Dang Xiaolin, Beijing Sanyou Intell. Prop. Agency Ltd., *China Establishes Patent Open Licensing System*, LEXOLOGY (May 21, 2021), <https://www.lexology.com/library/detail.aspx?g=e77e287b-c0d1-4319-a883-57f4dab635a5> (“The patent open licensing system has the following advantages: 1. conducive to promoting the connection between the supply and demand of patented technology, and to promoting the spread and application of patented technology; 2. reducing the difficulty of license negotiation and saving the cost of contract negotiation; 3. reducing legal risks caused by rights defects in patent licensing transactions because open-licensed patents are valid patents recognized by CNIPA, and open-licensing of utility models and design patents requires a patent right evaluation report; and 4. the patent annuity can be reduced or exempted during the implementation period of the open license, which can save the patentee’s maintenance costs of patent rights.”). Thank you to Ronald Ker Wei Yu for this point.

²⁰⁹ See Press Release, Aon, Aon Announces Launch of New Solution to Create Greater Access to Capital Based on the Value of an Organization’s Intellectual Property Portfolio (Oct. 6, 2020), <https://aon.mediaroom.com/2020-10-06-Aon-Announces-Launch-of-New-Solution-to-Creater-Greater-Access-to-Capital-Based-on-the-Value-of-an-Organizations-Intellectual-Property-Portfolio> (“The first deal involves Indigo Ag, a high-growth, IP-rich agriculture technology company, which is borrowing over \$100 million from a lender utilizing its IP as collateral, with the value of that collateral insured by a group of insurance markets led by Markel Specialty. Hudson Structured Capital Management (HSCM) was the largest capacity

erty-backed finance should be created after standards are set. This includes insurance funding to cover intellectual property litigation, which currently exists.²¹⁰ This can lower insurance costs and make it more readily available. Indeed, insurance can perhaps incentivize SMEs to enter markets dominated by entities with large patent portfolios and massive resources.²¹¹

- Increase the availability of low-cost lending for SMEs to support intellectual property registration and attorney fee costs. Governments could back the lending to reduce costs associated with that funding.

C. Calls for Further Research

- The potential benefits of creating megafunds and their impact across different industries should be assessed in greater detail.²¹² In relation to life science and

provider.”).

²¹⁰ See U.N. ECON. COMM’N, *supra* note 10, at 68 (“One of the main advantages of these insurance schemes is that they enable SMEs . . . to defend their patents against larger companies without having to settle or license. Furthermore, having an insured patent portfolio is likely to help attract investors, while possessing patent insurance strengthens a patent owner’s ability to license its patents to corporate entities who want to commercialize certain aspects of the patented technology.”).

²¹¹ See Ian McClure, *Intellectual Property Insurance: Transforming the Economic Model for IP Litigation*, 57 FED. LAW., July 2010, at 18, 18 (“[S]mall to medium sized firms are deterred from entering markets saturated with companies boasting large patent portfolios and deep pockets. A single infringement claim filed against a start-up small to medium-sized firm that lacks sufficient capital to fight the claim could effectively close down the company. Consequently, these firms’ precious operating capital becomes defense funds for IP litigation, and the firms never get around to commercializing their special product. In sum, the barrier to entry becomes insurmountable simply because the price tag for playing is too high. . . . But IP insurance aims to provide a balanced playing field.”).

²¹² For example, in a letter to the U.S. Congress concerning the 21st Century Cures Initiative, Executive Director of Faster Cures, a Center of the Milken Institute, Margaret Andersen, points to several ideas including the Distributed Partnering Model; Leveraging Philanthropic Capital: Fast Forward; Government-Backed Ventures: Israeli Life Sciences Fund; and Professor Andrew Lo’s Early Stage Megafund proposal. See Margaret Andersen, *FasterCures Comments on the 21st Century Cures Initiative*, MILKEN INST. (June 25, 2014), <https://web.archive.org/web/20170726023541/https://www.fastercures.org/newsroom/comments/view/12>. In *Commercializing Biomedical Research Through Securitization Techniques*, Professor Andrew Lo, Jose-Maria Fernandez and Roger Stein describe their proposal: “(i) create[e] large diversified portfolios—‘megafunds’ on the order of \$5–30 billion—of biomedical projects at all stages of development; and (ii) structure[e] the financing for these portfolios as combinations of equity and securitized debt so as to access much larger sources of investment capital.” Jose-Maria Fernandez, Roger M. Stein & Andrew W. Lo, *Commercializing Biomedical Research Through Securitization Techniques*, 30 NATURE BIOTECHNOLOGY 964, 965 (2012). The authors note, “The key feature of portfolio diversification is the reduction in uncertainty achieved by undertaking many programs simultaneously.” *Id.* The megafund idea can also be applied to orphan drug development. See David E. Fagnan, Austin A. Gromatzky, Roger M. Stein, Jose-Maria Fernandez & Andrew W. Lo, *Financing Drug Discovery for Orphan Diseases*, 19 DRUG DISCOVERY TODAY

the issue of biologics, for example, such medicines are very expensive and there is a low drop-off of price for biosimilars. Megafunds could help counter such negative pricing effects.

- Research should explore how direct level funding, such as that provided by France Brevets, could support the field of patent-backed finance.²¹³ However, government guarantees may be more efficient in making more capital available on lower rates than Brevets. The research should include state-supported patent funds, such as “technology development funds . . . [which] acquire patented technologies, and invest in their further development with the aim of commercialising them through sale, licensing, or creation of new firms.”²¹⁴
- Another topic concerns the use of binding arbitration to lower costs of litigation and using awards to set value (which should be made public), as this would aid in moving away from litigation value. At least three arbitrators should be used with one as a certified valuation expert. This can be done by means of an exchange, as mentioned above.
- The concept of intellectual property as securities should be further investigated using the work by Professor Michael Risch, which proposes that patent portfolios are treated as securities in order to improve the market for patents by increasing transparency, clarifying ownership and setting price.²¹⁵ This research should take into account the complexity posed by the role of trade secrets and know-how, which may provide the ultimate value of the patented technology.²¹⁶
- Additional research should be carried out on proposals such as providing extended patent term to incentivize finance or funding future research and development.²¹⁷
- A common way for start-up companies to secure venture capital funding is the prospect of being acquired by a larger company. The possibility of new rules concerning antitrust concerns that make it more difficult to acquire or merge with another company may lower the chance of start-ups to secure venture capital funding. Additional research could be conducted on whether a better functioning patent market may lessen the harm of these new rules to the ability of start-ups to secure finance.²¹⁸

533 (2014).

²¹³ FRANCE BREVETS, *supra* note 179.

²¹⁴ See *Report on Patent Aggregation*, *supra* note 155, at 7.

²¹⁵ See Risch, *supra* note 7, at 93–94.

²¹⁶ See Lee, *supra* note 45, at 1523–26.

²¹⁷ See Sivagrakau, *supra* note 19 (reviewing proposals to increase pharmaceutical finance for research and development).

²¹⁸ See also Merges, *supra* note 12, at 53, 96–97 (“This Article argues that patent markets are superior in some cases to complete acquisition of a small firm by a Big Platform company because

- Additional research concerning the use of non-fungible tokens (NFTs) and blockchain technology is necessary.²¹⁹ NFTs have been utilized for digital art protected by copyright.²²⁰ Essentially, the non-fungible token allows the creation of scarcity—a person can own the NFT associated with a piece of digital art that, for example, represents that the digital art is an original or the first print. A market has developed for NFTs for digital artwork. Importantly, the ownership of an NFT may not confer ownership over the intellectual property rights of the underlying digital artwork.

IPwe, in collaboration with IBM, has announced that they will use NFTs to create a more transparent market for patents leading to the creation of an asset class that is more easily traded, including usage of university patents and tech transfer.²²¹ IPwe states:

IBM and IPwe have worked together for the last three years applying IBM's deep expertise in blockchain and artificial intelligence to the IPwe Platform to help protect ownership information; generate patent and portfolio analytics; facilitate transactions; reporting and advancements of the next intelligent generation of patent pooling - an agreement among multiple patent holders to jointly license their IP.²²²

However, it appears that numerous problems still exist for the use of NFTs in connection with patents—for example, patents often need know-how and

selling patents allows a small firm to survive as an independent entity. Recent patent system reforms support this pro-secondary market policy: the era of easy and extortionate patent litigation, traditionally associated with the secondary patent market, is coming to a close. Patent sales and licensing, at times backed by the threat of litigation, will promote small company innovation once these reforms gain traction. This is crucial; though Big Platforms are currently young and vigorous, history suggests that they will become less innovative in the long run. Preserving multiple small innovators—through the patent market and otherwise—is the best way to prepare for the future of Big Platforms.”).

²¹⁹ For a discussion concerning the promise of NFTs, see LICENSE GLOBAL, WHITE PAPER: A COMPREHENSIVE LOOK INTO NFTS, <https://www.licenseglobal.com/trends/comprehensive-look-nfts> (last visited Mar. 13, 2022).

²²⁰ The NFT market for art is significant. Business Insider reports \$3 billion in sales on one marketplace in one month. See Ethan Wu, *NFT Traders Sank \$3 Billion into Digital Art in August as Interest Spikes*, MKTS. INSIDER (Sept. 2, 2021, 4:01 PM), <https://markets.businessinsider.com/news/currencies/nft-opensea-digital-art-bitcoin-cardano-ethereum-meme-crypto-2021-09>.

²²¹ Press Release, IPwe, IPwe Announces Advisory Committee for University Technology Transfer Led by Ian McClure of the University of Kentucky (June 4, 2021), <https://www.prnewswire.com/news-releases/ipwe-announces-advisory-committee-for-university-technology-transfer-led-by-ian-mcclure-of-the-university-of-kentucky-301305939.html>.

²²² *IPwe and IBM Seek to Transform Corporate Patents With Next Generation NFTs Using IBM Blockchain*, IBM: NEWSROOM (Apr. 20, 2021), <https://newsroom.ibm.com/2021-04-20-IPwe-and-IBM-Seek-to-Transform-Corporate-Patents-With-Next-Generation-NFTs-Using-IBM-Blockchain>.

trade secrets in order to be valuable; patents do not exactly cover products; the underlying ownership and other interests to the patent may not be recorded in the blockchain or tied to the NFT²²³ as well as other issues discussed above.²²⁴ One of the primary benefits of IPwe's usage of blockchain and NFTs may be the adoption of their system to track ownership by governments across the world.²²⁵ Thus, governments would need to have patent owners utilize IPwe's blockchain to record ownership interests, including security interests.²²⁶ This would clarify ownership, but at the same time, licenses would also need to be disclosed as well to add transparency because terms of licenses tend to be confidential. It is unclear if businesses would agree to disclose the terms and subject matter of their agreements.²²⁷ Indeed, relatedly, even government purchase agreements for vaccines have redacted provisions. However, governments do regularly collect trade secret data in a regulatory capacity. IPwe would have to become a trusted partner to a government and collect that information and engage in matchmaking. Perhaps eventually, some licensing data could be disclosed and some data could be held confidential; however, an efficient and

²²³ See Marc Richards & Daniel Broaddus, *Converting Your Patent Portfolio to Patent NFTs? Best to 'Wait and See'*, IPWATCHDOG (July 8, 2021), <https://www.ipwatchdog.com/2021/07/08/convertng-patent-portfolio-patent-nfts-best-wait-see/id=135328/> (“For example, blockchain does not track off-chain asset transfers, nor does it guarantee that the current holder obtained the asset without identity theft.”). Richards and Broaddus note that contractual agreements by patent owners to only pass interests with NFTs would provide some protection and that even licenses provided by non-exclusive licensees may be tracked. *Id.* Indeed, they point to how patent assertion entities and others could track and make high volume licenses and perhaps avoid transaction costs associated with individually negotiated agreements. *Id.*

²²⁴ Richards and Broaddus also note that a private digital key may be lost or stolen. *See id.* (“People who lose their private keys are out of luck. Those who have their keys stolen through a data breach or identity theft can only hope that the scale of the breach affects so many users that there might be enough votes by blockchain computing nodes to support wholly rewriting the blockchain through a fork.”).

²²⁵ See, e.g., Ezgi Baklaci Güllökar & Sena Yaşaroğlu, *European Union Intellectual Property Office Launches Europe's First Ever Blockchain Platform for Secure Delivery in Real Time of IP Rights Information*, LEXOLOGY (May 11, 2021), <https://www.lexology.com/library/detail.aspx?g=dac873b5-d028-4979-94b7-03ccad5654eb> (discussing availability of ownership information and noting “EUIPO announced plans to launch a decentralized, blockchain authentication platform to combat IP counterfeiting”).

²²⁶ For an additional discussion of the benefits and limitations of blockchain and smart contracts, see Helen Eenmaa-Dimitrieva & Maria José Schmidt-Kessen, *Smart Contracts: Reducing Risks in Economic Exchange with No-Party Trust?*, 10 EUR. J. RISK REGUL. 245 (2019); Helen Eenmaa-Dimitrieva & Maria José Schmidt-Kessen, *Creating Markets in No-trust Environments: The Law and Economics of Smart Contracts*, 35 COMPUT. L. & SEC. REV. 69 (2019). Smart contracts associated with the blockchain may execute, for example, payment of royalties.

²²⁷ China's open patent licensing system should be monitored for participation rates and effectiveness. See, e.g., Jianzhong & Xiaolin, *supra* note 208.

transparent system would allow the middleman to make that decision or broker that decision.²²⁸ This would reduce some of the benefit of a blockchain with respect to savings and speedier transactions.²²⁹ Unfortunately, concerns with patent quality undermine the entire system and unstable law in patent-eligible subject matter only contributes to the problems. Moreover, the differences in standards and rules concerning patents across international jurisdictions may cause additional impediments for the development of IPwe's project. A step in the right direction may be a government run blockchain for filing ownership interests with a priority system for the world. A trusted government would need to be chosen—maybe the United Kingdom or Switzerland.²³⁰

CONCLUSION

Patent-backed finance depends upon three interrelated markets: (1) the market for creating intellectual property; (2) the market for transferring that intellectual property to those who can develop and commercialize it; and (3) the intellectual property financial market—the market for collateralization and securitization to secure financing for additional research and development.

This Article argues that the disarrayed doctrine of patent-eligible subject matter constitutes a main impediment for sound development and functioning of patent-backed finance in the United States. The literature indicates that the legal uncertainty associated with this doctrine prevents it from accomplishing the very purpose for which it was conceived, that is, to incentivize innovation and provide economic growth and benefits to society, at least for certain industrial sectors.

The law does not exist in a vacuum, but is simultaneously a product of, and an influence on, society, and therefore cannot work in isolation from the fabric in

²²⁸ Perhaps a semi-private blockchain can be utilized. See IMRAN BASHIR, MASTERING BLOCKCHAIN: A DEEP DIVE INTO DISTRIBUTED LEDGERS, CONSENSUS PROTOCOLS, SMART CONTRACTS, DAPPS, CRYPTOCURRENCIES, ETHERIUM, AND MORE 26 (3d ed. 2020) (“With a semi-private blockchain, the private part is controlled by a group of individuals, while the public part is open for participation by anyone.”). A possibility could be merging a semi-private blockchain with a permissioned ledger, thus, speeding transactions amongst repeat players. See *id.* at 27 (“In this case, for verification of transactions on the chain, all verifiers are already preselected by a central authority and, typically, there is no need for a mining mechanism. . . . For example, Bitcoin can become a permissioned ledger if an access control layer is introduced on top of it that verifies the identity of a user and then allows access to the blockchain.”).

²²⁹ *Id.* at 15 (noting “a significant benefit of decentralization . . . because . . . no banks or central clearinghouses are required”).

²³⁰ Artificial intelligence and quantum computing may ultimately lead to an overall reduction in transaction costs discussed in this article. See, e.g., Tim Pohlmann, *AI May Be the Solution to Skyrocketing Numbers of SEP Declarations*, IAM (July 21, 2021), <https://www.iam-media.com/ai-may-be-the-solution-skyrocketing-numbers-of-sep-declarations> (noting potential of AI to sort through thousands of possible SEPs).

which it is embedded. As U.S. Supreme Court decisions related to patent-eligible subject matter exercise great impact on the innovation-based economy and associated investments, such judgments need to take into account the complexities associated with technology development and its translation into patent claims. Section 101 should be clarified by the U.S. Congress, U.S. courts and the U.S. Patent and Trademark Office.

Taking a more downstream perspective on patent-backed finance, there have been attempts to increase fluidity in the markets for intellectual property as part of the endeavour to accelerate innovation pace and to galvanise financial markets. There is common agreement that a higher degree of liquidity is required to unravel the potential of intellectual property assets. The intellectual property market in its entirety consists of three intimately related markets, that is, (1) the market for intellectual property creation, (2) the commercialization and transfer market, and (3) the intellectual property financial market.

A number of advantages are foreseen in relation to the function of intellectual property as an asset *on a par* with any other tradable asset. A well-functioning intellectual property asset market would make a greater number of valuable inventions available for the market, with the result of stoked innovation. More efficient securitization using intellectual property would provide a novel means of financing research, development and innovation that consists neither of debt nor equity finance, which could fuel public research and bolster SME growth, as well as provide funds for capital and patience intensive endeavours, such as the development of new medicines. A solid new asset class in the market should also energise the securitization market, which is steadily growing in the United States and Asia, while still remaining relatively curtailed in Europe.

A number of central challenges need to be overcome to accomplish the vision of a well-functioning market for patents. Firstly, research is needed to develop patent-protected technologies. Secondly, the liquidity of the underlying intellectual property asset market is indispensable for the proper functioning of the intellectual property market; different issues relating to its illiquidity and opaqueness need to be addressed. Particularly in the case of patents, the asset market needs to clear before full-fledged securitization can take place, and this is to a great degree dependent upon accurate and transparent patent valuations. Furthermore, changes in the international legal frameworks are needed to fully accommodate intellectual property as a traded asset, which likewise would embrace actions to increase patent quality. In relation to the use of intellectual property as collateral in a well-functioning intellectual property financial market, confidence in these assets must spread in the finance and commercial communities.