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## A Social Responsibility View of the "Patent-Centric Linear Model" of University Technology Transfer

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# A Social Responsibility View of the “Patent-Centric Linear Model” of University Technology Transfer

Christopher S. Hayter\*

## ABSTRACT

*Research universities are increasingly recognized for their role in regional and national economic prosperity. The contributions of research universities are primarily related to their role in the production and dissemination of new knowledge into society, including through the education of students.*

*New knowledge is the seed corn of innovation, and thus drives social and economic development. Given that research universities are sanctioned by society as non-profit, publicly-chartered organizations devoted to the public good, this article posits that their primary responsibility related to the production of new knowledge—especially new knowledge flowing from federally-funded research—is its rapid dissemination. While there are many mechanisms through which knowledge is disseminated, this article focuses on the efficacy of “formal” technology transfer, one particular interpretation of the Bayh–Dole Act of 1980.*

*To this end, I construct a unique analytical framework based on the voluminous corporate social responsibility (“CSR”) literature to examine specific technology transfer management practices and—most importantly—their impact on society. Despite the recent development of licensing practices related to global health and other areas, I nonetheless find that the “Patent-Centric Linear Model” of university technology transfer is far from socially optimal, often favoring opportunities for revenue generation at the expense of knowledge dissemination; current interpretations of Bayh–Dole are socially irresponsible.*

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INTRODUCTION .....	9
I. CURRENT INTERPRETATIONS OF THE BAYH–DOLE ACT.....	11
A. <i>Reexamining the Patent-Centric Linear Model</i> .....	15
II. SOCIAL RESPONSIBILITY AND HIGHER EDUCATION.....	16
A. <i>The Emergence of Corporate Social Responsibility and Corporate Social Performance</i> .....	16
B. <i>The Social Responsibility and Higher Education</i> .....	18
C. <i>A Social Performance Framework for Higher Education</i> .....	19
III. A UNIVERSITY’S KNOWLEDGE DISSEMINATION MISSION: AN ECONOMICS PERSPECTIVE .....	20
A. <i>The Role of Knowledge in Economic and Social Development</i> .....	21
B. <i>Knowledge Dissemination and Higher Education</i> .....	24
1. <i>Publication, Teaching, and Service</i> .....	24
2. <i>Formal University Technology Transfer</i> .....	26
3. <i>Informal University Technology Transfer to Industry</i> .....	26
IV. SOCIAL RESPONSIBILITIES RELATED TO UNIVERSITY TECHNOLOGY TRANSFER .....	28
A. <i>Legal Facets of Social Responsibility Relating to Technology Transfer</i> .....	29
1. <i>Non-Profit Status of Universities</i> .....	29
2. <i>Legal Obligations Under the Bayh–Dole Act</i> .....	33
3. <i>Stanford v. Roche</i> .....	34
B. <i>Discretionary Elements of University Technology Transfer</i> .....	36
1. <i>Do Nothing Beyond “Protecting Government Interests”</i> .....	37
2. <i>Faculty-as-Owner Paradigm</i> .....	38
3. <i>University-as-Owner Paradigm</i> .....	39
4. <i>Third Party Assignment of Patents to Organizations Outside the University</i> .....	41
5. <i>Other Options</i> .....	42
V. ANALYSIS.....	43

A.	<i>Absence of Broader Conceptions of University Social Responsibility</i> .....	44
B.	<i>Divergent Values Among TTOs</i> .....	45
C.	<i>Patents Have Limited Utility for Knowledge Dissemination</i> .....	47
D.	<i>Commercialization is a Team (Networked) Sport</i> .....	50
CONCLUSION .....		51

## INTRODUCTION

While knowledge creation and dissemination—embodied in research and teaching—have long been responsibilities of colleges and universities, technology transfer is generally considered part of what has emerged in policy lexicon as the so-called “fourth mission” of higher education: economic development.<sup>1</sup> The emergence of a fourth mission implies that a university’s economic development mission is distinct from its other three traditional missions: teaching, research, and outreach missions.

Policymakers broadly use the term “technology transfer” to describe specific economic development contributions, including the establishment of university spinoff companies, the development of new technologies, employment, and attraction of talented individuals to work in the surrounding region.<sup>2</sup> The focus here, however, is on a specific *interpretation* of the University and Small Business Patent Procedures Act of 1980, otherwise known as the Bayh–Dole Act.<sup>3</sup> The purpose of Bayh–Dole was to maximize the dissemination and commercialization of technologies stemming from university research.<sup>4</sup> This article will discuss one relatively linear, bureaucratic approach: what I term the “Patent-Centric Linear Model” of university technology transfer.

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1. Christopher S. Hayter, *Social Responsibility and the Knowledge Production Function of Higher Education*, in ROUTLEDGE HANDBOOK OF THE ECONOMICS OF KNOWLEDGE 144 (Cristiano Antonelli & Albert N. Link eds., 2015).

2. See Phillip H. Phan & Donald S. Siegel, *The Effectiveness of University Technology Transfer: Lessons Learned, Managerial and Policy Implications, and the Road Forward*, 2 FOUND. & TRENDS IN ENTREPRENEURSHIP 77, 77–144 (2006); Frank T. Rothaermel et al., *University Entrepreneurship: A Taxonomy of the Literature*, 16 INDUS. & CORP. CHANGE 691, 691–791 (2007).

3. 35 U.S.C. §§ 200–212 (2012).

4. Samantha R. Bradley et al., *Models and Methods of University Technology Transfer*, 9 FOUND. & TRENDS IN ENTREPRENEURSHIP 571, 571 (2013).

The focus on the relationship between technology transfer and knowledge dissemination is motivated by several interrelated factors: (1) in the wake of the 2008 financial crisis, higher education has garnered significant attention among policymakers for its potential and realized contributions to economic development; (2) recent cutting-edge economics research has not only provided an understanding of the economic and social value of new knowledge, it has created awareness of the barriers and enablers to its flow and, thus, its impact; and (3) a robust and rapidly growing empirical literature examines the structure, operation, and impact of the current technology transfer system.

In order to examine the impact of the Patent-Centric Linear Model on knowledge dissemination, I develop a social responsibility framework. Within this context, knowledge production and dissemination is conceptualized as the primary responsibility of higher education, which is not only congruent with the intent of Bayh–Dole, but also the traditional teaching and research missions of universities.

I find that the Patent-Centric Linear Model is socially irresponsible because it fails to optimize knowledge dissemination and commercialization and, instead, mandates a “review and protect or reject” approach to technology management in hopes of maximizing licensing revenues. As such, the model neglects the variety of options possible under current legal frameworks that would more closely align with the realities of technology commercialization and entrepreneurship. Armed with a broader understanding of how social responsibility is framed within an academic context—and a robust conceptual framework with which to analyze it—it is easy to understand why and how the current technology transfer system exists and why it has experienced much tension and criticism.

In support of this analysis, Section I introduces the Patent-Centric Linear Model, which is, according to a recent review of the technology transfer literature, a nearly ubiquitous interpretation of the Bayh–Dole Act.<sup>5</sup> Section II introduces a social responsibility framework specific to the mission of higher education, especially related to the creation and dissemination of new knowledge. Section III reviews the economics literature underlying the role of new knowledge in economic and social development. Section IV articulates the social responsibilities of higher education as they relate to technology transfer, exploring both existing legal requirements as well as discretionary options. Section V provides a discussion as to

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5. Bradley et al., *supra* note 4.

why the Patent-Centric Linear Model is socially irresponsible, with conclusions provided in Section VI.

## I. CURRENT INTERPRETATIONS OF THE BAYH–DOLE ACT

The Bayh–Dole Act was passed in 1980 in an effort to accelerate the dissemination and commercialization of new knowledge produced in universities.<sup>6</sup> The Bayh–Dole Act provides a specific, though relatively broad, legal framework regarding the treatment of inventions resulting from federally funded research.<sup>7</sup> Bayh–Dole was motivated by a perception among policymakers that technologies derived from federally funded research were “sitting on the shelf” as a result of excessive bureaucracy and regulation—and a response to fears that the United States was losing its international competitiveness.<sup>8</sup> The Act not only aligned intellectual property (“IP”) policy among all federal research and development (“R&D”) funding agencies, it also sought to create incentives for universities to become engaged in the technology transfer process.<sup>9</sup> It did so by giving universities primary responsibility for managing derivative technologies, including the ability to claim ownership of said technology via patents.<sup>10</sup>

In practice, universities have adopted one specific interpretation of Bayh–Dole, recently termed the “Traditional Linear Model,” which defines technology transfer primarily in terms of patenting.<sup>11</sup> For this article, I refer to this concept as the “Patent-Centric Linear Model” of university technology transfer. Crucial to this interpretation was the creation and central role of university technology transfer offices (“TTOs”). Nearly all major research universities—more than 200—have established TTOs.<sup>12</sup> Also important to this interpretation is the fact that the Bayh–Dole Act ties university IP ownership claims to patents, though a multitude of university knowledge dissemination and commercialization alternatives exist.<sup>13</sup> Finally, a small number of large research universities contributed to this interpretation; many were involved in patenting and

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6. 35 U.S.C. §§ 200–212.

7. Bradley et al., *supra* note 4, at 576.

8. See DAVID C. MOWERY ET AL., *IVORY TOWER AND INDUSTRIAL INNOVATION: UNIVERSITY–INDUSTRY TECHNOLOGY TRANSFER BEFORE AND AFTER THE BAYH–DOLE ACT IN THE UNITED STATES* 97–98 (2004); Bhaven N. Sampat, *Patenting and US Academic Research in the 20th Century: The World Before and After Bayh–Dole*, 35 RES. POLY 772, 776–77 (2006).

9. Sampat, *supra* note 8, at 780, 782–83.

10. *Id.* at 779–80.

11. Bradley et al., *supra* note 4, at 574–76.

12. *Id.* at 592–94.

13. *Id.* at 610, 619–26.

technology commercialization before Bayh–Dole and served as highly visible linear-model examples for other research universities.<sup>14</sup> Recent research finds that the linear model not only represents *the* dominant technology management model for universities—especially within the early stages of developing technology transfer capability—it also drives conceptual and empirical research on university technology transfer.<sup>15</sup>

Figure 1 illustrates the Patent-Centric Linear Model process. Following the model, a university scientist makes an invention and (1) discloses the invention to their university’s TTO.<sup>16</sup> The TTO then (2) evaluates the invention and, if viable, (3) files a patent application to the U.S. Patent and Trademark Office (“USPTO”).<sup>17</sup> If granted, (4) the TTO markets the patented technology to potential licensees, including large firms, small businesses, and entrepreneurs, or works with the faculty inventor if the inventor is interested in establishing a university spinoff company.<sup>18</sup> The TTO then (5) negotiates the terms of the licensing agreement and (6) licenses the technology (7) to large companies or (8) spinoff companies.<sup>19</sup>

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14. *Id.* at 571.

15. *See generally id.*

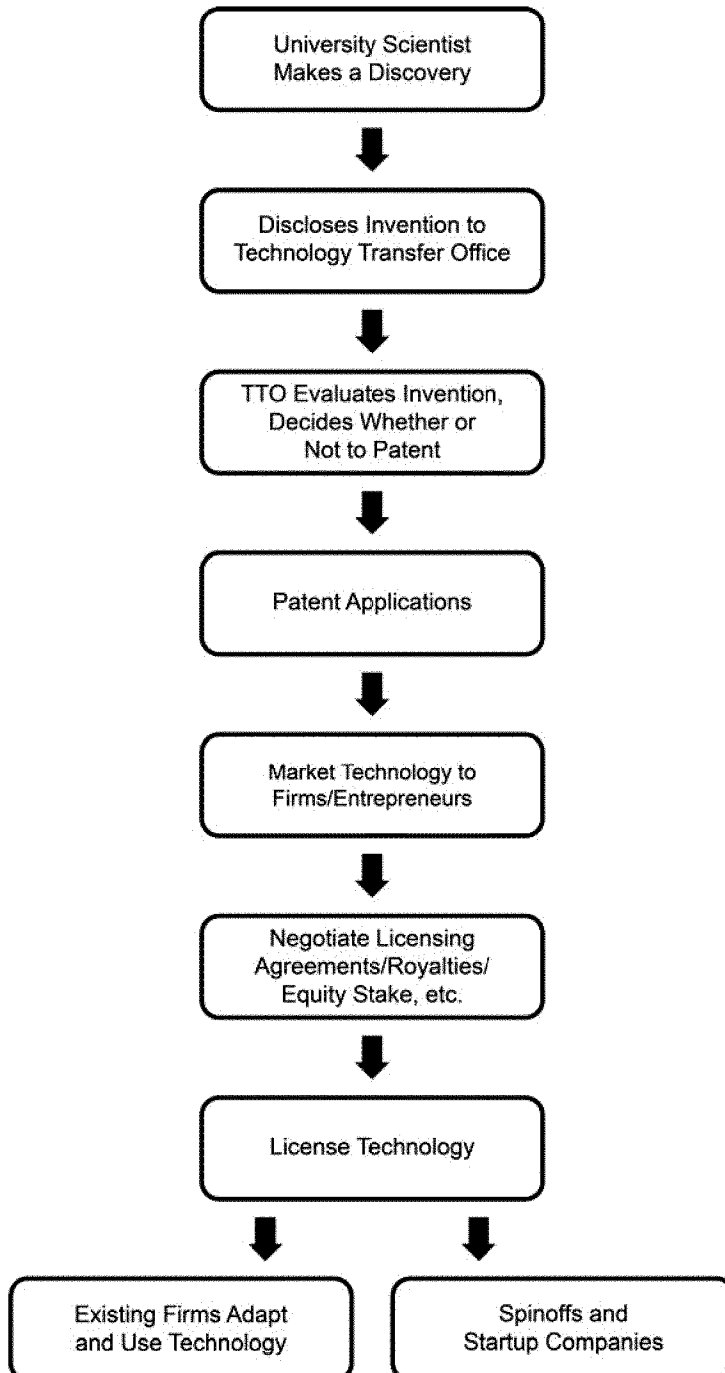
16. *Id.*

17. Bradley et al., *supra* note 4, at 575.

18. *Id.*

19. *Id.*

**Figure 1: Patent-Centric Linear Model of Technology Transfer**<sup>20</sup>



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20. *Id.*



Discussed in the next section, the linear model is a hands-on approach with many possible derivations. For example, many universities begin marketing technologies and negotiating agreements before a patent application is filed, often asking potential licensees to cover licensing costs.<sup>21</sup> But the model presented in Figure 1 represents a general process of evaluating invention disclosures and their readiness for patenting in hopes of licensing to organizations outside the university; the model views patents as the primary vehicle for technology transfer.

Within the context of the model, Bayh–Dole has been credited with an enormous increase in patenting and technology commercialization activity from universities.<sup>22</sup> From 1983 to 2003, the number of patents issued to universities grew from 434 to 3,259.<sup>23</sup> According to the USPTO, 4,797 utility patents were awarded in 2012.<sup>24</sup> Further, the Association of University Technology Managers (“AUTM”) reported that 818 university spinoff companies were established in 2013, and that more than 4,200 established over the course of the past 30 years remained in operation. These activities have resulted in significant benefits for several universities: \$12.5 billion in net licensing income since 2009, \$2.8 billion in 2013 alone.<sup>25</sup>

Universities have adopted the Patent-Centric Linear Model (or similar derivations thereof) in pursuit of additional revenue in response to an increasingly competitive higher education marketplace combined with declining or flat funding from state and federal sources.<sup>26</sup> Further, highly visible university licensing success among a handful of universities provided a signal to other universities of the licensing revenue potential of the Patent-Centric Linear Model. For example, the so-called Boyer–Cohen patents, filed in the late 1970s on a pioneering and fundamental technique for the creation of genetically engineered microorganisms, earned the Uni-

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21. *Id.* at 584–85.

22. *Id.* at 596.

23. Wesley M. Cohen & John P. Walsh, *Real Impediments to Academic Biomedical Research*, 8 INNOVATION POL’Y & THE ECON. 1, 1 (2007).

24. U.S. PATENT & TRADEMARK OFFICE, U.S. COLLEGES AND UNIVERSITIES: UTILITY PATENT GRANTS, CALENDAR YEARS 1969–2012, [http://www.uspto.gov/web/offices/ac/ido/oeip/taf/univ/org\\_gr/all\\_univ\\_ag.htm](http://www.uspto.gov/web/offices/ac/ido/oeip/taf/univ/org_gr/all_univ_ag.htm) (last visited May 10, 2015).

25. Association of University Technology Managers, AUTM U.S. LICENSING ACTIVITY SURVEY: FY 2013, at 32 [hereinafter AUTM].

26. Bradley et al., *supra* note 4, at 608–09.

versity of California and Stanford University more than \$255 million in licensing revenue during their 17-year patent life.<sup>27</sup> Similarly, the most successful universities can have annual licensing revenue in the range of \$20–\$60 million, with the upper bound well above \$100 million.<sup>28</sup>

### A. *Reexamining the Patent-Centric Linear Model*

When evaluating the impact of policy, analysts typically turn to the concept of the counter-factual: What would have been the outcome if a policy or program had *not* been implemented?<sup>29</sup> For this article, it is clear from a number of metrics that universities are increasingly disclosing technology, patenting, licensing, and spinning off new companies. But to what extent are these activities a specific outcome of Bayh–Dole and, for purposes of this article, the linear model?

Professors Richard C. Nelson, Bhaven N. Sampat, and Arvids Z. Ziedonis investigated the larger of the aforementioned questions—the overall impact of Bayh–Dole—and found that many research universities had a history of transferring technologies to industry long before 1980.<sup>30</sup> They also posit that, while the Act may have created marginal administrative efficiencies, many other factors also contributed to the growth of university technology transfer activity, including large increases in federal research funding (especially in life sciences), the increasing importance of early-stage R&D within nascent industries (e.g. pharmaceuticals), and the rapid development of information and communication technologies that not only enabled more robust collaboration, but also allowed individuals to learn about the technology transfer activities of other institutions.<sup>31</sup>

Research more narrowly focused on the Patent-Centric Linear Model found that it is at best simplistic: technology creation, dissemination, development, and adoption differ by discipline, institution, and industry, among other facets.<sup>32</sup> As a heuristic, the model is not only misleading with regard to how university technology transfer actually occurs, it distracts scholars and policymakers from

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27. Martin Kenney & Donald Patton, *Reconsidering the Bayh–Dole Act and the Current University Invention Ownership Model*, 38 RES. POL'Y 1407, 1409 (2009).

28. AUTM, *supra* note 25, at 67–71.

29. See Adam B. Jaffe, *Building Programme Evaluation Into the Design of Public Research-Support Programmes*, 18 OXFORD REV. OF ECON. POL'Y 22 (2002).

30. See MOWERY ET AL., *supra* note 8, at 38–57.

31. Sampat, *supra* note 8, at 784–86.

32. See, e.g., ERIC VON HIPPLE, *THE SOURCES OF INNOVATION* 3–7 (1988).

how it *could* occur, especially given its focus on patents.<sup>33</sup> Finally, at worst, the model can slow or even inhibit the dissemination of new knowledge into society.<sup>34</sup> This investigation carefully examines the Patent-Centric Linear Model through a social responsibility lens, with the next section establishing the relevant conceptual framework.

## II. SOCIAL RESPONSIBILITY AND HIGHER EDUCATION

Higher education institutions were established hundreds of years ago to contribute to the public good of society.<sup>35</sup> Surprisingly, a recent review of the extant higher education literature finds that discussions of *how* social responsibility is defined and, more importantly, how responsibility manifests in the decisions, management practices, and impact of colleges and universities is woefully underdeveloped. This is in contrast to the expansive and rapidly growing body of scholarship relating to corporate social responsibility (“CSR”).<sup>36</sup>

### A. *The Emergence of Corporate Social Responsibility and Corporate Social Performance*

While the objective function of the firm is typically viewed as profit generation, CSR—a concept deeply embedded within business school literature—examines a broader question: What are the overall contributions that firms make to society?<sup>37</sup> A voluminous and rapidly growing literature seeks to address this question.

CSR emerged in the 1950s largely as a normative exercise with Howard Bowen, author of *Social Responsibilities of the Businessman*.<sup>38</sup> Considered the father of CSR, Bowen posited that business serves at the pleasure of society, so its behavior and actions must conform to society’s expectations.<sup>39</sup> Thus, a social contract—a set of implied rights and affirmative obligations—is the foundation for business legitimacy. First among these obligations is the economic

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33. See generally Bradley et al., *supra* note 4; Kenney & Patton, *supra* note 27.

34. Bradley et al., *supra* note 4, at 611–12.

35. See JOHN R. THELIN, *A HISTORY OF AMERICAN HIGHER EDUCATION* 1–5 (2d ed. 2011).

36. Hayter, *supra* note 1, at 136.

37. See Archie B. Carroll, *A Three-Dimensional Conceptual Model of Corporate Performance*, 4 *ACAD. OF MGMT. REV.* 497 (1979) [hereinafter *Corporate Performance*].

38. HOWARD R. BOWEN, *THE SOCIAL RESPONSIBILITIES OF THE BUSINESSMAN* 28–30 (1953).

39. *Id.*; see also S. Prakash Sethi, *Dimensions of Corporate Social Performance: An Analytical Framework*, 17 *CAL. MGMT. REV.* 58, 62 (1975) (positing “social responsibility implies bringing corporate behavior up to a level where it is congruent with the prevailing norms, values, and expectations of performance”).

role profit motive plays, followed by a business's ethical obligations.<sup>40</sup> As Bowen's ideas gained traction, conversations focused on the normative aspects of social responsibility: What *should* businesses do to benefit society?<sup>41</sup>

Professor Archie Carroll, considered one of the preeminent experts on CSR, identified a key problem with early approaches: normative discussions of social responsibility were, up until the late 1970s, largely separated from discussions relating to mainstream business management practices.<sup>42</sup> The most important responsibility of companies, Carroll argued, is generating returns for their shareholders.<sup>43</sup> Thus, discussions were needed relating to *how* businesses can be socially responsible, not just what social responsibility means.

Carroll's ideas are manifested in the Corporate Social Performance ("CSP") model, which includes legal and ethical responsibilities in addition to profit-generation obligations.<sup>44</sup> Introduced in 1979, the CSP model has evolved into one of the most influential conceptual frameworks within what scholars term the "business and society" literature.<sup>45</sup> Early CSP models emphasized the importance of being responsive to social obligations.<sup>46</sup> While CSR focuses on determining social obligations, CSP is complementary, focusing on *how* firms best fulfill these goals.<sup>47</sup> This obligation-performance link was strengthened in the 1980s and 1990s with the emergence of Professor Michael Porter's Competitive Advantage Model, which states that firms create value by combining strategy and adaptation to external contexts.<sup>48</sup> Specific to CSR, stakeholder

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40. See *Corporate Performance*, *supra* note 37, at 500; Archie B. Carroll, *Corporate Social Responsibility: Evolution of a Definitional Construct*, 38 BUS. & SOC'Y 268 (1999) [hereinafter *Corporate Social Responsibility*].

41. See *Corporate Performance*, *supra* note 37, at 500.

42. *Id.* at 498.

43. *Id.* at 500.

44. *Id.*

45. See Diane L. Swanson, *Toward an Integrative Theory of Business and Society: A Research Strategy for Corporate Social Performance*, 24 ACAD. OF MGMT. REV. 506, 507 (1999).

46. *Id.* at 506.

47. See Steven L. Wartick & Philip L. Cochran, *The Evolution of the Corporate Social Performance Model*, 10 ACAD. OF MGMT. REV. 758, 758 (1985). Despite Carroll's early intentions, scholars continue to criticize the lack of integration between normative aspects of CSR and business activity. Therefore, social responsibility may be integrated into the strategy and operations of firms and, in the case of the Synergistic Value Creation model, may help create unforeseen value. For additional information, see Elisabet Garriga & Domènec Melé, *Corporate Social Responsibility Theories: Mapping the Territory*, 53 J. OF BUS. ETHICS 51, 59–60 (2004).

48. See MICHAEL E. PORTER, *COMPETITIVE STRATEGY: TECHNIQUES FOR ANALYZING INDUSTRIES AND COMPETITORS* 71–87, 126–55 (1980).

demands for social investments, philanthropy, and catering to underserved populations can be seen as an important marketing opportunity for firms.<sup>49</sup>

In the 21<sup>st</sup> century, CSP has co-evolved with other derivative CSR frameworks, integrating social responsibility into real-world management practices.<sup>50</sup> CSP provides an integrated approach to social responsibility: When core business functions are aligned with social impact, both society and business can benefit.<sup>51</sup> An emergent literature shows that businesses that adopt such a strategic approach enjoy a number of benefits, including improved financial performance.<sup>52</sup>

### *B. The Social Responsibility and Higher Education*

The creation of wealth remains the most important and appropriate objective function of industry. Conversely, colleges and universities are *de facto* social organizations originally established to advance the public good.<sup>53</sup> For example, the social responsibility of American colleges was reflected in colonial charters, and provided the motivating logic behind the Morrill Acts of 1862 and 1890 that led to the establishment of the nation's land-grant universities, agriculture experiment stations, and cooperative extension service.<sup>54</sup>

In the 20<sup>th</sup> century, the social mission of emerging public institutions was reflected in their (typically) non-profit status and receipt of substantial public funding, especially regular appropriations from state governments.<sup>55</sup> Social responsibility was also a critical dimension of the 1947 Truman Commission Report, which recommended the establishment of a nation-wide network of community colleges and financial aid for students of limited means, the latter

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49. See, e.g., Peter F. Drucker, *The New Meaning of Corporate Social Responsibility*, 26 CAL. MGMT. REV. 53, 60–62 (1984).

50. Wartick & Cochran, *supra* note 47, at 765–67.

51. See Bryan W. Husted, *A Contingency Theory of Corporate Social Performance*, 39 BUS. & SOC'Y 24 (2000).

52. See Bryan W. Husted & José De Jesus Salazar, *Taking Friedman Seriously: Maximizing Profits and Social Performance*, 43 J. OF MGMT. STUD. 75 (2006) (arguing that a strategic approach to social responsibility not only results in better financial performance due to strategic behavior, it also yields far greater social performance compared to alternative approaches such as corporate altruism).

53. Hayter, *supra* note 1, at 141.

54. See, e.g., GEORGE R. McDOWELL, LAND-GRANT UNIVERSITIES AND EXTENSION INTO THE 21ST CENTURY: RENEGOTIATING OR ABANDONING A SOCIAL CONTRACT 16–17 (2001); Hayter, *supra* note 1, at 141.

55. THELIN, *supra* note 35, at 4–5, 137–141.

of which led indirectly to the Higher Education Act of 1965 and its subsequent reauthorizations.<sup>56</sup>

In a previous article, I comprehensively reviewed the extant higher education literature and found that very little exists in the way of a scholarly or practice-oriented body of knowledge relating to the identification and fulfillment of social responsibilities within an academic context.<sup>57</sup> This is ironic given that society confers many valuable privileges in support of higher education's important public mission. These benefits include exemptions from income, property, and sales taxes; tax-exempt debt or bond authority (depending on the state);<sup>58</sup> preferred eligibility for federal grants and contracts; favorable treatment of charitable giving; and—in the case of public universities—regular (albeit declining) state subsidies, among other benefits.<sup>59</sup> Thus, rhetorically, what are the *specific* social responsibilities of colleges and universities—and the policy and programmatic (typically public) systems that support them—and to what extent are these groups collectively fulfilling these responsibilities?

### C. *A Social Performance Framework for Higher Education*

The introduction of CSR, with an emphasis on the CSP framework, is motivated by the need for a practical approach to defining and articulating the specific social responsibilities of colleges and universities, practices best suited to meeting them, and the extent to which they are met. In deference to Professor Carroll, this article introduces a social performance conceptual framework for higher education. Similar to its corporate cousin, a higher education-focused social performance model emphasizes the *impact* of colleges and universities on society with a focus on practice: the efficacy of specific higher education management techniques, policies, and programs. While ideas of social value exist, the framework draws heavily from CSP given the well-developed nature of the supporting

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56. See PRESIDENT'S COMMISSION ON HIGHER EDUC., HIGHER EDUCATION FOR AMERICAN DEMOCRACY (1947).

57. Hayter, *supra* note 1, at 146–47.

58. See *An Education in Finance*, ECONOMIST (May 18, 2006), <http://www.economist.com/node/6958688>; Stephen E. Weyl & Ronald F. Rodgers, *Tax-Exempt Bonds: Considerations for College and University In-House Counsel*, in NATIONAL ASSOCIATION OF COLLEGE AND UNIVERSITY ATTORNEYS: PUBLICATION SERIES 1–2 (2006); Ry Rivard, *The Lure of Taxable Debt*, INSIDE HIGHER ED, (July 21), <https://www.insidehighered.com/news/2014/07/21/lure-research-and-avoid-regulations-some-universities-turn-away-tax-exempt-bonds>.

59. Hayter, *supra* note 1, at 141.

empirical literature, as well as the more competitive and revenue-oriented nature of higher education markets.

Similar to CSR, the social performance model embraces legal and discretionary obligations but replaces profit generation with the responsibility to fulfill the university mission. Thus, social responsibility of colleges and universities depends on their ability to fulfill their mission, while also fulfilling their legal and discretionary requirements to society. This is not to say that revenues are not important. Quite the opposite—financial resources are needed to support scale and impact. However, revenue generation must necessarily follow other responsibilities for a number of reasons discussed below. Especially critical is the designation of (most) higher education institutions as tax-exempt organizations and the derivative emphasis on the public-good elements relating to knowledge creation and dissemination.

Most importantly, a social performance model motivates strategic thinking within higher education. Referring to the discussion of strategy above, it is likely wrong to suggest that a college or university can address all social issues. Thus, in order for higher education to maximize its social impact, it must first be selective as to the scope of its mission (i.e. focus what responsibility or responsibilities it chooses to be “world class” in). The more responsibilities that higher education takes on, the more it may diminish the impact of other responsibilities. The next section reviews the existing economics literature to explain why the dissemination of new knowledge is an important university responsibility, especially as that obligation relates to the university’s role in economic and social development.

### III. A UNIVERSITY’S KNOWLEDGE DISSEMINATION MISSION: AN ECONOMICS PERSPECTIVE

Research and teaching are critical responsibilities of higher education. The American notion of the research university traces its roots back to the establishment of Johns Hopkins University (“JHU”) in 1876.<sup>60</sup> JHU’s first President, Daniel Coit Gilman, sought to revolutionize higher education by advocating a model of advanced discovery and scholarship similar to that used in Germany.<sup>61</sup> However, he felt that, given the relative paucity of tech-

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60. THELIN, *supra* note 35, at 103–04.

61. *Id.* at 241; see also John C. Scott, *The Mission of the University: Medieval to Postmodern Transformations*, 77 J. OF HIGHER EDUC. 1, 3, 15, 22–23 (2006).

nical capabilities within the United States, research responsibilities needed to be closely integrated with the historical teaching mission of higher education.<sup>62</sup> This “hybrid” research-teaching model of education was influential among existing universities at the time, as well as in establishment of the emergent public land grant universities.<sup>63</sup>

While early support for university research came from the institutions themselves, along with a few charitable organizations, this began to change during the Second World War. Vannevar Bush, science advisor to President Franklin D. Roosevelt, advocated for federal support for academic research due to its importance in addressing issues of national security, human health, and commerce.<sup>64</sup> Bush’s ideas eventually led to the formation of the National Science Foundation,<sup>65</sup> and helped shape contemporary notions of universities as knowledge-production assets important for national well-being. While other research funding sources (i.e. industry- and foundation-sponsored research) have grown in relative terms, the federal government remains the largest sponsor of academic research, providing more than \$67 billion in 2013 to universities, nearly half of the federal government’s \$140 billion research budget.<sup>66</sup>

### A. *The Role of Knowledge in Economic and Social Development*

The production function constitutes one of the foundational theoretical concepts in economics, whereby the input of labor and capital result in economic output.<sup>67</sup> In the 1950s economists—led by Robert

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62. Scott, *supra* note 61, at 22–23.

63. *Id.*

64. See OFFICE OF SCI. RES. & DEV., SCIENCE, THE ENDLESS FRONTIER: A REPORT TO THE PRESIDENT (1945).

65. The National Science Foundation, the primary principal funder of basic university research in the United States, was established in 1950. The primary purpose of the NSF is to organize and award research grants through competitive, peer-review processes. See *A Timeline of NSF History*, NAT’L SCI. FOUND., <http://www.nsf.gov/about/history/overview-50.jsp> (last visited December 11, 2015).

66. See Ronda Britt, *Higher Education Research and Development Survey: Fiscal Year 2013*, NAT’L CTR. FOR SCI. AND ENG’G STATISTICS (July 31, 2014), <http://ncesdata.nsf.gov/herd/2013/>.

67. See Robert M. Solow, *A Contribution to the Theory of Economic Growth*, 70 Q. J. ECON. 65, 66 (1956).



Solow—began to account for the role of knowledge within the production function.<sup>68</sup> This role was later termed the “knowledge production function,”<sup>69</sup> the inputs for which are R&D, human capital, and/or academic research.<sup>70</sup>

Several decades of empirical research finds that the knowledge production function holds true at a macroeconomic level of aggregation: The most innovative countries are those with the greatest investments in R&D, just as less developed countries typically generate little new knowledge.<sup>71</sup> Similarly, the most innovative industries tend to be characterized by relatively large R&D investments.<sup>72</sup> Thus, at a macro level, knowledge is a critical source of innovation, economic dynamism, and growth.<sup>73</sup>

At least two policy options exist to assist production levels in reaching what economists term “socially optimal” levels. The first is formal intellectual property protection, providing a potential incentive for innovation by granting a temporary monopoly to creators so they have the opportunity to reap a return from their creation *and*—in the case of patents—promote disclosure to society.<sup>74</sup> The second policy option is to encourage knowledge production through research subsidies, which is demonstrated by the substantial levels of public R&D funding.<sup>75</sup> These policies are complementary, depending on the context in which they are used.<sup>76</sup>

Professor Paul Romer later introduced his endogenous growth theory, whereby economic growth occurs through the generation, accumulation, and spillover of new technological knowledge.<sup>77</sup> Building on Arrow’s ideas, Romer not only assumed that knowledge is the seed corn for innovation (and, thus, economic and social development), he also believed that new knowledge, once created, “automatically” spills over, allowing third-party firms and economic

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68. *Id.* at 68.

69. See Zvi Griliches, *Patent Statistics as Economic Indicators: A Survey*, 28 J. ECON. LIT. 1661, 1671–72 (1990).

70. See DAVID B. AUDRETSCH ET AL., *ENTREPRENEURSHIP AND ECONOMIC GROWTH* 34–36, 51–59 (2006).

71. *Id.* at 170–86.

72. Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in *THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS* 609, 626 (Nat’l Bureau of Econ. Res. ed., 1962); Paul M. Romer, *Increasing Returns and Long-Run Growth*, 94 J. POL. ECON. 1002, 1034 (1986).

73. Romer, *supra* note 72, at 1034.

74. See Diana Rhoten & Walter W. Powell, *The Frontiers of Intellectual Property: Expanded Protection Versus New Models of Open Science*, 3 ANN. REV. L. & SOC. SCI. 345, 348–49 (2007).

75. *Id.*

76. *Id.*

77. Arrow, *supra* note 72, at 1018–20, 1034.

agents access to new technological knowledge.<sup>78</sup> Thus, endogenous growth theory became a critical rationale/justification for ever-increasing public expenditures for public R&D.

Recent advances in economics research by Professors Zoltan Acs, David Audretsch, Bo Carlsson, and Pontus Braunerhjelm, among others, cast new light on Romer's work. Embodied in the Knowledge Spillover Theory of Entrepreneurship ("KSTE"), their works embrace Solow and Romer's contention that new knowledge is critical to economic growth.<sup>79</sup> However, KSTE takes issue with traditional theoretical assumptions that all knowledge is economically useful and spills over "automatically."<sup>80</sup> Instead, knowledge is subject to institutional, geographic, and cost constraints.<sup>81</sup>

The dynamics of knowledge spillovers are also affected by the properties of knowledge itself.<sup>82</sup> First, the economic value of knowledge is relatively uncertain, especially compared to the more certain nature of information.<sup>83</sup> Second, knowledge is characterized by asymmetry across economic agents; the same knowledge may be assigned different values—or have different expected values—by different individuals. Third, while the transaction cost for sharing information across economic agents is trivial, transmitting knowledge may require longer-term and proximate communication, thus increasing transaction costs.<sup>84</sup>

Fundamental to this last point is well-established differences between codified and tacit knowledge.<sup>85</sup> Codified knowledge is embodied in the form of books, articles, blueprints, software programs, and other vehicles often protected by copyright.<sup>86</sup> Codified knowledge is easily transmitted across distances and among agents; a consumer does not necessarily need to be the originator of codified knowledge to enjoy its benefits. Academic publications are an example of codified knowledge. On the other hand, tacit

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78. *Id.*

79. See Zoltan J. Acs et al., *The Knowledge Spillover Theory of Entrepreneurship*, 41 SMALL BUS. ECON. 757, 759–61 (2013).

80. *Id.* at 759–61.

81. See, e.g., Paul Almeida & Bruce Kogut, *Localization of Knowledge and the Mobility of Engineers in Regional Networks*, 45 MGMT. SCI. 905 (1999); Janet Bercovitz & Maryann Feldman, *Academic Entrepreneurs: Organizational Change at the Individual Level*, 19 ORG. SCI. 69 (2008).

82. See David B. Audretsch et al., *From Knowledge to Innovation: The Role of Knowledge Spillover Entrepreneurship*, in ROUTLEDGE HANDBOOK OF THE ECONOMICS OF KNOWLEDGE 21–22 (Cristiano Antonelli & Albert N. Link eds., 2015).

83. *Id.*

84. *Id.*

85. See Bruce Kogut & Udo Zander, *Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology*, 3 ORG. SCI. 383, 387–88 (1992).

86. *Id.*

knowledge—referred to as *know-how*—is not easily codified. Rather, this type of knowledge is highly specialized and is typically embodied in individuals, organizations, and processes.<sup>87</sup> Research shows that as knowledge becomes more valuable (i.e. evolves toward application), it becomes more “sticky”—more difficult to transmit and, therefore, more place-based.<sup>88</sup>

Within a university context, inventions emerge from years of academic research experience and are thus an example of tacit knowledge embedded within faculty, students, and long-established facilities and processes. Discussed later, patents are an intermediate output that codifies key elements of an invention, but patents do not and cannot completely capture the full value of knowledge generated during academic research. Nor do patents, even licensed patents, signify the “complete” exchange of knowledge.<sup>89</sup> Research shows that the transmission of technical knowledge is instead dependent on the existence of robust social networks and shared technical capabilities of the transmitting parties.<sup>90</sup>

Thus, the operative question when discussing knowledge spillover is: To what extent do university organizational structures, practices, and policies enable the dissemination and commercialization of knowledge? In other words, *how well* do universities disseminate and commercialize their newly generated knowledge?

## B. *Knowledge Dissemination and Higher Education*

### 1. *Publication, Teaching, and Service*

While most discussions regarding the role of knowledge in economic and social development have focused on knowledge inputs (i.e. R&D funding), only recently have scholars turned to questions of how and why knowledge spillover occurs.<sup>91</sup> Scholarly publications and conference presentations serve as the most traditional

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87. See David B. Audretsch & Maryann Feldman, *R&D Spillovers and the Geography of Innovation and Production*, 86 AM. ECON. REV. 630, 638 (1996); see also MOWERY ET AL., *supra* note 8, at 175.

88. See Eric von Hippel, “Sticky Information” and the Locus of Problem Solving: Implications for Innovation, 40 MGMT. SCI. 429 (1994).

89. Bronwyn Hall et al., *The Choice Between Formal and Informal Intellectual Property: A Review*, 52 J. ECON. LIT. 375, 376–77 (2014).

90. See ANNALEE SAXENIAN, REGIONAL ADVANTAGE: CULTURE AND COMPETITION IN SILICON VALLEY AND ROUTE 128, 141–56 (1996); Martin Kenney & U von Burg, *Technology, Entrepreneurship and Path Dependence: Industrial Clustering in Silicon Valley and Route 128*, 8 INDUS. AND CORP. CHANGE 67, 71 (1999).

91. See Acs et al., *supra* note 79.

and widely accepted forms of knowledge dissemination within higher education.<sup>92</sup> However, many other forms exist.<sup>93</sup>

Education is a long-accepted responsibility of colleges and universities—and perhaps the oldest form of knowledge dissemination. In 1858, Cardinal John Henry Newman’s *The Idea of a University Defined and Illustrated* posited that universities benefited society by educating *gentlemen* with “a cultivated intellect, a delicate taste, a candid, equitable, dispassionate mind, [and] a noble and courteous bearing in the conduct of life . . . .”<sup>94</sup> In many ways, American colleges established early in the nation’s history reflected this view.<sup>95</sup> Early exceptions included the establishment of the United States Military Academy at West Point and, later, the establishment of American Land Grant universities to meet the military leadership and engineering needs of a rapidly-growing nation.<sup>96</sup>

In the 20<sup>th</sup> century, higher education rapidly evolved from a luxury largely reserved for the wealthy, to a large and increasingly accessible public enterprise designed to meet the educational needs of the country.<sup>97</sup> In addition to providing a general education to students, this “massification” of higher education was a way to transmit new knowledge into society while meeting critical local and national workforce needs, such as the nation-wide demand for highly qualified math and science teachers.<sup>98</sup>

The “third” mission of higher education, public engagement and outreach, is another way to disseminate knowledge into society.<sup>99</sup> Service can relate to the actions of students, faculty, and staff.<sup>100</sup> Service learning programs, for example, combine curricular objectives with community-oriented goals in an effort to meet higher education’s responsibility to educate civic-minded individuals, especially undergraduates.<sup>101</sup> Other types of engagement and outreach

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92. See, e.g., Wesley M. Cohen et al., *Links and Impacts: The Influence of Public Research on Industrial R&D*, 48 MGMT. SCI. 1, 14, 16–17 (2002) (noting other mechanisms of university knowledge dissemination might include students, informal collaboration, consulting and entrepreneurship).

93. *Id.* at 16–17.

94. JOHN HENRY CARDINAL NEWMAN, *THE IDEA OF A UNIVERSITY* 91 (Martin J. Svaglic ed., 1960).

95. *Id.*

96. THELIN, *supra* note 35, at 42–43.

97. *Id.* at 156–57.

98. Christopher Hayter, *A Compact for Postsecondary Education*, NAT’L GOVERNORS ASS’N 1, 10–12 (2007), available at <http://www.nga.org/files/live/sites/NGA/files/pdf/0707INNOVATIONPOSTSEC.PDF>; Judith A. Ramaley, *Scholarship for the Public Good: Living in Pasteur’s Quadrant*, in HIGHER EDUCATION FOR THE PUBLIC GOOD 166, 170 (Adrianna J. Kezar et al., eds., 2005).

99. Hayter, *supra* note 1, at 143.

100. *Id.*

101. *Id.*

programs, such as agriculture and education extension programs, aid in the transmission of knowledge while providing a vehicle to understand and address society's needs.<sup>102</sup>

### 2. *Formal University Technology Transfer*

To reiterate, the current formal technology transfer system is based on one interpretation of the Bayh–Dole Act of 1980. Related research finds that knowledge dissemination is typically conceptualized by both practitioners and scholars as a relatively linear process that includes invention disclosure, patenting, and licensing—including licensing to new spinoff companies established by faculty and students.<sup>103</sup> Patents serve as a mechanism for appropriating new knowledge and disclosing it to society and, thus, act as a type of proxy for knowledge dissemination.<sup>104</sup> This formal transfer of technology has led to numerous innovations in the form of new products and processes and, at least as related to university spinoffs, has made modest but important contributions to regional economies through the development of new technologies, employment, and wealth creation.<sup>105</sup>

### 3. *Informal University Technology Transfer to Industry*

While formal technology transfer has evolved substantially over the past 35 years, informal technology transfer (beyond the aforementioned knowledge dissemination mechanisms) has occurred for far longer. Professors Nelson, Sampat, and Ziedonis found substantial evidence of various forms of university technology transfer, including formal and informal mechanisms, occurring long before the passage of the Bayh–Dole Act.<sup>106</sup>

Informal technology transfer has long been important within the context of innovation, with patenting and licensing typically among the least important mechanisms for disseminating knowledge. For example, recent research finds that the most important mechanisms for knowledge transfer from universities include (in order): scientific output (typically transferred in the form of publications

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102. MCDOWELL, *supra* note 54, at 3–14.

103. See Bradley et al., *supra* note 4, at 575.

104. Hall et al., *supra* note 89, at 376–77.

105. For example, AUTM reported that 818 university spinoff companies were established in 2013, with more than 4,200 established over the course of the past 30 years remaining in operation. These activities have resulted in significant benefits for several universities: \$12.5 billion in net licensing income since 2009, \$2.8 billion in 2013 alone. See AUTM, *supra* note 25, at 11, 32.

106. MOWERY ET AL., *supra* note 8, at 35–57

and conference presentations), informal contact with faculty and students, connections to future employees (students), and collaborative and contract research, with patenting and licensing ranking last.<sup>107</sup> These findings were duplicated in a study conducted by Professor Cohen and his colleagues, who found that publications, open scientific communication, and consulting are the ways that firms most benefit from university research; patents and licensing rank last.<sup>108</sup> In addition, an MIT study found that only seven percent of knowledge transfer is accomplished through the use of patents; publication and other channels are more important vehicles for sharing knowledge.<sup>109</sup>

In related lines of research, Professors Albert Link, Donald Siegel, and Barry Bozeman refer to formal technology transfer as an instrument of law, whereas, with informal technology transfer, property rights play a secondary (if not negligible) role.<sup>110</sup> In support of their inquiry, they conceive of informal technology transfer as faculty (1) working directly with industry personnel to transfer or commercialize technology, (2) consulting to an industrial firm (if separate), or (3) co-authoring with an individual from industry.<sup>111</sup> They find that informal technology transfer is a function of academic seniority, especially tenure, and access to extramural research funding.<sup>112</sup>

Other scholars suggest that informal technology transfer may be a result of faculty malfeasance through so-called “out-the-back-door” patenting, another method of informal technology transfer that does not necessarily utilize formal university technology transfer mechanisms.<sup>113</sup> Specifically, Professors Markman, Giodonis, and Phan found that, within their sample, 42 percent of university scientists awarded patents bypassed their institution (i.e. they did not assign their patent to their home university), with 33 percent of patents originating in universities assigned to private companies

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107. Rudi Bekkers & Isabel Maria Bodas Freitas, *Analysing Knowledge Transfer Channels Between Universities and Industry: To What Degree Do Sectors Also Matter?*, 37 RES. POL'Y 1837, 1843 (2008).

108. See Wesley M. Cohen et al., *Industry and the Academy: Uneasy Partners in the Cause of Technological Advance*, in CHALLENGES TO RESEARCH UNIVERSITIES 171, 179 (Rodger G. Noll ed., 1998); see also Jeannette Colyvas et al., *How Do University Inventions Get into Practice?*, 48 MGMT. SCI. 61, 68 (2002); Cohen et al., *supra* note 92, at 17.

109. Ajay Agrawal & Rebecca Henderson, *Putting Patents in Context: Exploring Knowledge Transfer from MIT*, 48 MGMT. SCI. 44, 45–46, 48 (2002).

110. Albert N. Link et al., *An Empirical Analysis of the Propensity of Academics to Engage in Informal University Technology Transfer*, 16 INDUSTRIAL & CORP. CHANGE 641 (2007).

111. *Id.*

112. *Id.*

113. Gideon D. Markman et al., *Full-Time Faculty or Part-Time Entrepreneurs*, 55 IEEE TRANSACTIONS ON ENG'G MGMT. 29, 29 (2008).

(as opposed to being licensed by the university to these companies).<sup>114</sup> Other research finds similar results: Professors Thursby, Fuller, and Thursby find that only 62.4 percent of patents among a sample of faculty researchers are assigned solely to universities, with 26 percent of patents in the sample assigned to other firms, one third (8.6 percent) of which are assigned to firms where the faculty inventor is principal.<sup>115</sup>

According to the literature, these findings may be interpreted in a number of ways, including faculty ignorance<sup>116</sup> and cultural “dissonance.”<sup>117</sup> Another possibility is that many TTOs regularly reject disclosed university technology for the purposes of patenting and, thus, return the technology back to the original inventor.<sup>118</sup> Further, because university technology is at such an early stage, it requires additional development. Recent research finds that the main reason why university technology is not patented is that disclosed technologies are “non-patentable.”<sup>119</sup> Research also shows that even the efficacy of formal technology transfer is dependent on the involvement of the inventing faculty members; many licensing agreements include consulting provisions for faculty work with licensees so they may fully understand varying nuances related to the technology and, therefore, transfer it more fully.<sup>120</sup> In summary, the Patent-Centric Linear Model represents only one of multiple pathways for the dissemination of new knowledge.

#### IV. SOCIAL RESPONSIBILITIES RELATED TO UNIVERSITY TECHNOLOGY TRANSFER

Beyond the university’s social responsibility mission of knowledge creation and dissemination, two components of socially responsible technology transfer remain: the legal component and

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114. *Id.* at 33–34.

115. Jerry Thursby et al., *US Faculty Patenting: Inside and Outside the University*, 38 RES. POL’Y 14, 15, 18 (2009).

116. See, e.g., Nicola Baldini et al., *To Patent or Not to Patent? A Survey of Italian Inventors on Motivations, Incentives, and Obstacles to University Patenting*, 70 SCIENTOMETRICS 333, 348–50 (2007).

117. See Bercovitz & Feldman, *supra* note 81, at 83.

118. See Bradley et. al, *supra* note 4, at 579–80. Though the phenomenon is not well studied in the literature, refusing to patent disclosed technology, thus reverting back to the inventor (and, in the process notifying the sponsoring agency) is a relatively common practice. Markman et al., *supra* note 113, at 32 (acknowledging this possibility and listing it as a factor for which they are unable to account in their research).

119. Nicola Baldini, *University Patenting: Patterns of Faculty Motivations*, 23 TECH. ANALYSIS & STRATEGIC MGMT. 103 (2011).

120. Thursby et al., *supra* note 115; Phone Interview with Mark Cromwell, former AUTM President and Technology Licensing Officer, University of Virginia and University of North Carolina (July 11, 2012).

the discretionary component of analyzing social responsibility. The following sections examine these legal and discretionary responsibilities in greater depth.

A. *Legal Facets of Social Responsibility Relating to Technology Transfer*

1. *Non-Profit Status of Universities*

Society has bestowed certain benefits on higher education to encourage and support the social mission of colleges and universities. Fundamental to these benefits is Treasury Regulation § 1.501(c)(3)-1, which designates education institutions that meet certain criteria as not-for-profit, tax-exempt organizations.<sup>121</sup> This section examines the criteria that specifically apply to a research university's status as a scientific organization. Professor Peter Blumberg has highlighted specific Treasury Regulations that apply to the scientific mission of research universities: "[A] scientific organization must be organized and operated in the public interest . . . therefore, the term scientific, as used in section 501(c)(3), includes the carrying on of scientific research in the public interest."<sup>122</sup>

The Treasury Regulations define three criteria that may fulfill the public interest specification: first, when research results are made available to the public on a nondiscriminatory basis; second, when the research is performed for the United States or other political subdivision; or third, when the research is directed toward benefitting the public.<sup>123</sup> The regulations further elaborate upon what constitutes scientific research "benefitting the public," including: (1) the scientific education of college or university students; (2) publication in a treatise, thesis, or trade publication; (3) research carried on for the purpose of discovering a cure for a disease; and (4) research oriented toward the development of a geographic area.<sup>124</sup>

In short, a research university's "formal" responsibility to society, under Treasury Regulations, is congruent with the traditional ideals of academic science that favor open unfettered investigation,

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121. 26 C.F.R. § 1.501(c)(3)-1 (as amended in 2014).

122. Peter D. Blumberg, Comment, *From "Publish or Perish" to "Profit or Perish": Revenues from University Technology Transfer and the § 501(C)(3) Tax Exemption*, 145 U. PA. L. REV. 89, 105 (1996).

123. 26 C.F.R. § 1.501(c)(3)-1.

124. *Id.*



open publication, and the wide dissemination of new knowledge.<sup>125</sup> Guidelines that scientific research be substantially related to the education of “college or university students” comport with the training and education goals of, for example, National Science Foundation (“NSF”) or National Institutes of Health (“NIH”) academic research grants.<sup>126</sup> Finally, the emphasis on publication suits traditional norms, while “the development of a geographic area” sounds remarkably similar to what one might consider a regional economic and social development strategy.

Courts have provided further guidance regarding the “public purpose” criterion for the tax-exempt status of higher education institutions, with *Bob Jones University v. United States*<sup>127</sup> perhaps among the most influential cases. In *Bob Jones University*, the IRS denied the university tax-exempt status due to practices that were deemed to endorse certain forms of racial discrimination; the IRS’s action was upheld by the Supreme Court in an 8–1 decision.<sup>128</sup>

Writing for the majority, Chief Justice Burger articulated: “Government has a fundamental, overriding interest in eradicating racial discrimination in education . . . [which] substantially outweighs whatever burden denial of tax benefits places on [the University’s] exercise of [its] religious beliefs.”<sup>129</sup> The Court stated, however, that its holding dealt “only with religious schools—not with churches or other purely religious institutions.”<sup>130</sup> Of interest here are discussions relating to the purpose and benefits provided to society by non-profit, educational institutions: “[I]n enacting . . . [tax code Section] 501(c)(3), Congress sought to provide tax benefits to charitable organizations, to encourage the development of private institutions that serve a useful public purpose or supplement or take the place of public institutions of the same kind.”<sup>131</sup> Justice Burger continued: “Charitable exemptions are justified on the basis that the exempt entity confers a public benefit—a benefit which the society or the community may not itself choose or be able to provide, or which supplements and advances the work of public institutions already supported by tax revenues.”<sup>132</sup>

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125. ROBERT K. MERTON, *THE SOCIOLOGY OF SCIENCE: THEORETICAL AND EMPIRICAL INVESTIGATIONS* 203, 268–78 (1973).

126. See, e.g., *NSF at a Glance*, NAT’L SCI. FOUND., <http://www.nsf.gov/about/glance.jsp> (last visited Dec. 11, 2015).

127. *Bob Jones Univ. v. United States*, 461 U.S. 574 (1983).

128. *Id.* at 577.

129. *Id.* at 604.

130. *Id.* at 604 n.29 (emphasis omitted).

131. *Id.* at 587–88.

132. *Id.* at 591.

*Bob Jones University*, among other cases like it,<sup>133</sup> not only provided clarification for the Treasury Regulations' "public benefit" clause, it also suggested that limits exist to the tax-exempt status of higher education organizations. While the overall non-profit status of colleges and universities is unlikely at risk, rapidly growing revenues from a variety of sources, including college sports and technology licensing revenues, could be subject to the IRS unrelated business income tax ("UBIT").<sup>134</sup> UBIT was introduced in 1950, largely motivated by the concern that allowing non-profit organizations "to operate businesses tax-free would result in a reduction of corporate tax revenues" that otherwise would be collected from these businesses if they operated in for-profit form."<sup>135</sup>

On the contrary, Professor John Colombo finds no theoretical (or legal) reasons that colleges and universities should not be exempt from taxation based on revenues earned from sports.<sup>136</sup> However, there may be policy reasons that lead Congress to use the tax code to affect specific purposes and, thus, there is no reason why it "should not attach special rules regarding continuing this tax-favored treatment for college athletics to affect public policy goals."<sup>137</sup> Similarly, Professor Blumberg suggests that formal technology transfer practices, especially the exclusive licensing of university technologies to single companies, seem to serve little purpose other than to generate revenues for research universities.<sup>138</sup> While revenues are not inherently negative, revenue-driven activities present an operational risk, especially when they may impede other public benefits (such as open publication) stipulated in the Treasury Regulations. These activities may attract unwanted attention among government regulators and may, therefore, be subject to the UBIT or legal challenges relating to a university's tax-exempt status.<sup>139</sup>

Critics have long argued for "academic exceptionalism" as it relates to IP protection. Academic exceptionalism is the idea that universities should be treated differently, especially related to the "experimental" or "fair use" of IP, to further their research mission

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133. See, e.g., *Iowa IIT Research Inst. v. United States*, 9 Cl. Ct. 13 (1985); *Iowa State Univ. of Sci. & Tech. v. United States*, 500 F.2d 508 (Ct. Cl. 1974).

134. John D. Colombo, *The NCAA, Tax Exemption, and College Athletics*, 2010 U. ILL. L. REV. 109, 109.

135. *Id.* at 115.

136. *Id.* at 117.

137. *Id.* at 155.

138. Blumberg, *supra* note 122, at 128.

139. *Id.* at 108; see David Voreacos, *Princeton Loses Appeal in Bid to Dismiss Tax-Exemption Suit*, BLOOMBERG BUSINESS (Apr. 21, 2015, 3:08 PM), <http://www.bloomberg.com/news/articles/2015-04-21/princeton-loses-appeal-in-bid-to-dismiss-tax-exemption-lawsuit>.

and unique role in society.<sup>140</sup> As an increasing number of universities adopted the current technology transfer paradigm, however, so withered the legitimacy of those arguments in the eyes of the law, as demonstrated by *Madey v. Duke University*.<sup>141</sup> In *Madey*, researcher John Madey became the head of Duke's Free Electron Lab, bringing with him several patents he had filed for on his own.<sup>142</sup> After almost a decade of running the lab, Duke removed him from the position; Madey later resigned from his academic job in 1998.<sup>143</sup>

After Madey's departure, the University continued to use most of the equipment in his lab.<sup>144</sup> Madey sued, claiming that Duke infringed on several of his patents—Duke invoked the “experimental use” defense.<sup>145</sup> The trial court initially ruled in favor of the University, but the United States Court of Appeals for the Federal Circuit reversed.<sup>146</sup> The appellate court held that Duke's use of Madey's patented laser “unmistakably further[s] [Duke's] legitimate business objectives, including educating and enlightening students and faculty participating in these projects.”<sup>147</sup> The opinion further noted: “Duke . . . like other major research institutions of higher learning, is not shy in pursuing an aggressive patent licensing program from which it derives a not insubstantial revenue stream.”<sup>148</sup>

In other words, Duke's non-profit status was immaterial to the court's decision because, in this case, the IP in question furthered Duke's “business objectives.” Use of this term—similar to the UBIT—connotes that the benefits bestowed on the not-for-profit sector are not contingent on an organization's Section 501(c)(3) designation *per se*, but are instead contingent on the overall intent and impact of its actions. By the late 1990s, most major research universities (including Duke) had established TTOs and were patenting, licensing, and collecting revenues on publicly funded technologies.<sup>149</sup> The courts found that universities cannot have it both ways; according to Professor Peter Lee, “[a]fter *Madey*, universities and

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140. Peter Lee, *Patents and the University*, 63 DUKE L. J. 1, 25–26 (2013).

141. *Madey v. Duke Univ.*, 307 F.3d 1351 (Fed. Cir. 2002).

142. *Id.* at 1352.

143. *Id.* at 1352–53.

144. *Id.* at 1353.

145. *Id.* An experimental use exception is an ancient judicial doctrine originating from *Whittemore v. Cutter*, 29 F. Cas. 1120 (C.C.D. Mass. 1813). The current exception holds that use of patented investigations for purposes of “amusement, to satisfy idle curiosity, or for strictly philosophical inquiry” do not infringe. *Madey*, 307 F.3d at 1362.

146. *Madey*, 307 F.3d at 1352.

147. *Id.* at 1362.

148. *Id.* at 1362 n.7.

149. See DENNIS PATRICK LEYDEN & ALBERT N. LINK, PUBLIC SECTOR ENTREPRENEURSHIP: U.S. TECHNOLOGY AND INNOVATION POLICY 82–83 (2015).

their scientists largely lost whatever privileged normative status they may have enjoyed, particularly their claim to disinterested stewardship of knowledge in the public interest.”<sup>150</sup>

## 2. *Legal Obligations Under the Bayh–Dole Act*

The Bayh–Dole Act provides a broad, legal framework regarding the treatment of inventions resulting from federally funded research. First, non-profit universities must ensure that the inventor (faculty researcher) discloses “each subject invention” to “contractor personnel responsible for patent matters” and that this disclosure is reported to the respective federal funding agency within two months of when the disclosure is made.<sup>151</sup> Disclosure reports list the inventor and research grant under which the disclosure was made, a detailed description of the invention, as well as manuscripts associated with the invention either submitted for publication or published.<sup>152</sup> Second, the university must elect, in writing, whether or not it chooses to retain title to the disclosed invention.<sup>153</sup> If the university decides to retain title, it must file a patent on the invention and grant the government a nonexclusive, nontransferable, irrevocable, paid-up license to the invention and agree to share a portion of any resulting royalties with the inventing scientist.<sup>154</sup>

If the university does not elect to take title, the government may choose to do so, although this happens infrequently.<sup>155</sup> If the government does retain title, the university is granted a nonexclusive, royalty-free license.<sup>156</sup> If the government does not claim title, the faculty can petition the government agency for ownership, a request that is normally granted.<sup>157</sup>

The Bayh–Dole Act further stipulates that colleges and universities must ensure that government interests are protected. To this end, universities must agree to: (1) confirm the government’s right to the invention, (2) require their employees to disclose inventions stemming from federally funded research, (3) execute all papers necessary to file patent applications on subject inventions and to establish the government’s rights to the subject inventions (if the

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150. Lee, *supra* note 140, at 58.

151. 37 C.F.R. § 401.14(c)(1) (2002).

152. *Id.*

153. 37 C.F.R. § 401.14(c)(2).

154. 37 C.F.R. § 401.14(a)(6).

155. 37 C.F.R. § 401.14(d); see also Pat K. Chew, *Faculty-Generated Inventions: Who Owns the Golden Egg?*, 1992 WIS. L. REV. 259, 294–95.

156. 37 C.F.R. § 401.14(e)(1).

157. 37 C.F.R. § 401.14.

universities elect to take this route), (4) provide guidance to employees regarding the procedure and timelines associated with the filing of patent applications (again, if this route is taken), (5) notify the sponsoring agency if plans exist to abandon or not defend their patents (if patents are obtained), and (6) include on any patent application filed within the U.S. an acknowledgement to the agency source and the related identifier (grant or contract number).<sup>158</sup>

### 3. *Stanford v. Roche*

In *Board of Trustees of Leland Stanford Junior University v. Roche Molecular Systems, Inc.*,<sup>159</sup> the Supreme Court provided legal clarity to the statutory requirements of the Bayh–Dole Act. In that case, Cetus, a small biotechnology company, developed methods for detecting HIV/AIDS levels within the human bloodstream.<sup>160</sup> In 1988, Cetus began to collaborate with scientists at Stanford University, including Dr. Mark Holodniy.<sup>161</sup> Prior to making use of Cetus facilities, Dr. Holodniy signed a confidentially agreement with the company, whereby he agreed to assign inventions stemming from his work to the company.<sup>162</sup> After completing his research assignment with Cetus, Holodniy returned to Stanford and continued to develop HIV tests, assigning his work to Stanford, which filed for and was awarded three patents for technologies stemming from his research.<sup>163</sup>

The HIV/AIDS diagnostic kits developed by Cetus (later acquired by Roche Pharmaceuticals) are sold and used all over the world.<sup>164</sup> Following an investigation, Stanford filed suit against Roche claiming that the company's HIV kits infringed on patents held by the university.<sup>165</sup> Roche, on the other hand, claimed that Holodniy's agreement with Cetus gave it co-ownership of the procedure and, therefore, Stanford lacked standing to sue for patent infringement.<sup>166</sup> Stanford, in turn, claimed that Holodniy had no right to assign his work because the University was given superior ownership rights under the Bayh–Dole Act.<sup>167</sup>

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158. 37 C.F.R. § 401.9.

159. *Bd. of Trs. of the Leland Stanford Junior Univ. v. Roche Molecular Sys., Inc.*, 131 S. Ct 2188 (2011).

160. *Id.* at 2192.

161. *Id.*

162. *Id.*

163. *Id.*

164. *Id.*

165. *Roche Molecular Sys., Inc.*, 131 S. Ct. at 2193.

166. *Id.* at 2193.

167. *Id.*

While the district court agreed with Stanford, the United States Court of Appeals for the Federal Circuit did not, concluding that the Bayh–Dole Act did not automatically void an inventor’s constitutionally guaranteed rights to inventions, and, thus, Holodniy’s assignment to Cetus (Roche) was legitimate.<sup>168</sup> The case was accepted for review by the Supreme Court, which also found for the defendant, Roche.<sup>169</sup>

The Supreme Court took issue with Stanford’s contention that the “invention of the contractor” articulated within the Bayh–Dole Act included all inventions made by contractor (university) employees with the aid of federal funds. In response, Roberts wrote: “That reading assumes that Congress subtly set aside two centuries of patent law in a statutory definition. This Court has rejected the idea that mere employment is sufficient to vest title to an employee’s invention in the employer.”<sup>170</sup> Finally, the Court found that Section 202(a), which states that “contractors may ‘elect to retain title,’ confirms that the Act does not vest title.”<sup>171</sup> Writing for the majority, Chief Justice Roberts stated: “The Bayh–Dole Act does not confer title to federally funded inventions on contractors or authorize contractors to unilaterally take title to those inventions.”<sup>172</sup>

The practical, immediate impact of the *Stanford* ruling was that universities across the country reviewed and revised their employment contracts to ensure they covered various IP assignment contingencies related to the case.<sup>173</sup> More notable, however, are the legal implications of *Stanford* relating to knowledge dissemination. Justice Breyer’s dissent in *Stanford* provides valuable context, acknowledging that IP policies should be used to promote knowledge dissemination:

The importance of assuring this community “benefit” is reflected in legal rules that may deny or limit the award of patent rights where the public has already paid to produce an invention, lest the public bear the potential costs of patent protection where there is no offsetting need for such protection to elicit

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168. *Id.* at 2194.

169. *Id.*

170. *Id.* at 2190.

171. *Roche Molecular Sys., Inc.*, 131 S. Ct. at 2197.

172. *Id.* The Court also found that Bayh–Dole did not grant “automatic ownership” to universities (though they might have), “Congress has in the past divested inventors of their rights in inventions by providing unambiguously that inventions created pursuant to certain specified federal contracts become the Government’s property. Such unambiguous language is notably absent from the Bayh–Dole Act.” *Id.* at 2190.

173. CARY NELSON ET AL., DEFENDING THE FREEDOM TO INNOVATE: FACULTY INTELLECTUAL PROPERTY RIGHTS AFTER *STANFORD V. ROCHE* 8 (2014).

that invention. Why should the public have to pay twice for the same invention?<sup>174</sup>

In other words, Justice Breyer's concern in *Stanford* was that individual university faculty may ignore their employment contract and dispose of (their) IP in ways that do not conform to the original intent of Congress in passing Bayh–Dole. Justice Breyer assumed that universities would generally have the interests of society in mind in their IP management decisions, no doubt the original motivating intent of the Bayh–Dole Act:

I agree with the majority that the Act does not simply take the individual inventors' rights and grant them to the Government. Rather, it assumes that the federal funds' recipient . . . will possess those rights. The Act leaves those rights in the hands of that recipient . . . for a special public policy reason. In doing so, it seeks to encourage those institutions to commercialize inventions that otherwise might not realize their potentially beneficial public use. The Act helps assure that commercialization . . . by imposing a set of conditions upon the federal funds recipient, by providing that sometimes the Government will take direct control of the patent rights, and by adding that on occasion the Government will permit the individual inventor to retain those rights."<sup>175</sup>

In other words, Justice Breyer articulates that the legislative goal of Bayh–Dole is “commercialization,” but does not offer any strictures as to how this would best be accomplished other than to say that this should be the responsibility of a university (or small business).

Thus, *Stanford* not only provides legal clarification of Bayh–Dole, it also highlights the substantial autonomy that colleges and universities have been given under the law to fulfill their fiduciary responsibility for disseminating knowledge.

### *B. Discretionary Elements of University Technology Transfer*

To explore the discretion afforded by the current federal legal framework articulated above,<sup>176</sup> this section draws heavily from a

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174. *Roche Molecular Sys., Inc.*, 131 S. Ct. at 2200–01 (Breyer, J., dissenting).

175. *Id.* at 2201 (citations omitted).

176. The impact of state laws and policies on university technology transfer, an area of potential interest and impact, is beyond the scope of this article.

comprehensive review of university technology transfer literature.<sup>177</sup> The prevailing policy rhetoric, supported by the extant economics and technology policy literature, tends to view technology transfer as a “linear process” or “traditional model” dominated by a disposition that promotes patent filing, licensing, and revenue generation.<sup>178</sup> A cursory scan of the legal scholarship finds little attention paid to policy alternatives that do not favor patenting, though authors have recently explored unique approaches such as open licensing.<sup>179</sup>

A comprehensive review of the literature finds that commentators have lamented that the linear model is at best simplistic and at worst incorrect.<sup>180</sup> While several alternatives to the current Bayh–Dole framework have been suggested,<sup>181</sup> this article focuses on alternatives available to universities *within* the current federal framework articulated above.<sup>182</sup>

### 1. *Do Nothing Beyond “Protecting Government Interests”*

Though rarely discussed in debates surrounding the dissemination of university knowledge, one option under Bayh–Dole is to simply “do nothing” beyond adhering to the aforementioned disclosure requirements. As long as government interests are protected, there is no reason why universities could not notify the respective funding agency that they do not intend to claim ownership. As discussed, the government agency would then need to decide whether or not to protect this intellectual property or allow it to revert back to the inventor.<sup>183</sup> This practice occurs when university inventions are of little immediate commercial value and patent filing and

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177. See Bradley et al., *supra* note 4, at 575.

178. *Id.* at 572; Chew, *supra* note 155, at 259. According to Chew, the university believes that to comply with these regulations, it must own the inventions. *Id.* at 293. For example, the university presumably supposes that one of the instruments necessary to confirm the government’s right is a university policy assuring university ownership. *Id.* at 295.

179. See Amy Kapczynski et al., *Addressing Global Health Inequities: An Open Licensing Approach for University Innovations*, 20 BERKELEY TECH. L.J. 1031 (2005).

180. See, e.g., Bradley et al., *supra* note 4, at 609.

181. See, e.g., Robert E. Litan et al., *Commercializing University Innovations: Alternative Approaches*, 8 INNOVATION POL’Y & THE ECON. 31, 33 (2008).

182. I draw heavily from Figure 5.1. Bradley et al., *supra* note 4, at 621.

183. Chew, *supra* note 155, at 278. If the university does not elect to take title, the government may take title. In practice, the government claims title infrequently, such as in cases where the invention supplements, parallels, or otherwise contributes to the research that the agency already is conducting or sponsoring. If the government does not claim, then the faculty can petition the government agency for ownership and these are normally granted. The procedure gives title to the faculty *only* after both university and government reject it. 35 U.S.C. § 202(d) (2012); 37 C.F.R. § 401.14(b) (2004).



maintenance costs are high.<sup>184</sup> This also happens when a funding agency deems research critical to the advance of science. For example, Professor Peter Lee discussed the efforts by the NIH during the Human Genome Project to discourage grant recipients from patenting DNA sequences and keep findings within the public domain.<sup>185</sup>

## 2. *Faculty-as-Owner Paradigm*

Universities could easily choose to solely allow faculty to own their own inventions regardless of whether or not such inventions stem from federal funds. Inventors initially hold title to an invention made with federal support and then assign title to the university pursuant to linear model interpretations of Bayh–Dole. The *Stanford* ruling showed that universities could just as easily *not* require faculty and staff to assign their IP to the institution. Several other commentators also advocate faculty ownership (so-termed “faculty free agency”) as an alternative to the Patent-Centric Linear Model of technology transfer.<sup>186</sup>

A common retort to the faculty ownership option is that university ownership is required in order to ensure compliance with the legal requirements of Bayh–Dole.<sup>187</sup> Of course, this rationale does not logically account for the IP that universities do not claim (albeit after intensive administrative review). These arguments also assume that faculty will patent their inventions. First, Professor Pat Chew finds that if faculty members choose to patent their invention, regulations could be in place to ensure that these individuals file the paperwork required to grant the government its derivative rights.<sup>188</sup> However, similar to universities, faculty could choose not to pursue IP protection, and instead disseminate the results via traditional publication and by working with groups outside the university to best utilize the results of their research.

Another option is for universities to explore with agencies how they might assign patents developed by the university to faculty inventors, companies, or non-profit organizations on their behalf. Bayh–Dole stipulates that patents developed with federal funds cannot be assigned without the approval of the federal agency that

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184. Phone Interview with Dana Bostrom, former Technology Transfer Office at Portland State University, University of California–Berkeley, and University of Washington (Dec. 12, 2014).

185. Lee, *supra* note 140, at 84.

186. See NELSON ET AL., *supra* note 173, at 11; see also Litan et al., *supra* note 181, at 50.

187. Chew, *supra* note 155, at 293.

188. *Id.* at 296.

provided those funds, unless “assignment is made to an organization which has as one of its primary functions the management of inventions.”<sup>189</sup> Bayh–Dole does not define what this means. However, given the possibilities discussed in these sections, management of invention alternatives that would improve the chances of knowledge dissemination could certainly be explored. Regardless of the vehicle, the practice of faculty ownership within the higher education context is admittedly rare. However, it is a practice employed by Waterloo University in Canada, considered one of the most innovative universities in the world.<sup>190</sup>

### 3. *University-as-Owner Paradigm*

Colleges and universities could continue to mandate the ownership of faculty patent rights as a general condition of employment. As a starting point, Professor Chew outlines a conceptual framework to explain the degree to which universities claim ownership of faculty IP (assuming they do), including the following approaches:

- *Resource provider*: Invention IP assignment depends on the “significant use” of university resources in its creation. This approach is based on the notion that “the university is entitled to ownership only if it significantly contributes to its development.”<sup>191</sup> University resources are broadly interpreted and may include the following: (direct) research funding provided by the university, university facilities, university support personnel, and projects from specific sponsors (e.g. federally funded research).<sup>192</sup>
- *Maximalist*: Universities claim ownership of IP resulting from (1) the course of the faculty’s employment and (2) from the faculty’s use of university resources.<sup>193</sup> This approach goes beyond the “significant use” requirement above to include university work, including research, teaching, and administrative activity.<sup>194</sup> Faculty work schedules are unpredictable compared to other professions and, thus, “work time” may be broadly interpreted

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189. 35 U.S.C. § 200 (2012).

190. Allison Bramwell & David A. Wolfe, *Universities and Regional Economic Development: The Entrepreneurial University of Waterloo*, 37 RES. POL’Y 1175, 1179 (2008).

191. Chew, *supra* note 155, at 276–77.

192. *Id.* at 277.

193. *Id.*

194. *Id.* at 278.

to include activities such as academic conferences and community projects.<sup>195</sup>

- *Super-maximalist*: A university claims ownership of any invention developed by faculty whether or not the faculty use university resources or develop an invention during the course of employment.<sup>196</sup>

While Professor Chew's framework has not been tested empirically, it nonetheless presents a useful way to understand that, even under the university-as-owner paradigm, universities have significant latitude relating to the extent to which they claim faculty IP.

If a university obtains a patent, then it can also decide how it chooses to license it. At one extreme, a university can choose to exclusively license its patent to a single organization. The University of Wisconsin's exclusive licensing of its entire line of stem cells to the biotechnology company Geron is a frequently cited example.<sup>197</sup> This is a common practice for a number of reasons, including demands by licensees that exclusivity is needed for commercialization, especially related to drug development. Increasingly, many universities also will not patent an invention unless another organization will pay for the patent costs.<sup>198</sup> It is thus reasonable to assume that under these conditions the licensee would expect IP exclusivity. Patents are frequently licensed exclusively to faculty and student companies spun off of the university.<sup>199</sup> Finally, exclusive licenses might be used on the premise that they may generate more revenue for the university.

Universities can also choose to license patents non-exclusively. Non-exclusive licensing generally ensures that inventions are widely available to multiple organizations. The aforementioned Boyer-Cohen patents demonstrate that non-exclusive licensing has been successful in both generating revenue and ensuring broad availability of discoveries, including those largely credited for the emergence of the biotechnology industry.<sup>200</sup> Further, the NIH has

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195. *Id.* at 278–79.

196. *Id.* at 280.

197. See, e.g., Arti K. Rai & Rebecca S. Eisenberg, *The Public Domain: Bayh-Dole Reform and the Progress of Biomedicine*, 66 LAW & CONTEMP. PROBS. 289, 301 (2003).

198. Interview with Mark Cromwell, *supra* note 120.

199. Mark Edwards et al., *Gold in the Ivory Tower: Equity Rewards of Outlicensing*, 24 NATURE BIOTECH. 509 (2006).

200. Kenney & Patton, *supra* note 27, at 1416.

encouraged and in many cases required its grantees to widely license patented research tools and genomic inventions, especially for further academic investigation.<sup>201</sup>

Universities can choose to differentiate their licensing practices depending on their goals and the intent of their licensees. For example, commentators recently proposed “equitable access” and “neglected disease” licensing approaches.<sup>202</sup> The former includes a provision in university licensing agreements to large companies that would give third parties the freedom to use the licensed technology (or any derivative product) in order to improve public health within the developing world.<sup>203</sup> The latter would grant a research exception to those engaged in global health research of tropical and neglected diseases: the freedom to use and improve upon proprietary university technologies.<sup>204</sup>

Finally, under the university ownership model, Professor Jacob Rooksby discusses the decision among universities *not* to enforce their patents (through prosecution)—or, at a minimum, their failure to anticipate and prepare for the possibility.<sup>205</sup> One possibility is for the university to voluntarily choose not to defend their patents, raising the question of why the university patented in the first place.<sup>206</sup> A second possibility, discussed by Professor Rooksby, is that universities may be added involuntarily to third-party patent infringement cases when licensees are involved in patent lawsuits.<sup>207</sup> The latter case may be less of a “choice,” but it is a possible outcome under the university-as-owner paradigm.

#### 4. *Third Party Assignment of Patents to Organizations Outside the University*

There is no prohibition against third-party assignment of patents so long as (1) one of the functions of the organization is “the management of inventions” or (2) the university has agency approval.<sup>208</sup>

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201. Lee, *supra* note 140, at 84.

202. Kapczynski et al., *supra* note 179, at 1091, 1109.

203. This approach has been suggested by so-called product development partnerships (PDPs), organizations devoted to accelerating the development of efficacious vaccines to prevent tropical diseases in the developing world. See Christopher S. Hayter & Muhammad Azfar Nisar, *Spurring Vaccine Development for the Developing World: A Collaborative Governance Perspective on Product Development Partnerships* (Ariz. State Univ., Working Paper, 2015).

204. Kapczynski et al., *supra* note 179, at 1041.

205. See Jacob H. Rooksby, *Innovation and Litigation: Tensions Between Universities and Patents and How to Fix Them*, 15 YALE J.L. & TECH. 312, 328 (2013).

206. Hall et al., *supra* note 89, at 4, 9.

207. Rooksby, *supra* note 205, at 326, 368.

208. 37 C.F.R. § 401.14(k)(1).

In other words, a university can contract with (or transfer title to) another entity that manages those patent rights on the owner's behalf.<sup>209</sup> Professor Rooksby finds that this section of Bayh–Dole arguably was intended to cover separately incorporated research and patent foundations closely affiliated with universities, and, in practice, this type of third-party assignment happens frequently.<sup>210</sup> For example, at the University of Wisconsin–Madison, the Wisconsin Alumni Research Foundation (“WARF”)—an organization affiliated with but legally distinct from the university—“has first right to retain title to any inventions conceived or made in whole or in part during federally funded [research].”<sup>211</sup>

However, as Professor Rooksby points out, this provision also allows universities to assign patent rights to so-called Patent Assertion Entities (“PAEs”), organizations created for the sole purpose of monetizing acquired patents by asserting infringement claims against others.<sup>212</sup> Recent research by Professors Robin Feldman and Tom Ewing focuses on one such PAE, Intellectual Ventures (“IV”). The authors find that at least fifty universities have sold or licensed their patents (or future patent rights) to IV; the University of California San Diego has agreements with five such shell companies.<sup>213</sup> Many of these universities have also invested in IV or other PAEs as potential revenue sources.<sup>214</sup>

### 5. *Other Options*

Illustrated in Section I above, knowledge dissemination is governed by relatively broad legal and regulatory requirements. The underlying goal of existing legal frameworks is the promotion of knowledge dissemination and innovation. Thus, it is puzzling that so few unique or experimental approaches have been taken (or at-

209. *Id.*

210. See Jacob H. Rooksby, *When Tigers Bare Teeth: A Qualitative Study of University Patent Enforcement*, 46 AKRON L. REV. 169, 205 n.22 (2013).

211. UNIV. WISCONSIN–MADISON, INTELLECTUAL PROPERTY POLICIES AND PROCEDURES FOR UNIVERSITY RESEARCH 5 (2005), <https://kb.wisc.edu/images/group156/32996/12.15IntellectualPropertyPoliciesandProceduresforUniversityResearch.pdf>.

212. See Rooksby, *supra* note 210, at 194–95.

213. Robin Feldman & Tom Ewing, *The Giants Among Us*, 2012 STAN. TECH. L. REV. 1, 31; see also Mark A. Lemley, *Are Universities Patent Trolls?*, 18 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 611, 613 (2008) (asking if universities are patent trolls—non-manufacturing entities that do not themselves make the product or develop technology—and concluding they are not; but that PAEs indeed are).

214. See Feldman & Ewing, *supra* note 213, at app. B.

215. Phone Interview with Gerry Barnett, Director, Research Technology Enterprise Initiative, University of Washington, Bothell, (Mar. 21, 2011).

tempted) with these goals in mind. In other words, aside from several options mentioned above, universities and policymakers could develop innovative new approaches under the current legal frameworks to improve and accelerate knowledge dissemination (not to mention potentially increase revenues).

Professor Gerry Barnett, a former technology transfer officer, has attempted to convince others of this potentiality. Professor Barnett is developing an approach that segments IP rights between their use for research and experimentation and their use to sell a product.<sup>215</sup> Conceivably, universities could usually openly license IP for research or internal use while managing the commercial aspects of licensing on a case-by-case basis. Further, universities might build on recent efforts to create IP “clubs,” whereby companies may pay an annual fee that not only provides users with updates and technical support, but also may only provide an option with a commercial license to sell derivative products. Such an approach would focus attention not on how “commercially valuable” an invention might be, but, rather, whether there is enough interest in specific technologies to attract a critical mass of interested parties necessary to cover patent costs (perhaps buried in club fees) and other infrastructure needed to support this type of endeavor.

Clearly, this represents only one alternative. Other approaches might prioritize entrepreneurship and small businesses. Within the context of the club discussed above, universities might differentiate between in-state and out-of-state companies in an effort to promote regional development. The point is that experimentation is difficult without clear leadership, policy guidance, and shared, articulated responsibilities—but it is certainly possible.

## V. ANALYSIS

This article defines the mission of research universities as the creation and dissemination of new knowledge. This definition is not only well suited to the historical role of research universities, it is also congruent with the legislative intent of the Bayh–Dole Act: to disseminate and commercialize technologies derived from federally funded research, among other sources.<sup>216</sup> A social responsibility framework allows us to focus on *how* research universities fulfill this mission.

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216. See Sampat, *supra* note 8, at 784.

The social responsibility model requires strategic thinking: what mechanisms or combination of mechanisms should a research university employ to fulfill its knowledge dissemination mission? The sections above illustrate that universities have myriad options by which they can meet their social responsibility to quickly and fully disseminate new knowledge. However, research universities have overwhelmingly adopted one specific interpretation of the Bayh-Dole Act, the Patent-Centric Linear Model.<sup>217</sup>

In many cases, individual TTOs may capably handle the management of university technology. But factors internal and external to the model (and university), such as TTO staff turnover, changes in university leadership, changes in patent law, and capability gaps can transform such a linear system into an administrative bottleneck blocking, or at least slowing, the dissemination of early-stage technologies important for economic and social development. Thus, the Patent-Centric Linear Model is socially irresponsible. The next sections articulate the principle reasons why this is the case, including (1) the absence of broader conceptions of university social responsibility, (2) divergent values among TTOs within the context of social responsibility, (3) the Model's misplaced emphasis on patenting, and (4) the importance of social networks for university technology commercialization and the need for policies and programs to reflect this reality.

#### A. *Absence of Broader Conceptions of University Social Responsibility*

As mentioned, only scant literature exists that conceptualizes social responsibility within a higher education context.<sup>218</sup> Little, if any, research explores empirically how faculty, students, or administrators define social responsibility in higher education, not to mention policymakers, community leaders, or the general public. Furthermore, there are few systematic analyses of how, beyond the ubiquitous three-pronged mission of teaching, research, and service, social responsibilities are specifically defined.

Practice-oriented discussions for identifying and fulfilling the social responsibilities of higher education are also lacking. This is not surprising given what Professors Thornton and Jaeger observe in higher education as few common references to social responsibility

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217. See Bradley et al., *supra* note 4, at 574–75.

218. See Hayter, *supra* note 1, at 136.

that can be “cited by biology professors, groundskeepers, and athletic directors alike.”<sup>219</sup> In short, if common visions of social responsibility are not clearly articulated, then it is difficult to understand how social responsibilities are implemented and, therefore, how knowledge is best disseminated beyond academic publication.

This finding has important implications for this article. For CSR—and, thus, the article’s derivative university social responsibility framework—the relationship between social responsibilities and strategy is critical; the efficacy of CSR largely depends on how well it is integrated into core business strategies and practices. A research university is a non-profit education and research organization sanctioned by society to meet certain social responsibilities.<sup>220</sup> However, if the social responsibilities of research universities are not well defined and articulated (and research shows that they are not) then an organizational strategy is unlikely to exist. Therefore, it is not surprising that the Patent-Centric Linear Model conflicts with other university priorities if, for example, “optimal” knowledge dissemination and commercialization has never been defined as an overarching organizational priority.

### *B. Divergent Values Among TTOs*

During the 1970s and 1980s, corporations responded to increasing pressure for more socially responsible behavior by creating separate policies or organizations.<sup>221</sup> While CSR activities have evolved among many companies, a balkanized, “departmental” approach to CSR remains a common practice, if companies have a CSR strategy at all.<sup>222</sup> Designated policies or organizations typically reflect a specific function: corporate foundations oversee philanthropy, positions within human resources promote the hiring of women and minorities, and, more recently, sustainability departments promote more environmentally-friendly practices.<sup>223</sup> Similarly, within the university context, TTOs have been created in response to a specific interpretation of the Bayh–Dole Act primarily

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219. Courtney H. Thornton & Audrey J. Jaeger, *A New Context for Understanding Civic Responsibility: Relating Culture to Action at a Research University*, 48 RES. HIGHER EDUC. 993, 994 (2007).

220. THELIN, *supra* note 35, at 42–43.

221. See Hayter, *supra* note 1, at 140.

222. See Jeremy Galbreath, *Building Corporate Social Responsibility into Strategy*, 21 EUR. BUS. REV. 109, 109–10 (2009).

223. See Hayter, *supra* note 1, at 140.



for the purposes of legislative compliance and revenue generation.<sup>224</sup>

Professor Diane Swanson discusses some of the challenges of the add-on-department approach to social responsibility.<sup>225</sup> First, even when normative values (e.g. knowledge dissemination) exist, the instrumental activities of individual departments may not fit the social responsibility-oriented goals for the company.<sup>226</sup> Further, when core business functions do not serve the goals of an organization making strides towards social responsibility, then it becomes what Professor Swanson terms an “inversion of business and society aims . . . .”<sup>227</sup> Inversion may be especially acute between the IP-protection orientation of a TTO compared to the overall decentralized nature of a research university that thrives on open inquiry, information exchange, and disclosure.<sup>228</sup>

In the present case, the oft-described function of the TTO is formal technology transfer, commercialization, and economic development, functions that are perceived as different and specialized compared to core university functions.<sup>229</sup> Individuals with technology management and legal backgrounds are hired, many of who have never worked within a university environment. Further, TTO personnel have a high degree of responsibility, but are also subject to long hours, high turnover, and changing organizational dynamics.<sup>230</sup> Again, most TTOs do not generate substantial returns, if they break even at all.<sup>231</sup> In short, TTOs are not well integrated into the mainstream operations and culture of most research universities.

Given a lack of operational integration, the Patent-Centric Linear Model is subject to what Professor Swanson calls “normative myopia,” or the perception that larger organizational values are irrelevant to day-to-day decision making—especially if those values

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224. See Thursby et al., *supra* note 115, at 15; see also Jerry G. Thursby et al., *Objectives, Characteristics and Outcomes of University Licensing: A Survey of Major U.S. Universities*, 26 J. TECH TRANSFER 59, 59, 65, 70 (2001).

225. See Swanson, *supra* note 45, at 510.

226. See *id.*

227. *Id.*

228. *Id.*

229. See Bradley et al., *supra* note 4, at 586, 598; see also Interview with Mark Cromwell, *supra* note 120.

230. See generally Bradley et al., *supra* note 4.

231. See Walter Valdivia, *University Start-ups: Critical for Improving Technology Transfer*, CTR. FOR TECH. INNOVATION AT BROOKINGS 6, 9 (Nov. 2013), [http://www.brookings.edu/~media/research/files/papers/2013/11/start-ups-tech-transfer-valdivia/valdivia\\_tech-transfer\\_v29\\_no-embargo.pdf](http://www.brookings.edu/~media/research/files/papers/2013/11/start-ups-tech-transfer-valdivia/valdivia_tech-transfer_v29_no-embargo.pdf).

aren't clear or do not exist, as discussed above.<sup>232</sup> For example, absent guidance to the contrary, TTOs will likely choose to prioritize revenue generation to offset the "losing proposition" of technology transfer at most universities, eschewing other options for disseminating and commercializing new knowledge.

Over time, Professor Swanson observes that misaligned departments become increasingly "immunized" from and resistant to broader organizational goals.<sup>233</sup> Department identities solidify and become more susceptible to vested interests *outside* of the organization.<sup>234</sup> In the case of university technology transfer, with greater autonomy and "immunization," TTOs may be more susceptible to an emergent professional ethos and value definitions manifest in organizations like AUTM.

Interestingly, outside values can become embedded in broader organizational narratives. For example, when asked how universities contribute to the aforementioned "economic development mission," policymakers regularly mention the emergence of the Patent-Centric Linear Model.<sup>235</sup> But of course these statements fail to recognize that other potentially more socially responsible options exist. Thus, with misalignment, it is easy to understand why knowledge filtering occurs in the form of slow or onerous administrative procedures, preferential treatment for the life sciences (compared to disciplines not as well-suited to formal IP protection), lack of technical capability among TTO personnel, and faculty frustrations, including pressures to delay publication.<sup>236</sup>

### C. *Patents Have Limited Utility for Knowledge Dissemination*

Research shows that patents are a critical component of the linear model.<sup>237</sup> This article similarly found that most legal analyses assume that patents are the cornerstone of university technology transfer. However, the transfer of technology (knowledge dissemination) occurs through a multitude of mechanisms, most of which do not require formal IP protection. So why base a university technology management system on patents except to earn licensing revenues?

The traditional purpose of the patent system is to create a potential motivation for innovation by granting individuals a temporary,

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232. See Swanson, *supra* note 45, at 513.

233. See *id.*

234. See *id.*

235. See Rothaermel et al., *supra* note 2, at 708.

236. See Kenney & Patton, *supra* note 27, at 1413.

237. See generally Bradley et al., *supra* note 4, at 571–72.

government-sanctioned monopoly for their inventions in exchange for disclosing the invention to society.<sup>238</sup> However, patents are not required to motivate inquiry and invention within an academic context; university researchers are typically motivated by intellectual curiosity and contributing their findings to the scientific commons, not financial gain *per se*.<sup>239</sup> Further, disclosure via academic publication is the primary output for academic researchers and the currency of achievement and status.<sup>240</sup>

A separate, but related line of research finds that intellectual property, the very mechanism meant to encourage knowledge production, may actually inhibit knowledge dissemination. For example, Professor Richard Nelson argues that scientific knowledge is a latent rather than a pure public good, with its public and private value largely determined by government action.<sup>241</sup> Thus, too little IP protection may dwarf incentives for protection, while too much IP control can increase the social costs associated with restricted use.<sup>242</sup> Economists studying the impacts of patenting have found that patents are a flawed measure of innovative output; particularly because not all new innovations are patented and because patents differ greatly in their economic impact.<sup>243</sup>

Relating to specific patenting practices by industry, Professor Bronwyn Hall and her colleagues found that firms generally rely upon informal IP, not patents, to protect their inventions; and that most firms use no IP at all.<sup>244</sup> The researchers find several reasons for this—the first being the fundamental nature of patents.<sup>245</sup> An invention is only the first step in a complex process in creating a successful innovation, and a patent only describes the latter, not necessarily the former.<sup>246</sup> The second is the nature of industries and the underlying technologies themselves; while patents are important for pharmaceutical and chemical innovation, they are much less important for innovation in other industries. Termed the “patent paradox” by Professors Hall and Ziedonis, companies instead

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238. See Lemley, *supra* note 213, at 621.

239. Rhoten & Powell, *supra* note 74, at 345, 347.

240. See MERTON, *supra* note 125, at 297–324.

241. See Richard Nelson, *Why Do Firms Differ, and Why Does it Matter?* 12 STRATEGIC MGMT. J., 61 71–72 (1991).

242. See Brett M. Frischmann & Mark A Lemley, *Spillovers*, 107 COLUM. L. REV. 257, 283 (2007).

243. See Ariel Pakes & Zvi Griliches, *Patents and R&D at the Firm Level: A First Look* 5 (Nat'l Bureau of Econ. Research, Working Paper No. 561, 1980), <http://www.nber.org/authenticate.library.duq.edu/papers/w0561.pdf>.

244. See Hall et al., *supra* note 89, at 4.

245. See *id.* at 5.

246. See *id.* at 3.

patent for other strategic reasons, including to block competitors, improve their technical reputation, and to improve bargaining power, among other reasons.<sup>247</sup>

In an academic context, challenges associated with IP protection that is “too strong” (i.e. reliant on patents) may be especially acute. First, unlike other countries, the United States does not provide a research exception to patent rights that would allow scientists to further advance knowledge about their invention.<sup>248</sup> Further, most knowledge created in universities is “embryonic,” and thus foundational to future scientific and technical progress; the filtering of new knowledge from colleges and universities substantially increases the social cost of innovation.<sup>249</sup>

Oft-used arguments for the Patent-Centric Linear Model lie in what Professor Mark Lemley terms “commercialization theory”: The act of turning a university technology into a marketable product requires industry investment and, to do this, industry requires exclusivity through patents (and in many cases exclusive patents).<sup>250</sup> Research examining the value of university partnerships to industry finds that patents and licenses generally rank low (or last) compared to other knowledge transfer mechanisms, including informal relationships with faculty and students, publications, and conferences.<sup>251</sup> Moreover, U.S. companies beyond the life science and chemical industries generally prefer other ways of protecting intellectual property, especially trade secrets and rapid innovation.<sup>252</sup>

No doubt a few university technologies, especially in the life sciences, are well suited for patenting and immediate licensing. While “easy” examples are rare, this article does not suggest that patenting is *per se* socially irresponsible. However, within the Patent-Centric Linear Model, TTOs evaluate all invention disclosures to determine whether or not it will patent a specific technology, a right of first refusal for patenting. In addition to the aforementioned challenges, research shows that revenue generation is the primary motivation among TTOs, as universities are increasingly utilizing third-party PAEs, (otherwise known as “trolls”) to monetize patents

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247. See generally Bronwyn H. Hall & Rosemarie Ham Ziedonis, *The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979–1995*, 32 RAND J. OF ECON. 101 (2001).

248. See Rhoten & Powell, *supra* note 74, at 350.

249. See Rai & Eisenberg, *supra* note 197, at 296, 301–02.

250. See Lemley, *supra* note 213, at 621.

251. See Cohen et al., *supra* note 108, at 178–79.

252. See Hall et al., *supra* note 89, at 10–11.

by asserting infringement claims against others.<sup>253</sup> Litigating IP ownership claims is distinct from building social networks between faculty and students and contacts outside the university who can aid in the commercialization of new technologies. Patent and other forms of litigation can get in the way of commercialization, so it is difficult to see how a patent-based, litigious approach embodied within the Patent-Centric Linear Model is socially responsible.<sup>254</sup>

#### *D. Commercialization is a Team (Networked) Sport*

A robust empirical literature shows that university faculties rely upon social networks to access resources and other contacts important to their professional success.<sup>255</sup> Faculty involvement is critical to effective technology transfer. Specific to technology commercialization and entrepreneurship, faculty must also rely upon social networks for resources and contacts, though these networks differ significantly from their day-to-day professional networks. Faculty and students that participate in commercialization must bridge a yawning social gap between traditional, academic social networks and more market-oriented entrepreneurial networks needed to advance their technology.<sup>256</sup>

Recent research finds that, within many universities, TTOs are the first point of contact related to technology commercialization and entrepreneurship.<sup>257</sup> In this case, the likelihood of commercialization success is dependent on the capability of the TTO and the composition of its network. Unfortunately, TTOs do not typically possess the social networks needed to connect faculty to other contacts important to technology commercialization and entrepreneurship.<sup>258</sup> In the worst cases, reliance upon the TTO as a network intermediary can slow or even inhibit the development of networks

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253. See Rooksby, *supra* note 210, at 172, 186.

254. See *id.* at 172, 188–89, 198.

255. See Barry Bozeman et al., Scientific and Technical Human Capital: An Alternative Model for Research Evaluation 2, 13–14 (Sept. 5, 1999) (prepared for presentation at the Am. Pol. Sci. Ass'n.), available at [https://www.academia.edu/3016786/Scientific\\_and\\_technical\\_human\\_capital\\_an\\_alternative\\_model\\_for\\_research\\_evaluation](https://www.academia.edu/3016786/Scientific_and_technical_human_capital_an_alternative_model_for_research_evaluation).

256. See Christopher S. Hayter, *Social Networks and the Success of University Spin-offs: Toward An Agenda for Regional Growth*, 29 *ECON. DEV. Q.* 3, 3-4, 10 (2015); Christopher S. Hayter, *Harnessing University Entrepreneurship for Economic Growth: Factors of Success Among University Spin-offs*, 27 *ECON. DEV. Q.* 18, 20 (2013).

257. See Bradley et al., *supra* note 4, at 574-75.

258. Christopher S. Hayter, *Constraining Entrepreneurial Development?: A Knowledge-Based View of Social Networks Among Academic Entrepreneurs*, 45 *RES. POL'Y*, 475, 486-87 (2015).

because of their priority on licensing and IP issues as opposed to ways to *best* commercialize new technologies.<sup>259</sup>

In addition, research on successful commercialization shows that university scientists who have strong ties to industry, receive industry funding, or possess industry experience are more likely to have commercially-relevant technology; they are also more likely to patent, license, and establish a university spinoff.<sup>260</sup> Similarly, faculty and students exposed to a wide range of commercialization and entrepreneurship activities are more likely to be successful in the development of university spinoffs. Formal courses, workshops, product/technology development seminars, mentoring, funding, and networking services, designed to promote and support academic entrepreneurship, not only provide knowledge important for commercialization, but are also mechanisms for engaging contacts important for obtaining resources, commercialization, and spinoff success.<sup>261</sup>

## CONCLUSION

If knowledge dissemination and commercialization is a priority, then the Patent-Centric Linear Model—a process that mandates administrative review by one bureaucratic intermediary, typically limited in their capability and networks—is far from ideal. While faculty and students are constrained by their own professional networks, universities have the flexibility to construct new, innovative approaches to knowledge dissemination and commercialization, the original intent of Bayh–Dole. First, they can standardize and streamline processes for IP protection.<sup>262</sup> More importantly, uni-

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259. *Id.*

260. See Magnus Gulbrandsen & Jens-Christian Smeby, *Industry Funding and University Professors' Research Performance*, 34 RES. POL'Y 932, 936 (2005); see generally Colm O'Gorman et al., *How Scientists Commercialise New Knowledge Via Entrepreneurship*, 33 J. TECH. TRANSFER 23 (2008).

261. Christopher S. Hayter, *A Trajectory of Early-Stage Spinoff Success: The Role of Knowledge Intermediaries within an Entrepreneurial University Ecosystem*, 21 (Arizona State University, Working Paper, 2015).

262. One approach would be to adopt a licensing strategy similar to that of the Carolina Express License at the University of North Carolina-Chapel Hill. See Office of Technology Development, *Starting a Company/Carolina Express License*, U.N.C. CHAPEL HILL RES. <http://research.unc.edu/offices/otd/inventors/starting-a-company/> (last visited May 21, 2015). The Carolina Express License is a standardized agreement designed for startups established from UNC. *Id.* The stated goal is to increase the number of companies established, not necessarily maximize financial gain flowing to the university. *Id.* The Carolina Express License offers startup founders a standardized agreement with relatively low, pre-set royalty percentages for the university. *Id.*

versities can shift their focus away from IP protection toward building connective networks that will better enable commercialization and spinoff success among faculty and students.

As mentioned, the contributions of research universities have been framed in terms of economic development and, thus, seen as a distinct function. While *commercialization* may be a relatively new formalized objective for research universities, knowledge dissemination is not. So “fourth mission” language, related to technology transfer, seems to be more of a clever public relations vehicle that allows colleges and universities to differentiate the “unique role” of the technology transfer office from its other core missions. Rarely do these discussions highlight how the Patent-Centric Linear Model affects other university missions, but its impacts—realized and potential—are tangible. First, it creates unreasonable expectations of universities beyond their missions as non-profit education and research organizations devoted to fulfilling important social needs. Second, it (strangely) frames the contributions of research universities in terms of licensing revenue. How does a university profiting from revenue received from the licensing of a publicly funded technology advance the public interest? Finally, and most importantly, it neglects the opportunity to explore other innovative, and arguably more effective, organizational approaches to accelerate knowledge dissemination and commercialization. Only by maximizing knowledge dissemination and commercialization—likely eschewing the Patent-Centric Linear Model—will research universities fully conform to the intent of Bayh–Dole and thus be socially responsible.