

Patent Proliferation and the Patent System’s “Cost Disease”
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Abstract

Whether or not the patent system is truly in “crisis,” it is certainly under considerable strain. This paper uses a variety of statistics to analyze the U.S. patent system’s development through time. These include not only already readily available statistics such as the numbers of U.S. patents issued per year, but also yearly statistics for the number of U.S. patent examiners and for the number of full-time-equivalent U.S. research-and-development employees—statistics that seem to have previously appeared only in relatively isolated and scattered fashion. Through analysis of various selections, combinations, and variants of these statistics, including logarithms and ratios, the paper seeks to develop a better sense of what the real problems of the present patent system are. A key point is that, although recent percentage rates of growth characteristic of the U.S. patent system might be nowhere near the ballistic levels of the nineteenth century, the rate at which patents issue is still typically accelerating. This acceleration creates constant tension as public and private bureaucracies, as well as individuals, struggle to keep up. The paper characterizes the results as symptoms of a variant of William Baumol’s more general “cost disease” for services. The paper discusses potential responses, including greater worksharing with foreign patent offices, increased privatization of examination functions, and more effective rulemaking or automation of examination.

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1 Professor in Law, The University of Texas at Austin. Thanks to Maria Amon and Jane O’Connell for research assistance. For helpful comments, I thank John Duffy, Arti Rai, Christopher Yoo, and participants at the 2013 symposium hosted by the University of Houston’s Institute for Intellectual Property and Information Law.
I. Introduction

Since at least 1999, the exact words “The patent system is in crisis” have appeared so often in academic literature that they might be considered a meme. Whatever the cultural status of the “patent crisis” clause, however, its descriptive utility seems open to question. If there is a crisis in patent law, it appears to be of a long-lasting and distinctively vibrant sort. The number of patents issued each year continues to grow quite steadily: the number of utility patents issued in 2012 was 253,155, nearly 100,000 more patents than issued in 1999. The number of utility patent applications has grown even more dramatically during the same time period: 270,187 were filed in 1999; more than double that number, 542,815, were filed in 2012. Moreover, “patent system” growth has been international. The number of patent applications filed worldwide has recently been growing by over seven percent annually, with the People’s Republic of China alone “accounting for 72% of the world’s patent-filing growth between 2009 and 2011.” In short, despite a prolonged patent “crisis” at the start of the twenty-first century, the century seems destined to be patent-rich. Is the constant cry of “crisis” no more than an eye-catching headline?

“Crisis”—with its connotation of turning point—might not be the right word. Part II of this essay makes the point that the relentless proliferation of patents in the past few decades is really nothing terribly new. Recent increases in rates of patenting over are actually reasonably

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4 Id.


6 Id. (reporting that “China’s patent office received more applications than any other country’s in 2011”). See generally How Innovative Is China? Valuing Patents, The Economist, Jan. 15, 2013, at __ (noting that a surge in Chinese patenting might be “because government incentives have prompted people to file lots of iffy patent applications, which the local patent office has a tendency to approve”).
modest by the standards of the nineteenth century, and much of the recent overall increase is attributable to growth in U.S. patents issued to foreign individuals or entities—i.e., to greater internationalization of patenting and, arguably, innovation. Any sense that patents have become an unsustainable burden on the economy seems leavened when one considers that the number of U.S. patents issued annually per real dollar of U.S. GDP remains at a level roughly comparable or substantially less than the levels prevailing from 1929 through 1970.

Nonetheless, whether or not “crisis” is the right word to describe the current state of the patent system, there does seem to be substantial strain. Indeed, such strain seems a predictable symptom of the system’s very success at proliferation. Although the percentage rate of growth of the U.S. patent system might be nowhere close to the ballistic levels of the nineteenth century, the rate at which patents issue is still accelerating. This acceleration creates constant tension as public and private bureaucracies, as well as individuals, struggle to keep up. As Part III indicates, the number of patents per real dollar of GDP might not be at a historically high level, but the numbers of patents per member of the U.S. civilian workforce and per full-time-equivalent U.S. research-and-development employee apparently are. Further, for the last three decades percentage growth in the number of U.S. patent examiners has proceeded at a pace more characteristic of the mid-nineteenth century than most of the twentieth. With the U.S. Patent and Trademark Office (USPTO) striving to increase the number of patent examiners and administrative patent judges to unprecedented levels—and opening regional offices apparently in part to facilitate this—the patent system’s capacity to strain relatively scarce human capital seems clear. Indeed, such strains have, like the patent system’s accelerating growth, been an apparently continual feature of its existence for more than two centuries. These strains have forced administrative change in the past, and we should expect that they will continue to do so in the future. The continuing story of the patent system’s administrative and substantive evolution is thus in significant part a story of response to the patent system’s variant of William Baumol’s “cost disease” for services, in accordance with which more obstinately labor-intensive endeavors struggle to keep up with productivity gains in the rest of the economy and thus effectively operate as a comparative drag on overall growth.7

How can the present-day administrative apparatus of patent law adapt so that it can continue to bear the weight of an ever increasing number of applications? In this paper, I will focus for the most part on the up-front processing of applications by the USPTO. Back-end review of patents, as by the courts and International Trade Commission, is a related but distinct problem, complicated in terms of reform options by the United States’ constitutional provision for civil jury trial rights through the Seventh Amendment.

7 See WILLIAM J. BAUMOL, THE COST DISEASE: WHY COMPUTERS GET CHEAPER AND HEALTH CARE DOESN’T 22 (2012) (noting the “endurance of productivity stagnancy” in industries such as health care, education, and law characterized by a “handicraft—or in-person—attribute of their supply processes”); William J. Baumol, The Two-Sided Cost Disease and Its Frightening Consequences, in THE HANDBOOK OF INNOVATION AND SERVICES: A MULTI-DISCIPLINARY PERSPECTIVE 84, 85 (Faïz Gallouj & Faridah Djellal eds., 2010) (observing that items suffering from persistently rising costs “generally have a handicraft element in their production process, whose labor content is therefore difficult to cut down”).

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There seem at least three main ways in which the USPTO can respond to the ever rising tide of applications: (1) greater international work-sharing arrangements that might provide a relatively immediate, albeit perhaps only temporarily satisfactory, response to the internationalization of patent applications flowing into the USPTO; (2) greater privatization of functions of assessing patents’ or patent applications’ validity and proper scope; and (3) greater use of rulemaking or other means of “partially automating” processes of individual examination. The first approach, international work-sharing, appears to have received significant recent attention from the USPTO and foreign patent offices, although progress has likely been slower than many would desire, presumably at least partly as a result of political hurdles and idiosyncrasies of individual national or regional patent systems. The second approach has received glimmers of attention but is likely still underexploited. The third approach likewise seems substantially underexplored.

A possible barrier to the third approach is the desire for individualized consideration that is often an obstacle to implementation of a system of “mass” or “bureaucratic” justice. But here is another point at which the reader is meant to be impressed by emphasis in Parts II and III on the current and likely future volumes of patents and patent applications—on the apparently likely continuation of the historical trend of accelerating growth and on potentially crushing weight of those ever accumulating patents or patent applications if we do not develop more efficient ways of processing them. In reality, the patent system has, at its core, always been a system designed to provide only a relatively crude form of justice—one responsive to individual initiative but also bound to rough legal proxies for merit such “nonobviousness” and bound too by exogenous circumstances that can make a meritorious invention a relative market failure or a seemingly trivial invention a great monetary success. Recognizing that the patent system is virtually by necessity a system of quite crude, unevenly distributed “mass justice” might well be crucial to improving and streamlining its operations to best serve the needs of a patent-rich twenty-first century. If patents continue to issue at something like their currently accelerating rate, “muddling through” on matters of administrative organization might not be enough. Patents’ proliferation generates a numerical challenge for patent-system administrative that might require one or more paradigm shifts in order to produce a reasonably sustainable answer. A “mass justice” model for patent administration, using rulemaking and imprecisely controlled private mechanisms, might be a substantial part of the best answer we can have.
II. Patent Proliferation as Historical Norm, Not Recent Pathology

The United States currently issues three basic types of patents—utility patents for inventions of seemingly almost any functional, technological kind; plant patents for new, asexually reproduced plant varieties; and design patents for ornamental aspects of “article[s] of manufacture.” As discussed below, the general trend has been for the rate at which all three types of patents issue—i.e., the number of patents of each type issued each year—to grow with time. Indeed, at least for more than a century-old utility and design patents, the general long-term trend has been for the number of patents issued each year to increase at an accelerating pace—albeit a pace that has tended not to keep up with the growth of the United States’ gross domestic product (GDP) in inflation-adjusted real dollars. These long-term trends suggest that some of the recent talk of a “patent crisis” might be overblown. In the longer historical view, the oft-noted shift in U.S. patenting from relative stasis or decline prior to the mid-1980s to accelerating growth after the mid-1980s could be considered more of a “return to normalcy” than a descent into intellectual property extravagance. As Part III will discuss, various concerns associated with the return to accelerating growth are real and are particularly important for those of us interested in the proper structuring of patent law’s administrative institutions.

A. The Historical Trend of Accelerating Patenting

The United States has been issuing utility patents since 1790, in which three such patents issued. The number of patents issued each year has grown prodigiously with time. Such

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8 See 35 U.S.C. § 101 (“Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.”).

9 Id. § 161 (“Whoever invents or discovers and asexually reproduces any distinct and new variety of plant ... other than a tuberpropagated plant or a plant found in an uncultivated state, may obtain a patent therefor, subject to the conditions and requirements of this title.”).

10 Id. § 171 (“Whoever invents any new, original and ornamental design for an article of manufacture may obtain a patent therefor, subject to the conditions and requirements of this title.”).

11 See infra text accompanying notes __.

12 See infra text accompanying notes __.

13 See infra text accompanying notes __.


growth was particularly explosive in the nineteenth century, a fact that can be appreciated by consideration of some relatively straightforward numbers. In the period from 1800 through 1809, 911 utility patents issued.\(^{16}\) Fifty years later, in the 1850s, over twenty times that number of patents, 19,661, issued.\(^{17}\) Another fifty years on, from 1900 through 1909, the number of patents issued—304,726—was more than fifteen times greater still.\(^{18}\)

In the twentieth and early twenty-first centuries, the absolute number of utility patents issued in a year continued generally to grow, ultimately overcoming notable but temporary downturns from about 1933 through 1947 and from about 1972 through 1983.\(^{19}\) Despite the continuing growth trend, however, the overall percentage increases in patenting tended to be much smaller than in the 1800s. In a century in which the U.S. patent system was more mature and the U.S. participated in world wars and worldwide economic downturns, a norm of single-digit multiplicative growth over the course of a half century replaced the nineteenth-century norm of double-digit multiplicative growth over such a span. Thus, from 1950 through 1959, a total of 425,988 utility patents issued, about 1.4 times the figure for the period from 1900 through 1909.\(^{20}\) By the decade from 2000 through 2009, U.S. utility patents had returned to somewhat a higher percentage-growth rate, albeit nothing like the percentage-growth rates characteristic of the 1800s. The total number of U.S. utility patents issued from 2000 through 2009 was 1,624,154, nearly four times the total a half century earlier.\(^{21}\)

Growth in the numbers of utility patents issued each year has in part reflected growth in the array of technologies potentially covered by such patents, a growth that has been partly a product of the proliferation of technologies\(^{22}\) but also partly a product of a view of patentable subject matter that, at least until the last several years, had seemed to become more expansive with time.\(^{23}\) Expansion of the U.S. patent system has also occurred through the addition of the two other types of patents mentioned above: design patents, added by statute in 1842 as a

\(^{16}\) U.S. PATENT ACTIVITY, supra note 15, at 1-5.

\(^{17}\) Id.

\(^{18}\) Id.

\(^{19}\) Id. at 1-2.

\(^{20}\) Id.

\(^{21}\) Id.

\(^{22}\) Cf. John M. Golden, Innovation Dynamics, Patents, and Dynamic-Elasticity Tests for the Promotion of Progress, 24 HARP. J.L. & TECH. 47, 61 (2010) (discussing positive-feedback effects that can lead to both technological advances and technologies themselves proliferating with time).

\(^{23}\) See John R. Thomas, The Patenting of the Liberal Professions, 40 B.C. L. REV. 1139, 1139 (1999) (“Times have changed …. The sheer range of recently issued patents suggests that few restraints bound the sorts of subject matter that may be appropriated via the patent system.”).
separate option for ornamental aspects of functional objects, and plant patents, added in the 1930s as an option for asexually reproduced plants.

Since 1842, growth in the number of design patents has followed an upward trajectory that has been roughly similar to that for utility patents: ballistic upward growth in the nineteenth century and still accelerating growth but a lower percentage growth rate in the twentieth. The number of design patents issued in the 1850s was 925; the number issued in the period from 1900 through 1909 was 8,369; the number issued in the 1950s was 30,287; and the number issued in the period from 2000 through 2009 was 188,663. The multiplicative factors by which design patent issuance increased from half century to half century were thus 9.0, 3.6, and 6.2, respectively.

Because U.S. plant patents began issuing only in the 1930s, we only have a couple half-century figures for them. 992 plant patents issued during the 1950s, and 9,436 issued during the period from 2000 through 2009. Thus, the average number of plant patents issued each year increased by nearly tenfold over the latter half of the twentieth century. Interestingly, however, in the first decade or so of the twenty-first century, growth in plant-patent issuance appears potentially to have topped off or even gone into decline. Since the number of plant patents issued in a year passed one thousand in 2002, during which 1,133 such patents issued, the number of plant patents issued in a given year has been largely flat or decreasing: the current all-time maximum occurred in 2008, when 1,240 issued, and the numbers issued in 2010 through 2012—981, 823, and 860, respectively—have all been below 1,000. In contrast, utility-patent issuance reached an all-time high of 253,155 in 2012. In that same year, all-time highs were reached for the numbers of both utility-patent applications and design-patent applications filed—542,815 and 32,799, respectively—whereas the number of plant-patent applications filed in that year was 1,149, a number below the peak numbers of over 1,200 plant patents issued in each of 2004, 2005, and 2008. Such figures suggest that plant patents are currently on course to be an increasingly unimportant part of the U.S. patent system, perhaps as an at least partial result of the U.S. Supreme Court’s confirmation in 2001 that standard utility patents are a viable alternative

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27 Id. at 1-4.

28 Id. at 1.

29 Id. at 1-5.

30 Id.
for achieving patent protection for plants.\textsuperscript{31} Thus, trends with respect to plant patents might properly be viewed as a no more than incidental aspect of the overall story of relatively relentless growth in patent-issuance rates.

With respect to this dominant story of relentless growth, one might wonder about the representativeness of the various “half-century numbers” recited above. The use of aggregate figures for decades was meant to guard against such concerns, but graphical illustrations of the number of U.S. patents issued per year might be the easiest way to confirm both (1) the generally accelerating nature of growth over time and (2) the general slowdown of percentage growth in the twentieth century. To this end, Figure 1 graphs as a function of time the total number of U.S. patents issued—including any utility, design, and plant patents issued—in each year from 1790 through 2012. The generally accelerating nature of patent issuance, which I have previously discussed and sought at least partially to explain,\textsuperscript{32} is indicated by the long-term tendency of the resulting curve to slope upward at an ever sharper tilt as one moves to the right—i.e., as time elapses.

\textbf{Figure 1: Numbers of U.S. Patents Issued Per Year from 1790 through 2012}

Figure 2 sheds further light on the nature of this acceleration by graphing as a function of time the natural logarithm of the total number of U.S. patents issued in a given year. The slope of the total-patents graph in Figure 2 basically reflects the percentage change in the numbers of patents issued annually.\textsuperscript{33} Consequently, the generally declining nature of this slope indicates that, even though the number of patents issued in a given year is still tending to increase (a fact

\textsuperscript{31} J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int’l, Inc., 534 U.S. 124, 127 (2001) ("We hold that utility patents may be issued for plants.").

\textsuperscript{32} Golden, \textit{supra} note 22, at 90-96 (analyzing the time-dependent behavior of the total number of U.S. patents issued since 1790).

\textsuperscript{33} \textit{See} GEORGE B. THOMAS, JR. \& ROSS L. FINNEY, \textit{CALCULUS AND ANALYTIC GEOMETRY} 395 (6th ed. 1984) (noting that the derivative of the natural logarithm of \( u \) with respect to \( x \) is \( (1/u)(du/dx) \)).
indicated by the upward-curving nature of the graph in Figure 1), the percentage increase in the number of patents issued from year to year has tended to be substantially lower since 1900 than it was before 1900. In short, although growth in the absolute number of patents issued each year is still accelerating, percentage growth in the rate of patent issuance has generally slowed. Further, recent rates of percentage growth—i.e., percentage growth rates in patenting since the mid-1980s—do show an uptick relative to the immediately preceding decade but do not appear terribly anomalous for the post-1900 “long century,” at least outside periods of historically great slowdown, conflict, or dislocation such as the 1930s, 1940s, 1970s, and early 1980s.34

Figure 2: Natural Logarithms of the Numbers of U.S. Patents Issued Per Year

34 Despite seemingly apparent questions about the historical representativeness of a period running from 1930 to 1982, a period whose endpoints roughly coincide with (1) the beginning of the twentieth century’s first major slowdown in patenting and (2) the end of the twentieth century’s second major slowdown in patenting, Adam Jaffe and Josh Lerner have used this period as a foil for recent growth in patenting, which they characterize as a “Patent Explosion.” ADAM B. JAFFE & JOSH LERNER, INNOVATION AND ITS DISCONTENTS: HOW OUR BROKEN PATENT SYSTEM IS ENDANGERING INNOVATION AND PROGRESS, AND WHAT TO DO ABOUT IT 11 (2004) (comparing the percentage growth rate from 1983 through 2002 to that “from 1930 until 1982”) (some emphasis omitted).
B. Patenting by Non-U.S. Residents and the Uptick in Patenting’s Percentage Growth

Despite the relative historical modesty of patenting’s recent percentage growth, some commentary has suggested that this development signals that the patent system has spun out of control, in large part because of failures of the USPTO. Reference to patenting’s long-term trends casts some doubt on this inference. As is commonly the case when one tries to draw inferences from numbers or numerical trends, a key question is what baseline we should use as a reference point for current growth rates. Thus, as suggested above, if one views the patenting rates of the 1970s as a more an anomaly than a proper norm, the apparent uptick in patenting rates from the mid-1980s on looks more like a “restoration” than a revolution, a shift bringing overall patenting up toward where we might have expected it to be if the trends of the pre-Great Depression twentieth century or even of the more recent post-World War II 1950s and 1960s had continued.

Moreover, much of the uptick in percentage growth of U.S. patenting over the last half century or so seems likely to be more a product of greater internationalization of patenting than of any pathology peculiar to the U.S. patent system’s past few decades. If we remove from our tabulation U.S. patents issued to nonresidents, much of the recent growth in patenting disappears. Consider the following numbers for the total numbers of patents issued to U.S. residents and non-U.S. residents during our established half-century periods: 911 for the decade from 1800 through 1809; 20,586 for the decade from 1850 to 1859; 313,095 for the decade from 1900 to 1909; 457,267 for the decade from 1950 to 1959; and 1,822,253 for the decade from 2000 to 2009. These figures correspond to multiplicative factors for half-century growth of 23, 15, 1.5, and 4.0, respectively. Consider now the corresponding numbers for total numbers of patents issued to U.S. residents only: 911 from 1800 to 1809; 20,276 from 1850 to 1859; 277,884 from 1900 to 1909; 400,844 from 1950 to 1959; and 948,198 from 2000 to 2009. These figures correspond to multiplicative factors for successive half-century growth of 22, 14, 1.4, and 2.4, respectively. Although the more than doubling of U.S. patenting by U.S. residents since the 1950s is impressive, this multiplication of domestic patenting activity pales in comparison to the fourfold multiplication of U.S. patenting overall. This fourfold multiplication is necessarily the product of a more than fourfold multiplication of U.S. patenting by foreign residents. Indeed, foreign residents have experienced a more than fifteenfold multiplication in the number of U.S. patents issued to them from the 1950s to the first decade of the 2000s. Foreign residents obtained only 56,423 U.S. patents in the 1950s but 874,055 U.S. patents from 2000 to 2009.

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35 See JAFFE & LERNER, supra note 34, at 11 (“Much of the problem stems from the organization of the patent office itself.”).

36 See supra text accompanying notes __.

37 See supra Figure 2.


40 See infra text accompanying note 41.

41 U.S. PATENT ACTIVITY, supra note 15, at 1-4. Growth in the numbers of patents issued to foreign residents has been notably uneven, in part because of changes in U.S. law. Although the
Foreign patenting has grown so rapidly that it now accounts for the majority of newly issued U.S. patents: in each year from 2008 to 2012, the majority of U.S. patents issued to foreign residents.42

Because of the importance of foreign patenting to the modern story of U.S. patent law, Figures 1 and 2 graph as a function of time not only the total number of U.S. patents issued per year or the logarithm of that number, but also the total number of U.S. patents issued to U.S. residents per year or the logarithm of that number. In each figure, the gap between these two graphs reflects the increasingly substantial contribution of foreign patenting to the U.S. patent picture. If one removes patents issued to foreign residents from the story, the growth in patenting over the last few decades looks far less explosive, indeed arguably quite tame. If one suspects that the effective internationalization of U.S. patenting is likely to be more a reflection of globalization trends and economic development elsewhere than of the USPTO’s peculiar dysfunctionality,43 the notion that the recent “explosion” in U.S. patenting is predominantly a product of system breakdown becomes subject to additional doubt.

C. An Overwhelming “Patent Tax”? Patent Issuance Per Dollar of GDP

But even if the system has not yet broken down, could it be on the verge of collapse? Does the historically relentless tendency toward increased patenting—albeit at generally reduced

U.S. Patent Act of 1790 did not discriminate against non-citizens, B. ZORINA KHAN, THE DEMOCRATIZATION OF INVENTION: PATENTS AND COPYRIGHTS IN AMERICAN ECONOMIC DEVELOPMENT, 1790-1920, at 57 (2005), the Patent Act of 1793 did not allow foreign citizens to obtain U.S. patents, and acts of 1800 and 1832 only opened the door for foreign citizens who had lived in the United States for at least a year. Jennifer A. Crane, Riding the Tiger: A Comparison of Intellectual Property Rights in the United States and the People’s Republic of China, 7 CHI.-KENT J. INT’L. PROP. 95, 103-04 (2008) (noting that the U.S. amended its patent laws “in 1800 to allow foreign citizens who resided in the United States for two years to petition for a patent” and in 1832 “to enable foreign[ny] citizens who lived in the United States for twelve months and who swore an oath of intention for U.S. citizenship to petition”). “In 1836, the stipulations on citizenship and residency were removed, but were replaced with discriminatory patent fees,” which were ultimately repealed in 1861. KHAN, supra, at 57. Unsurprisingly, therefore, the USPTO does not report numbers for patents issued to foreign residents until 1836. For the decade of the 1850s, when the discriminatory fees for foreign residents were still in place, the total number of U.S. patents reported as issued to foreign residents is 310. U.S. PATENT ACTIVITY, supra note 15, at 3-4. For the period from 1900 to 1909, after the repeal of those discriminatory fees, the total number—35,211—is more than 110 times higher. Id. at 3. Foreign patenting fell substantially during the Great Depression in World War II. The number of U.S. patents issued to foreign residents fell from a then historical peak of 7,376 in 1932 to a 1,617 mid-century low of 1,617 in 1947, a number lower than any since 1888. Id. at 2-3.

42 U.S. PATENT ACTIVITY, supra note 15, at 1.

percentage rates over time—mean that we are now suffering under an overwhelming “patent tax”?\textsuperscript{44}

As a first cut at addressing the second question, we might consider the number of patents issued each year has compared to the United States’ gross domestic product (GDP) as a function of time. This effectively corresponds to considering the average “tax” that an individual patent imposes on the U.S. economy to have stayed relatively constant in real dollars and, effectively, to have been paid at the time of patent issuance. In addition to making objections that one should use cumulative numbers with lags from issuance to represent an effective “patent tax,” one might object that individual patents are likely to be worth more today, even in real dollars, in part because larger real GDPs correspond with larger effective markets and larger markets for more expensive goods and services. As I only wish to make the patents-to-GDP comparison primarily for the rough qualitative purpose of stimulating thought about the nature of current concerns with the patent system, I do not believe I need to try to devise the best patents-to-GDP comparison, an exercise that would likely require answering difficult empirical questions.\textsuperscript{45} Figure 3 presents the results of graphing the number of patents issued per year divided by U.S. GDP in billions of chained real dollars from 1929 through 2012.\textsuperscript{46}

\textsuperscript{44} See John M. Golden, Patent Privateers: Private Enforcement’s Historical Survivors, 26 HARV. J.L. & TECH. (forthcoming spring 2013) (“[A]s Macauley noted long ago with respect to copyright, patents effectively act as a private-taxation regime in which patentees use litigation or its threat to effect transfers of wealth.”).

\textsuperscript{45} If one considers damage awards in patent-infringement cases, work by Michael Mazzeo, Jonathan Hillel, and Samantha Zyontz suggests that mean patent damage awards per year might have increased by about a factor of three between the mid-1990s and the end of the last decade, but that median patent damage awards—which one might think are more representative of the value of the great mass of patents never litigated at all, see Jean O. Lanjouw & Mark Schankerman, Characteristics of Patent Litigation: A Window on Competition, 32 RAND J. ECON. 129, 146-147 & tab. 6 (2001) (showing typical litigation probabilities for U.S. owned corporate patents of only about a couple percent); Mark A. Lemley, Rational Ignorance at the Patent Office, 95 NW. UNIV. L. REV. 1495, 1501 (2001) (describing grounds for “estimat[ing] that at most only about two percent of all patents are ever litigated”—might have decreased over the same time period. See Michael J. Mazzeo, Jonathan Hillel & Samantha Zyontz, Predicting the “Unpredictable”: An Empirical Analysis of U.S. Patent Infringement Awards 13 fig. 3 (2012) (unpublished manuscript), available at http://ssrn.com/abstract=2164787. Which result or what combination of these results is most representative of overall trends in the size of the “patent tax” are questions beyond this article’s scope.

\textsuperscript{46} The figures used represent annual U.S. gross domestic product from 1929 through 2012 in billions of chained 2005 dollars—i.e., inflation-adjusted GDP values from 1929 through 2012—as indicated by the U.S. Department of Commerce’s Bureau of Economic Analysis. U.S. DEP’T OF COMMERCE, BUREAU OF ECONOMIC ANALYSIS, CURRENT-DOLLAR AND “REAL” GROSS DOMESTIC PRODUCT (2013) (providing various GDP figures), available at http://www.bea.gov/national/ (last visited on May 12, 2013). I only use figures from 1929 or
Figure 3 at least suggests that, if one wishes to contend that patents “overtax” social GDP, one might need to contend that individual patents are now on average more burdensome in real dollars than they were, say, fifty years ago or, alternatively, that such overtaxation has long been the case. In any event, the sense of relative tameness to the recent uptick in patenting, already suggested by sections II.A and II.B, seems even more pronounced in Figure 3. This figure shows a rather dramatic fall in number of patents per real GDP dollar from the 1930s through the 1970s. In the last forty years, there has been a relatively slow but seemingly relatively small rise in the number of U.S. patents issued annually to U.S. residents per real GDP dollar, with the result being a return to values for U.S.-resident patents per real GDP dollar that were typical of the the mid-1970s. The growth in foreign patenting has generated an approximate doubling of the overall number of U.S. patents issued annually per real GDP dollar, but even this more dramatic recent rise has only returned the number of U.S. patents issued annually per real GDP dollar to a size typical of the early 1950s, rather than some unprecedented historical height. As I have previously noted, for several decades now U.S. patenting per real GDP dollar has overall been remarkably flat compared to raw patenting rates.47

later because the relevant table from the Bureau does not go back further than 1929, see id. (providing figures for years from 1929 through 2012).

Indeed, the notion that, in light of modern economies’ size and investments in innovation, modern rates of patenting are not surprisingly out of control finds further support in Figure 4 below. Figure 4 shows the ratio of U.S. patents issued in any given year to the number of U.S. full-time equivalent employees engaged in research and development during that year according to National Science Foundation figures reported annually in the U.S. Census Bureau’s *Statistical Abstract of the United States*. As with the patents-per-GDP figures, recent patents-per-R&D-employee figures are actually relatively low, historically speaking. Although there has been a trend toward increases in the yearly ratios in the past couple decades, these increases do not appear facially overwhelming.

### Figure 4: Ratio of U.S. Patents to U.S. R&D Employees

![Figure 4](image)

In short, if one only looked at Figures 3 and 4, perhaps adding a glance at Figure 2’s illustration of generally slowed growth in the logarithm of number of patents issued annually, one might wonder why there is any fuss at all about supposedly excessive patenting. Indeed, one might wonder why our productivity in generating patents has apparently slowed and what might be done to increase current patent application and issuance rates. As Part III will argue, this does not mean there are no problems with the patent system—or more specifically that there is no truth to contentions that the USPTO is currently issuing too many patents. The basic point is that, because of the need to consider how patent issuance rates should be normalized—i.e., to what baselines they should be compared—one should not feel confident that citation of raw patent issuance numbers proves much of anything. As a logarithmic graph for which slope represents percentage changes over immediately prior years, Figure 2 implicitly makes prior years’ issuance rates the baseline for normalization. Figures 3 and 4 more explicitly make values for real GDP and numbers of R&D employees baselines for normalization. I do not claim to have used the limited space available in this short piece to have provided a decisive argument for any of these potential normalization schemes. But I hope their illustrative use is at least
suggestive of a lack of easy answers about whether the last few decades have witnessed a truly unprecedented and obviously dysfunctional “patent explosion.”

III. Proliferating Patents’ Relentless Pressure for Administrative Reform

A. Patent Law’s Labor Problem

Part II suggests that the present-day “patent crisis” might not be a sharp or fearsome as sometimes thought. Nonetheless, the historically relentless acceleration of patenting that Part II highlights also points to a very real problem. The continual acceleration of patenting rates strains both public and private actors’ capacities to perform all the various activities necessary for a patent system to function effectively. Many of these tasks—such as drafting patent applications, processing and evaluating such applications, making and adjudicating challenges to patent validity or enforceability, fulfilling requests for patent “clearance” (i.e., confirmation that relevant patent claims are invalid or not infringed), negotiating patent licenses, and identifying and taking legal action against potential patent infringement—all tend to require human labor for which the “Silicon Revolution” has not yet generated a workable technological equivalent. In short, the patent system, like legal services more generally, suffers from a form of the Baumol “cost disease” under which “handicraft” sectors struggle to keep up with productivity gains in endeavors more subject to standardization or automation—or, at least, benefiting more greatly from standardization or automation.

Relationally, as the numbers of patent applications, patents, and resultant clearance questions, licensing negotiations, or lawsuits increase, the system’s demands on a relatively scarce supply of people with appropriate scientific, technological, or legal backgrounds increase. Thus, not only can the patent system act as a relative economic drag by struggling to keep up with productivity gains in the innovation that it is meant to support, but it can also impose a sort of “diversion of labor” cost on the economy, pulling skilled labor away from economic sectors with greater opportunities for growth in productivity. Figure 5, which plots the number of U.S. patents issued per year divided by the size of that year’s U.S. civilian workforce, gives some sense of the “patent labor tax” that likely comes from having to devote more and more human labor to generating, studying, licensing, and litigating the ever growing numbers of patents that issue.

48 JAFFE & LERNER, supra note 34, at 11 (featuring “The Patent Explosion” as a section heading (emphasis omitted)).

49 BAUMOL, supra note 7, at 22-24 (listing “legal services” as one of “the stagnant services” and contrasting these services to services such as telecommunications that have experienced much greater productivity growth (emphasis omitted)).
But Figure 5 likely understates the likely rate of growth in the “patent labor tax.” By simply using raw patent numbers, Figure 5 does not reflect apparently increasing complexity in patents and patent applications themselves. Even aside from the arguably greater complexity or difficulty of some of the underlying technology appearing in modern patent applications, those applications tend now to have more pages and more individual claims than they did in times past. Consequently, one might expect that a representative individual application today makes more demands on human labor than a representative individual application from the past. Unless we are improving the speed with which we can process complexity or difficulty, the “patent labor tax” can therefore be expected to be increasing not only as a result of increases in sheer numbers of patents and patent applications but also as a result of increases in the complexity or difficulty of processing individual applications themselves.

Along these lines, one might conjecture that growth in the number of U.S. patent examiners is likely to reflect both these contributions to the “patent labor tax.” Other things being equal, the United States can be expected to need more examiners to process more patents and to need more examiners to process a constant number of patents marked by increased complexity. Figure 6 shows that, since the establishment of the “modern” examination system in

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50 The figures for the number of people in the U.S. civilian workforce for each year from 1947 through 2012 come from the U.S. Department of Labor’s Bureau of Labor Statistics and are available at [http://www.bls.gov/cps/cpsaat01.htm](http://www.bls.gov/cps/cpsaat01.htm) (last visited on April 26, 2013).

51 Mabey, *supra* note 43, at 231 (“The length of applications has grown both constantly and considerably over the years. The number of claims per application has also skyrocketed.”).
1836, the number of U.S. patent examiners has indeed grown prodigiously and, like the number of issued patents, has tended to grow at an accelerating rate. Less predictably and thus more remarkably, Figure 7, which graphs the logarithm of the number of U.S. patent examiners over time, shows that, since the year, 1982, in which the U.S. Court of Appeals for the Federal Circuit was created, the rate of percentage growth in the number of U.S. patent examiners—i.e., the slope of the logarithmic curve—has tended to reach levels more characteristic of the nineteenth century than the twentieth. This aspect of the growth in numbers of patent examiners contrasts with the corresponding aspect of the growth in numbers of issued patents: as Figure 2 shows, percentage growth in numbers of issued patents has undergone something of a revival in the wake of the Federal Circuit’s creation, but percentage growth rates for numbers of issued patents have tended not to reach nineteenth-century levels. The comparison between Figures 2 and 7 suggests that, instead of focusing so much on how much patenting has increased over the last few decades, commentators should be more focused on the comparatively more runaway growth in the patent bureaucracy.

Figure 6: Number of U.S. Patent Examiners from 1836 to 2012

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Numbers for U.S. patent examiners were generally obtained from annual reports of the USPTO or its relevant institutional predecessor, the U.S. Patent Office. Additional numbers for middle years of the nineteenth century—i.e., for years from 1836 to 1875—were obtained from Morriss & Nard, supra note 61, at 149 n.16 (discussing numbers for patent examiners in 1836, 1837, 1848, 1856, and 1875). Some of Morriss and Nard’s numbers might be overestimates in that at least their 1836 number appears to reflect the number of examiners (namely, one) that were then statutorily authorized, a number that presumably represented a ceiling but not necessarily a floor for the number of examiners actually employed. See id. (“The 1836 Patent Act authorized the Commissioner of Patents to appoint an ‘Examiner of Patents,’ a machinist, and two draftsmen.”). For purposes here, the possibility that some of Morriss and Nard’s numbers are mere ceilings seems to have little importance: in any case, the number of examiners shown for the period up through 1875 will be quite close to zero on the vertical scale of Figure 6.
Figures 8 and 9 further serve to drive home this point about the patent bureaucracy’s prodigious growth. By plotting the ratio between the number of U.S. patent examiners and the number of U.S. patents issued in years since 1836, Figure 8 shows how growth in the number of U.S. patent examiners has tended historically to outstrip growth in the number of issued patents—a fact that provides less than stirring testimony of increasing government efficiency, although one might hope that the lower number of patents issued per examiner reflects some form of either necessary or at least socially valuable additional investment in determining which

53 One might suggest that this graph suggests that the USPTO has suffered not only from “stagnant” productivity but, in fact, from declining productivity. But such a suggestion would likely be unfair. As pointed out above, the complexity of applications appears to have increased with time. Further, patentability requirements such as nonobviousness have emerged and become more refined with time, thereby adding to the demands placed on examiners in each individual case.

54 Problems in processing large volumes of applications or claims are not limited to the USPTO, of course. See James D. Ridgway, *Equitable Power in the Time of Budget Austerity: The Problem of Judicial Remedies for Unconstitutional Delays in Claims Processing by Federal Agencies*, 64 ADMIN. L. REV. 57, 66 (2012) (discussing, in the context of other agencies’ claims-processing challenges, how the USPTO “more than doubled” its number of examiners over the course of a decade but saw relevant times for processing patent applications increase by forty percent).
patent applications should issue and in what form. By plotting the ratio between the number of U.S. patent examiners and the number of thousands of full-time equivalent research-and-development employees in the United States, Figure 9 shows that, at least since the late 1980s, the number of examiners has been growing more rapidly than overall engagement of personnel in research and development.

Of course, the rise in the number of USPTO examiners is only one part of a larger growth in the patent system’s public and private personnel. Patents require not only patent examiners

55 See infra text accompanying notes 73-78.
but patent drafters, and patents asserted in or out of court commonly require lawyers to be involved in the processes of licensing or litigation. The patent system’s personnel demands extend far beyond the confines of USPTO offices, and this has significant implications for the system’s overall costs and the sustainability of its current growth trajectory.

If we imagine that the most crucial scarce resource for which our proliferating patents are competing is not capital but instead labor—whether the labor of patent prosecutors, patent examiners, attorneys advising on whether a planned course of action is likely to infringe another’s patent rights, attorneys and businesspeople trying to agree on licensing terms, or litigators, judges, and juries looking to resolve patent disputes in the courts—then I think we quickly come to confront what seems to me one of the more undeniable dilemmas for the modern patent system: whether we can continue to reconfigure the system’s institutions and processes to sustain something like the a trajectory of continually accelerating growth, a trajectory that reflects the likely continually accelerating growth of innovation itself. If we cannot do this, we will likely need to contain the patent system’s growth in potentially draconian ways—for example, by significantly weakening or limiting patent rights’ desirability or accessibility through severely truncated definitions of patentable subject matter, a significantly higher threshold for an invention to be considered patentably nonobvious, systematically narrower claim constructions, heavily diluted remedies for patent infringement, much higher fees for patenting or maintaining patents, or delays in processing applications or infringement claims that are so long that they much more substantially deter use of the system altogether. Some readers might champion one or another or perhaps even all of the latter set of potential reforms. But as this paper is for a conference focused on the institutions for administering our intellectual property laws, I will focus here on the former alternative—adapting patent-law administration to sustain the increasing weight of applications that it has been receiving and, other things being equal, should continue to expect.

B. Patent Law’s History of Administrative Change and Growth

This challenge is far from new. Reform of patent law’s institutions has occurred repeatedly throughout history, and a significant number of these reforms have been designed to respond to the ever more crushing weight that continually accelerating patenting places on patent-law institutions. This was true from the very start. The U.S. Patent Act of 1790 adopted an ambitious, high-level approach to the granting of patents: patents would issue on approval by a majority of a “patent board” composed of the Secretary of State, the Secretary of War, and the Attorney General. Predictably (at least in historical hindsight), these officials found themselves short on time and resources to review dozens of incoming applications.

56 Edward C. Walterscheid, To Promote the Progress of Useful Arts: American Patent Law and Administration, 1798-1836, at 168 (1998) (describing how “[u]nder the Act of 1790 the power to issue patents was completely vested in three high officials”).

57 Id. at 195 (“[I]t was the dawning recognition by the members of the patent board, and particularly by Jefferson, that they simply had insufficient time to properly carry out the tasks assigned to them under the Act, that more than anything else soon produced an understanding in the Congress that the Act of 1790 had to be amended or in some manner changed to avoid having high government officials responsible for the issuance of patents.”); see also Crane, supra note
Congress’s solution, implemented through the U.S. Patent Act of 1793, was to eliminate substantive examination of patents before issuance—i.e., to turn the U.S. patent system into a registration system. Generally speaking, the Secretary of State was empowered—albeit not explicitly required—to issue a patent once a petitioner had fulfilled a set of basic ministerial requirements. Policing the validity and scope of patents was generally left to post-issuance action by the courts.

The 1793 Act’s resolution of the patent system’s bureaucratic problems—achieved by largely eliminating the need for substantial pre-issuance bureaucracy—worked for a time. But with the number of patents issued per year increasing more than tenfold over the next few decades, strains inevitably showed. Once several hundreds of patents were issuing each year, even a residual ministerial requirement requiring the mere signing of each patent by the President, the Secretary of State, and the Attorney General became a burdensome source of delay. With more patents in private parties’ hands, patent litigation became more common—and a more common source of complaint. An 1836 Senate committee report lamented that “[a] considerable portion of the patents granted [were] worthless and void”; that lawsuits were “daily increasing in an alarming degree”; and that “frauds”—invalid patents obtained under false pretenses—had “become extensive and serious.” The patent bar’s development and refinement of patent claims as a means to clarify patent scope and validity apparently did not suffice to

41, at 103 (“In three years (1790-1793), 57 U.S. patents were granted, 114 petitions were still pending, and dozens of petitions were denied.”).

58 Id. at 223 (“The most fundamental change [made by the U.S. Patent Act of 1793] was of course from examination to registration by elimination of the requirement that the patent board determine that an invention was ‘sufficiently useful and important’ for a patent to issue.”).

59 Id. at 224 (“[T]he Act merely made it lawful for the Secretary of State to issue a patent [under specified circumstances]; it did not require him to do so.”).

60 Id. at 223 (describing patent issuance under the 1793 Act as “a pro forma process dependent only on the completion of the required ministerial acts by the petitioner for patent”).


62 See U.S. PATENT ACTIVITY, supra note 15, at 4-5 (listing numbers of utility patents issued for individual years from 1790 on).

63 WALTRESSCHEID, supra note 56, at 422 (noting that, in 1836, the Superintendent of Patents “readily acknowledged that patents were frequently delayed for months due to the inability to obtain the signatures of the three top government officials required, i.e., the President, the Secretary of State, and the Attorney General”).

64 1836 Senate Committee Report, 18 J. PAT. OFF. SOC’Y 853, 857 (1936)

65 Morriss & Nard, supra note 61, at 153-54.
relieve a perception of undue pressure on both courts and private parties who either feared or experienced unjust accusations of infringement.

The revised administrative solution, instituted through the U.S. Patent Act of 1836 and largely continued to this day, was to reinstate a form of pre-issuance examination while still retaining significant roles for the courts both in policing patentability post-issuance and in acting as primary interpreters of the Patent Act itself. A revival of substantive examination of patents prior to issuance was made feasible by placing responsibility for such examination in the hands of “a specialized bureaucracy” designed for the task, rather than making this task the responsibility of Cabinet officers having other, largely disconnected duties. Comparatively speaking, the basic institutional structure of the patent system has been only tweaked since then, prominent tweaks including, of course, the successive creation of semi-specialized appeals courts by Congress, the Court of Customs and Patent Appeals and its successor, the Court of Appeals for the Federal Circuit. Some scholars have suggested that the recent America Invents Act has shifted the balance of power between the USPTO and the courts in ways that might amount to more than another mere “tweak,” but the extent to which this is true remains to be seen.

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67 Cf. id. at 1134 (observing that, “unlike agencies in the twentieth century, the Patent Office was given no power to issue substantive regulations—a limitation that continues to have significant legal implications”).

68 Morriss & Nard, supra note 61, at 159.


71 See, e.g., Arti K. Rai, *Patent Validity Across the Executive Branch: Ex Ante Foundations for Policy Development*, 61 DUKE L.J. 1237, 1239 (2012) (“[T]o the extent [USPTO guidelines on topics such as patentability] were to be implemented in a postgrant review proceeding that resembled a formal adjudication, the strong form of deference enunciated by the Court in *Chevron* … and its progeny would be applicable.”); Sarah Tran, *Policy Tailors and the Patent Office*, 46 U.C. DAVIS L. REV. 487, 493 (2012) (“The freshly enacted Leahy-Smith America Invents Act … gives the USPTO opportunities to play a much larger role in policymaking than ever before.”); Melissa F. Wasserman, *The Changing Guard of Patent Law: Chevron Deference for the PTO*, 54 WM. & MARY L. REV. (forthcoming 2013) (“This Article concludes that the AIA rejects over two hundred years of court dominance in patent policy by anointing the PTO as the
In any event, since 1836, the principal way that the U.S. patent system has responded to the proliferation of patent rights and would-be patent rights is to multiply the number of hands on deck—most particularly, to multiply the number of examiners at a percentage rate that overall has exceed that for patents themselves. Andrew Morriss and Craig Nard report that, after the 1836 Act, the number of examiners grew nearly one-hundredfold in four decades: from one in 1836 to two in 1837, four in 1839, eight in 1848, twenty-four in 1856, and ninety-six in 1875. Generally speaking, the numbers have kept growing since. Economic historian Zorina Khan reports that in 1892 the U.S. Patent Office had “over six hundred employees, including some two hundred specialized technical examiners.” One hundred and twenty years later, at the end of fiscal year 2012, the USPTO had 7,935 patent examiners and 11,531 employees overall. Thus, during a one-hundred-twenty-year span from 1892 to 2012 in which the number of applications filed and patents issued multiplied by a factor of approximately fifteen, the number of examiners multiplied by a factor of approximately forty. Perhaps in part because of the increasing complexity of patent applications or the technologies they describe—but in any case despite the productivity-enhancing benefits of the late twentieth century’s information-technology revolution—individual U.S. patent examiners now apparently process less than half as many applications per year as their late-nineteenth-century forebears.

The more-hands-on-deck approach seems destined to continue indefinitely. The USPTO’s opening of four new regional offices in or about Dallas, Denver, Detroit, and Silicon Valley—all to complement the USPTO’s main office in Alexandria, Virginia—seems partly designed to serve this end.
But this blunt, expansion-of-the-patent-workforce approach seems likely to be ultimately problematic. Mark Lemley has suggested that relatively high turnover of USPTO examiners “means that the [US]PTO needs to hire more than 1,000 examiners a year just to keep even with attrition.”\textsuperscript{79} Unless the USPTO can significantly reduce the attrition rate, this simple replacement number will grow as the size of the examining corps rises, presumably causing the USPTO to have to run harder just to stay in place.\textsuperscript{80} Further, as the patent workforce rises relative to the size of the overall workforce, the search for additional qualified hands is only likely to become harder. Silicon Valley firms have become notoriously competitive in their pursuit of engineering talent—and assertive in their pursuit of immigration reform to help expand the practically available talent pool. If the USPTO continues to need to expand proportionately—or even super-proportionately—with the number of patents or patent applications and if the number of patents or applications continues to grow at an accelerating rate, the workforce demands for the USPTO can be expected to become harder and harder to fill. Even if the USPTO can somehow continue to fill ever greater demand for examiner labor by opening yet more regional offices or substantially increasing examiner salaries and patent-associated fees to pay for those salaries, one might wonder about the wisdom of an increasingly significant diversion of labor into administration of the U.S. patent system or increased fees that make the patent system less accessible to less well-capitalized innovators.

Moreover, the USPTO’s workforce demands are not the only “tax” on labor supply that the patent system generates. Increasing numbers of patents and patent applications mean, generally speaking, increased work for patent attorneys, patent agents, and paralegals involved with the process of drafting them and seeking their issuance through the USPTO. If the average number of lawsuits per patent remains relatively stable or increases, more patents will mean more litigation and thus more work for litigators, judges, and juries. There is also the less publicly visible transactional and counseling work of patent law: for example, the work on patent licenses and assignments, the work on assessing whether patent licenses are needed in the first place, the strategic assessment of whether one’s patent portfolio—or perhaps another’s patent portfolio that is ripe for acquisition—suffices to protect core business interests.

In short, in private as well as public sectors, our ever-growing patent system can be expected to strain the capacity of our society to efficiently supply the labor required, under the system’s current configuration, to develop, process, and, when necessary, adjudicate claims. We

\textsuperscript{79} Mark Lemley, Fixing the Patent Office, in INNOVATION POLICY AND THE ECONOMY 83, 89 (Josh Lerner & Scott Stern eds., 2013); Mabey, supra note 43, at 256 (“[T]he office has one of the highest attrition rates in the government.”).

\textsuperscript{80} Cf. Jason D. Grier, Comment, Chasing Its Own Tail? An Analysis of the USPTO’s Efforts to Reduce the Patent Backlog, 31 HOUS. J. INT’L L. 617, 645 (2009) (observing that patent-examiner attrition “is so severe that in some years the USPTO loses more examiners than it hires”).
thus have a classic problem of “bureaucratic rationality”81: How can we process such a large and increasing number of claims in a way that cost-effectively advances social goals? The suggestion above is that the more-hands-on-deck response will ultimately prove inadequate, even if not inadequate already. The patent system needs to put greater emphasis on exploring something other than sheer force-of-numbers responses. Some preliminary thoughts on potential directions to pursue are the subject of Part IV.

IV. Institutional Reforms to Meet the Challenge: Beyond Merely Scaling Up the Patent Bureaucracy

What non-brute-force innovations can the United States use to relieve the human-labor bottlenecks that the patent system’s own flourishing creates? This Part discusses three potential approaches: greater work-sharing with foreign patent offices, greater leveraging of private initiative and knowledge, and more generalized USPTO fact-finding. Aspects of at least the first two approaches would likely face significant opposition from the U.S. patent examiners’ labor union, the Patent Office Professional Association, a powerful force in patent-law politics that has a history of opposing the outsourcing of examiners’ work.82 But this short piece will not propose how to resolve such concerns of political economy. Instead, it will simply discuss some of the major options for addressing the current and future patent system’s entirely predictable, essentially inexorable workload needs. In any case, as these needs place greater and greater

81 JERRY L. MASHAW, BUREAUCRATIC JUSTICE: MANAGING SOCIAL SECURITY DISABILITY CLAIMS 26 (1983) (“From the perspective of bureaucratic rationality, administrative justice is accurate decisionmaking carried on through processes appropriately rationalized to take account of costs.”).

82 See Michael Abramowicz & John F. Duffy, Ending the Patent Monopoly, 157 U. PA. L. REV. 1541, 1573 & n.110 (2009) (noting that, in response to a USPTO proposal to “privatiz[e] prior art searches,” “political opposition has been voiced most fiercely by the examiners’ union”); David P. Irimies, Why the USPTO Should Adopt a Deferred Patent Examination System, 20 DEPAUL J. ART, TECH. & IP LAW 355, 386 (2010) (contending that the “main policy rationale” for a provision in a patent reform bill that would have “foreclose[d] the possibility of work sharing substantive examination of patent applications and prior art searches amongst national patent offices” is “that labor unions are a major stakeholder in Democratic Party politics”); S. Jay Plager, Foreword, The Evolving Future of Law and Technology, 8 J. TECH. L. & POL’Y xiii, xv (2003) (observing that a proposal to “contrac[t] out prior art search responsibilities” was “not surprisingly a move opposed by the examiner corps union”); cf. Chris J. Katopsis, Perfect Happiness?: Game Theory as a Tool for Enhancing Patent Quality, 10 YALE J.L. & TECH. 360, 379 (2008) (stating that “POPA has demonstrated ability to influence both Republican and Democratic members of Congress” and that “POPA’s two primary goals are essentially to obtain higher pay and more examining time per application for its personnel”). See generally Arti K. Rai, Growing Pains in the Administrative State: The Patent Office’s Troubled Quest for Managerial Control, 157 U. PA. L. REV. 2051, 2065 (2009) (noting that USPTO reforms “may be difficult to implement in a work environment where the patent examiners’ union tends to view management-proposed changes as attempts to squeeze examiners further with respect to the time that they have to examine applications”).
pressure on the system, one might expect that various seemingly insurmountable political barriers will ultimately give way.

A. Pooling Resources with Foreign Patent Offices

Given the recently dominant contribution of foreign applications to U.S. patenting growth, perhaps the most obvious response is for the U.S. to seek more substantial help from abroad. Many foreign applicants for U.S. patents simultaneously apply for foreign patents on the same subject matter, and many domestic U.S. applicants seek patent protection in other countries. Greater worksharing with foreign patent offices, which commonly are doing largely duplicative research into questions relating to patentability, is perhaps the most straightforward response to the foreign-filing “explosion.”

Patent offices for twenty-four countries and the European Union have sought to achieve such worksharing through a number of “Patent Prosecution Highway” (PPH) programs under which the results of at least partial examination in one office can help expedite review in another. Based on various reports, the PPH programs appear to be delivering faster and cheaper prosecution results for those applications in the program.

Nonetheless, despite robust growth in the last few years, the percentage of PPH filings is still miniscule: a record number of approximately 5,000 PPH filings at the USPTO in the USPTO’s fiscal year 2012 apparently represented only about one percent of the more than 500,000 applications the USPTO received that year. Moreover, whatever time and effort that worksharing through the PPH achieves, it is less than one hundred percent in any individual case. The PPH provides significantly less than a full pass through a second office’s examination

83 See supra text accompanying notes __.
84 See Mabey, supra note 43, at 222 ("[A]pplications claiming identical inventions are routinely filed in numerous global patent offices.").
85 See id. at 222 ("The basic requirements of patentability are remarkably similar across the world’s industrialized nations.").
86 See Toshinao Yamazaki, Patent Prosecution Highways (PPHs): Their First Five Years and Recent Developments Seen from Japan, 34 WORLD PATENT INFO. 279, 279 (2012) (providing an overview of PPH programs).
87 See id. at 280-82 (claiming PPH benefits in terms of speed of “patent acquisition,” increased allowance rates, and reduced costs); 2012 USPTO PERFORMANCE REPORT, supra note 75, at 20 (claiming that PPH “[u]sers benefit not only by fast portfolio-building, but also by enjoying the collective savings of millions of dollars in the process.”).
88 See 2012 USPTO PERFORMANCE REPORT, supra note 75, at 21 fig.8 (showing that about 5,000 additional PPH filings occurred between the end of September 2011 and the end of September 2012).
89 Id. at 175 tab.1 (listing preliminary patent application numbers for fiscal year 2012).
process. In short, the PPH is currently only saving the USPTO and patent applicants a fraction of their time, effort, and expense on less than one percent of currently pending applications.

Further substantive harmonization of the patent laws of different countries might enable greater worksharing. By moving the United States’ novelty rules toward the first-to-file rules more typical of other countries, the United States’ America Invents Act might represent a step toward greater capacity for worksharing. But the miniscule percentage of patents running through the PPH suggests we are at least a decade away from worksharing at a level that take a truly significant bite out of the workload facing the USPTO and other patent offices. Meanwhile, patenting and efforts to patent continue to accelerate. By the time substantial worksharing is able to take, say, a twenty-percent bite out of the workload faced by the USPTO, the size of the remaining eighty percent of the workload might already be overwhelming.

The likely inadequacy of international worksharing to relieve the USPTO’s long-term bottleneck problems reflects the fact that such worksharing is, to some degree, just another variant of the traditional approach of bringing more governmental hands on deck. The helpful twist is that international worksharing enables the USPTO to seek help from hands not on the USPTO’s deck, but instead already performing essentially redundant work in patent offices abroad. But this twist is of limited long-term value. Even perfect worksharing cannot alter the fact that, as the number of patent applications continues to increase, there will ultimately be a need for an additional governmental hand somewhere. The personnel shortfalls and cost concerns that plague USPTO operations thus merely become globalized. Unless we look forward to a day when every tenth person works for a patent office, we will need to seek further help elsewhere.

B. Privatization Options

Of course, another way of obtaining the benefit of additional hands is to look beyond the government itself. Although William Baumol has declared that “privatization is no cure for the cost disease” in which the patent system shares, he has recognized this as one potential response and seems primarily to have reacted negatively because of concerns about “threat[s] to liberty” and “politically irresistible” backlash to privatization in the form of price controls.


Janice M. Mueller, Patent Law 242 (4th ed. 2013) (observing that the AIA’s implicit “first-inventor-to-file standard” is not absolute but instead “subject to three important exceptions”).

Baumol, supra note 7, at 64.

Id. at 64-65 (noting the “threat to liberty posed by reliance on private armies” and contending that, “if rising costs are caused by unavoidably slow productivity growth in personal and handicraft services, cost controls can only lead to deterioration in the quality of those services or, worse, to their partial or total disappearance”); see also William J. Baumol, Health Care, Education and the Cost Disease: A Looming Crisis for Public Choice, 77 Pub. Choice 17, 27
There are at least three ways in which “privatization” of USPTO work might be increased. First, one can try to extract more information or work in “patent filtering” from patent applicants themselves. Second, one can look for like voluntary contributions from interested third parties. Third, one can more actively contract out aspects of the government’s work to private entities looking to make a direct profit from that work.

In line with patent law’s historical development of specification and claiming requirements, the most obvious “privatization” alternative is to consider what more might be extracted from applicants themselves. Whether because applicants have developed the claimed inventions themselves or because the applicants have chosen to acquire prospective rights to those inventions, applicants might be presumed to start with some degree of knowledge that would be helpful to examiners. In some circumstances, applicants might even be better able to acquire additional relevant knowledge. Already existing disclosure requirements, including a duty of candor whose breach can lead to a later charge of inequitable conduct, attempt to leverage such private knowledge and capacity to some degree. Nonetheless, as the U.S. Supreme Court’s decision in *Microsoft Corp. v. i4i Limited Partnership*, confirmed, the U.S. patent system can do more to place greater burdens of production or proof on applicants for patent rights.

On the other hand, substantially increasing the burdens on applicants—such as by requiring proof of a plausibly adequate prior-art search and further requiring a relatively impartial report on that search’s results—would likely substantially increase the effective cost of applying for patents. Such an effective cost increase could further discourage patenting by

(1993) (arguing that, with costs inevitable rise even after privatization, “[t]he prospect is that public pressure will be the enemy of the public interest as in so many cases where price control has been invoked as the magic formula for cost reduction”).


95 Cf. Abramowicz & Duffy, *supra* note 82, at 1574 (viewing as a form of privatization a “set of new initiatives … impos[ing] more burdens on the patent applicant to develop the information necessary to evaluate the application”).

96 37 C.F.R. § 1.56 (“Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section.”).

97 *MUELLER*, *supra* note 91, at 551 (noting that “a severe penalty is set for violations of the duty [of candor to the USPTO] that come to light in subsequent litigation of a patent: if the defense of inequitable conduct is proved, the entire patent (i.e., all claims, regardless of their validity) is rendered unenforceable”).

98 131 S. Ct. 2238, 2244 (2011) (rejecting a contention “that a preponderance standard [of proof] must apply at least when an invalidity defense rests on evidence that was never considered by the [US]PTO in the examination process”).
already cost-conscious innovators, potentially discouraging patenting by start-ups\textsuperscript{99} who might be among patent law’s most socially appropriate clientele.\textsuperscript{100}

A second “privatization” approach is to leverage third parties’ knowledge or incentives to acquire knowledge about potential or actual patent rights. With some aid from Congress, the USPTO has taken a number of incremental steps in this direction over the last few decades. A variety of reexamination or post-grant review proceedings enable private parties to challenge patent rights in administrative proceedings that tend to be much cheaper than litigation in the Article III courts and, because of lower thresholds for administrative standing as compared to Article III standing, more accessible to parties not immediately threatened with an infringement suit.\textsuperscript{101} The America Invents Act has also facilitated private parties’ submission of relevant information to the USPTO even prior to a patent’s grant.\textsuperscript{102} Moreover, a Peer-to-Patent Project has shown how private parties might productively contribute to examination of at least a portion of a select group of applications, in this case applications selected based on the willingness of patent applicants to subject them to a more open pre-grant review process.\textsuperscript{103}

I have previously expressed hope that, through such private challenges or inputs, private parties can help to check at least some of the limitations of USPTO processes.\textsuperscript{104} But because private incentives to bring such challenges, absent substantial publicly funded “bounties” provided in great numbers, seem likely to suffice only in a relatively small set of often unusually salient cases, even much greater provision of opportunities for private challenges and inputs

\textsuperscript{99} See Stuart J.H. Graham et al., \textit{High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey}, 24 BERKELEY TECH. L.J. 1255, 1310 (2009) (“We find that, among technology startups, the cost of getting a patent is the most common reason cited for not patenting a major technology.”).

\textsuperscript{100} John M. Golden, \textit{Biotechnology, Technology Policy, and Patentability: Natural Products and Invention in the American System}, 50 EMORY L.J. 101, 169-70 (2001) (describing how patents can help support the business models of small biotechnology companies).

\textsuperscript{101} Golden, supra note 44, at notes 463-67 and accompanying text (discussing the emergence of various forms of reexamination or post-grant review by the USPTO since 1980).


\textsuperscript{103} \textit{Id.} at 170-171 (describing the USPTO’s Peer-to-Patent Project, which opened the examination of a couple hundred applications “to online public participation” “allow[ing] anyone and everyone to participate as a patent reviewer and/or a patent facilitator”); \textit{see also} Giuseppina D’Agostino, \textit{Challenges to the Patent System}, 25 INTELL. PROP. J. 57, 69-71 (2012) (describing the USPTO’s peer-to-patent project as successful but noting concern that “there is a clear challenge in scaling-up the program” in light of apparently limited interest in participation).

\textsuperscript{104} Golden, supra note 44, at text accompanying notes 474-79.
appears unlikely to solve the general problem of dealing with the great mass of applications that are flowing into the USPTO at an accelerating rate.

Naturally, therefore, we might turn to the next set of “privatization” possibilities, a set characterized by much more ambitious privatization through such measures as the widespread provision of monetary “bounties” to challenge patent rights, as proposed in different ways by Jay Thomas and Joseph Miller, or the partial or general delegation of examination itself to regulated private firms, a proposal made by Michael Abramowicz and John Duffy. Such proposals are certainly intriguing. By offering hope that competition and decentralization will help spark significantly greater efficiency, Abramowicz and Duffy in particular suggest reason to think that systematic privatization might substantially improve society’s capacity to shoulder the ever-growing patent workload.

But how can such efficiencies be achieved? Abramowicz and Duffy offer their proposal as an alternative to lumbering government-based approaches that commonly end up embracing either inefficient decision-making through “multimember panel[s]” or unsatisfactory decision-making through “specific rules” that purport to tightly constrain examiner discretion. Thus, they appear to contemplate that private firms will review patents through a process largely of single-examiner review.

But if decision-making is still largely the function of individual examiners conducting highly individualized studies of individual patent applications, one must wonder how great the efficiency gains can be. By how much might private firms, working through the mechanism of individualized examination, cut the required examination workforce? The USPTO currently receives over 500,000 patent applications a year and employs about 7,000 examiners to review them. Commentators commonly view as manifestly insufficient for thorough review the estimated twenty hours or so that an examiner has, on average, to work on an individual application. Let’s assume, nonetheless, that examiners employed by private firms are so


106 Joseph Scott Miller, Building a Better Bounty: Litigation-Stage Rewards for Defeating Patents, 19 BERKELEY TECH. L.J. 667, 677 (2004) (proposing monetary rewards for patent challenges that operate “at the litigation stage, in an amount that varies as a function of the patentee’s net profits from the technology set forth in the asserted patent claims”).

107 Abramowicz & Duffy, supra note 82, at 1541-42 (suggesting a system in which examination of patent applications is conducted substantially by private firms regulated by the USPTO).

108 See id. at 1555 (noting that “the most significant advantages of private, rather than governmental, provision arise from the process of competition” and that “[t]he inability of the [US]PTO to adhere to basic commercial standards and adopt new technology is representative of the organizational challenges that government-owned enterprises face”).

109 Id. at 1559-60.

110 See, e.g., Michael J. Meurer, Patent Examination Priorities, 51 WM. & MARY L. REV. 675, (2009) (observing that an estimated average of eighteen hours per patent for examination
efficient, perhaps because of lower turnover and better personal and technological support, that they can complete satisfactory examination of individual patents in an average of twenty hours. Let’s also assume that the private firms squeeze an average of 2,000 examination hours out of each examiner each year—a quite optimistic figure, I think, given that corporate law firms often fall short of achieving such an average for the total annual billable hours of law-firm associates having much higher salaries than patent examiners. How many examiners would the private firms need to employ to process 500,000 applications per year? Multiply 500,000 by 20 hours and then divide by 2,000 hours per examiner, and one ends up with an answer of 5,000 examiners, a number roughly like the total number of examiners currently employed by the USPTO.111

In short, at least at the level of processing volume, as opposed to producing quality results, privatization of individualized examination seems unlikely to hold much magic that can make the patent workforce problem go away. Ultimately, if we wish to continue to increase patent-processing capacity in line with accelerating growth in patenting, we seem destined to need either a far vaster patent workforce or qualitatively different approaches to examination of individual patents. Section IV.C considers some possibilities.

C. Rulemaking or Other Approaches to “Partially Automated” Examination

How can the USPTO or even private-sector patent-certification entities adjudicate the patentability of more and more claimed inventions other than by adding hands? A variety of incremental efficiency-enhancing steps can undoubtedly be taken: as with other government agencies, the USPTO’s information technology has a reputation for being somewhat embarrassingly backward.112 But as pointed out above, basic mathematics suggests that, as long as we remain true to the current individualized examination model, straightforward efficiency-

“compares unfavorably to what I expect of my students when they write research memos”); Lemley, supra note 45, at 1496 n.3 (“Examiners have astonishingly little time to spend on each application—on average, a total of eighteen hours ….

111 Cf. Doug Lichtman & Mark A. Lemley, Rethinking Patent Law’s Presumption of Validity, 60 STAN. L. REV. 45, 53 (2007) (noting that to do significantly more than the USPTO does in examining applications, such as hiring outside experts to comment on individual applications, “would be enormously costly”).

increasing reforms such as mere updating of information technology will likely leave intact the bulk of the patent-processing challenge.

My sense is that, in a patent system that already employs crude proxies for social value such as novelty, nonobviousness, and a mostly feeble sense of utility, we need to be more willing to abandon illusions that the patent system can hope regularly to attain truly individualized, precise justice. In the spirit of Jerry Mashaw’s “bureaucratic rationality,” what we can more realistically hope to attain are better overall results with respect to the mass of patent cases, where the concept of “better” includes consideration of patents’ public and private costs, including administrative costs, as well as their public and private benefits. To this end, rulemaking that effectively truncates the need for individualized fact-finding and decision-making on at least some cross-sections of issues seems a promising way forward. Here again, I follow the more general path of Baumol, who has noted that the so-called “stagnant services,” those marked by relatively low productivity growth, tend to be ones that have resisted standardization and automation. An obvious response is to seek ways to overcome or circumvent this resistance, whose inherency Baumol himself has suggested can sometimes be more illusion than reality. More prevalent and effective USPTO rulemaking is in effect a way of trying to escape some of the basic causes of stagnancy by introducing more standardization and automation into USPTO review of individual patent applications.

The USPTO has already shown a capacity to develop rules that effectively guide and simplify decision-making in significant classes of cases, most notably through guidelines on utility and written description in the context of biochemical innovation. Such substantially fact-based rulemaking seems a model that the USPTO should be able to replicate with respect to other technologies. Why can’t the USPTO chronicle for the benefit of its examiners various already standard ways of combining communication, doing business, or finding amusement with existing electronic, computer-related, or more specifically Internet-related technologies?

113 See John M. Golden, Patentable Subject Matter and Institutional Choice, 89 Tex. L. Rev. 1041, 1065 (2011) (describing various tests for patentability as “no more than crude proxies for the question of whether any individual patent grant will further overall social goals”).

114 See generally Mashaw, supra note 81, at 26 (“From the perspective of bureaucratic rationality, administrative justice is accurate decisionmaking carried on through processes appropriately rationalized to take account of costs.”).

115 Baumol, supra note 7, at 22 (emphasis omitted).

116 Id. at 22-23 (observing that, in comparison to manufacture of automobiles, surgery and car repair “are inherently resistant to standardization” and that, for various services, “quality is—or at least is believed to be—inescapably correlated with the amount of labor expended on their production”).

117 Id. at 23 (noting some “self-deception by the providers of [stagnant] services and the customers who obtain them” and the possibilities for greater use of computers in health care, “a filmed lecture by an extraordinarily talented teacher,” and “recorded music”).

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Couldn’t the USPTO have generated an account of the replacement of various mechanical control technologies with electronic control technologies that would have better enabled the examiner of the patent in *KSR International Co. v. Teleflex Inc.*119 to reject that claimed invention as obvious?120 Although catalogs of standard “moves” will necessarily be a moving target as knowledge and practice develop, even a not fully up-to-date recorded catalog can remain useful for the class of potential combinations to which it applies. By explaining and ordering knowledge in a way that is specifically tailored to help examiners, USPTO guidelines can effectively arm them to make fact-supported rejections on various grounds of unpatentability without having to reinvent the wheel.

Such USPTO rulemaking need not be “substantive rulemaking” that possesses binding force of law in the courts.121 As indicated above, the USPTO can work effectively through guidelines.122 This approach might even be preferable to truer USPTO “lawmaking” because guidelines tend naturally—on judicial review if nowhere else—to leave room for rebuttal or distinction based on the facts of the individual case.

More radical savings in individual examination could come if we could trust machines to do some significant part of the review for us—effectively using rules encoded in their programming either to filter patent wheat from application chaff or at least to flag for significantly more searching review patent applications that appear particularly problematic or otherwise sensitive. With the merits of software to grade student examinations already subject to debate,123 is software that serves as a check or substantial aid to the evaluation of patentability conceivable? Even if the answer is “Yes,” there are likely to be limits. Dangers of applicants’ figuring out the nature of the software’s algorithms and then “gaming the system” would loom large. As the Internal Revenue Service has found and as courts of equity have long appeared to know, rules with some flex in them can be the best way to combine a desirable degree of predictability, justice, and robustness against opportunistic behavior.124 Such flex might be best

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120 See id. at 1744 (concluding that, at the time of invention, “[t]echnological developments made it clear that engines using computer-controlled throttles would become standard”); cf. Michael Abramowicz & John F. Duffy, *The Inducement Standard of Patentability*, 120 Yale L.J. 1590, 1677 (2011) (“The occurrence of an exogenous shock that decreases the cost of an invention or increases the benefit of an invention should count as a secondary consideration of obviousness.”).

121 See id. (describing common usage of the term “substantive rulemaking”).

122 See supra text accompanying notes __.

123 John Markoff, *Essay-Grading Software Offers Professors a Break*, N.Y. Times, Apr. 4, 2013, at __ (noting that “the use of artificial intelligence technology to grade essay answers has not yet received widespread endorsement by educators and has many critics”).

124 Mark P. Gergen, John M. Golden & Henry E. Smith, *The Supreme Court’s Accidental Revolution? The Test for Permanent Injunctions*, 112 Colum. L. Rev. 203, 237-38 (2012) (“It is foundational that equity must be open textured in light of the ability of parties to
implemented through human examiners. A bit more human-oriented algorithmic formulation—in the shape of fact-based guidelines directed at relatively specific technological issues—could improve examination efficiency and quality in the face of a rising patent flood.

V. Conclusion

The current crush of patent applications appears unlikely to be a passing phenomenon. For centuries, both the number of patent applications flowing into the patent office and the number of granted patents flowing out have been growing at a generally accelerating rate. This continual acceleration exerts constant pressure on patent law’s administrative institutions and forced repeated, dramatic change in the U.S. patent system’s early decades. A “more hands on deck” approach has been the dominant response to this pressure since the generation of a patent office with a professional examining corps under the Patent Act of 1836. But even as the USPTO opens four regional offices, this strategy that seems to come ever closer to Sisyphean futility. Indeed, the very opening of the new offices might suggest how desperate the search for patent-bureaucracy personnel has become.

A mix of additional strategies can limit the need to rely on the “more hands on deck” approach. Drawing on the efforts of foreign patent offices and increasing the contributions of private parties to examination can mitigate current and even medium-term pressures. But there are likely limits to the capacity of these approaches to keep up with continually accelerating growth over the long term. Another approach—incorporating more generalized fact-finding and rule-informed adjudication in the examination process—might help fill any remaining breach. The USPTO likely can provide more fact-based but nonetheless generalized guidance to examiners on what sorts of innovations and innovation disclosures should be considered to meet patent law’s basic patentability requirements. Over time, greater experience with such rulemaking might enable the USPTO to be more adept at it, in particular better at using it to facilitate processing an ever-growing deluge of applications. Whether the USPTO can and should evolve into an institution that delivers a socially acceptable form of “mass justice” as opposed to more individualized adjudication remains to be seen. But some move to experiment with more systematic rulemaking to expedite the work of USPTO examiners and appeals boards seems well worth a try.

opportunistically evade legal obligations. This problem is at an extreme in tax law, where anti-evasion doctrines are aimed at discouraging opportunism”).