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TECHNOLOGICAL INNOVATIONS AND ENDOGENOUS CHANGES
IN U.S. LEGAL INSTITUTIONS, 1790-1920

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ABSTRACT

Recent scholarship highlights the importance of institutions to the processes of economic growth, but the precise nature of their relationship bears further examination. This paper considers how the evolution of legal institutions has contributed to, and in turn been affected by, major technological innovations. The first section of the paper examines the U.S. intellectual property system. Patent and copyright laws, and their interpretation and enforcement by the federal judiciary, certainly influenced the course of technical and cultural change, but it is clear that they did not develop independently of the state of technology and of the economy. Both the statutes and their interpretations altered in response to the introduction and diffusion of new technologies. The second section explores in more detail the impact of some of these technological innovations -- including steamboats, railroads, telegraphy, medical technologies, and automobiles -- on the common law, regulation and insurance. Such technological advances often led to institutional bottlenecks, which then required accommodations in legal rules and their enforcement. Although the common law had some capability for economizing on legal adjustment costs through "adjudication by analogy," the socio-economic changes wrought by major innovations ultimately produced more fundamental change in legal institutions, such as shifts in the relative importance of state and federal policies, and in the degree of reliance on regulation by bureaucracy. In sum, the historical record of the evolution of legal rules and standards in the United States indicates a remarkable degree of flexibility as such institutions responded to changing economic circumstances.

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“I am not an advocate for frequent changes in laws and constitutions. But laws and institutions must go hand and hand with the progress of the human mind. As that becomes more developed, more enlightened, as new discoveries are made, new truths discovered and manners and opinions change, with the change of circumstances, institutions must advance also to keep pace with the times....”

-- Thomas Jefferson (1810)¹

1. INTRODUCTION

Recent scholarship highlights the importance of institutions in long-run economic growth, but the specific relationship is still not clearly understood, despite a plethora of research on both the theoretical and empirical aspects of institutions and economic activity.² Indeed, even in the face of evidence that such institutions might be endogenous, some empirical studies still treat legal regimes, patent systems and other forms of property rights as exogenous determinants of economic performance. Moreover, legal structures and statutory changes are often discussed without attempts to distinguish between rules and their enforcement. In short, there is a need for research that contributes to a better understanding of the sources of institutional change, the specific means through which revisions are implemented, the impact of different rules and standards, the feedback mechanism between economic factors and institutions, and the degree of substitutability across institutions. This paper addresses such issues by assessing several thousand lawsuits from U.S. state and federal courts over the “long nineteenth century.” The analysis indicates how legal institutions adapted to changing circumstances, and suggests that American economic success was partly due to the flexibility and transparency of its legal system.

Law and technology are both critical for understanding the evolution of American society.

As such prominent commentators as Thomas Paine and Alexis de Tocqueville have pointed out, U.S. policy has always been distinguished by the central role of law and the judiciary.³ Moreover,

1 See <http://www.monticello.org/reports/quotes/memorial.html>, for inscription at the Jefferson Memorial in Washington, D.C. (taken from a letter to Samuel Kercheval, July 12, 1810).

2 . For an excellent overview of the debate on institutions and economic growth, see Stanley L. Engerman and Kenneth L. Sokoloff, “Institutional and Non-Institutional Explanations of Economic Differences,” NBER Working Paper No. 9989, Sept. 2003; and Douglass North, Institutions, Institutional Change and Economic Performance, Cambridge: Cambridge University Press, 1990.

3 Thomas Paine felt that “in America THE LAW IS KING”((Caps. in the original text), Common Sense, Chapt. III, p. 49, Philadelphia: W. and T. Bradford, 1776. Alexis de Tocqueville argued that American courts wielded enormous

its citizens stand out for their innovativeness and willingness to adopt new technologies, to such an extent that some have even characterized the United States as a “republic of technology.” This favourable view of invention and innovation was matched by the readiness of the judiciary to accommodate the radical transformations caused by innovations. The notion that our own era is unique reveals a somewhat limited appreciation of the cumulative impact of such innovations as the telegraph, steam engine, railroad, radio, electric power and the automobile on American society in the nineteenth and early twentieth centuries. Unprecedented technical progress during that period brought about discrete and measurable changes in the lives, lifestyles and livelihood of Americans that arguably exceed those of our own time. Technological innovations also affected the scope and nature of the law. Competition policy, medical malpractice, nuisance, trespass and torts, the allocation of riparian rights and admiralty law all reflected the turmoil wrought by technical changes. Advances in forensic science and technology transformed the enforcement and adjudication of criminal law. Similarly, organizational innovations and the growth of national markets affected the nature of property rights, employment contracts and liability rules.⁴

This study focuses on the period between 1790 and 1920. Clearly, technological change was not unknown before this time, but the innovations of the nineteenth century were significantly different from those of previous centuries because their sphere of influence was on a much larger scale. For the first time in American history, innovations in transportation extended the practical boundaries of markets and social interactions to encompass repeated national and international transactions as a common occurrence. Moreover, the expansion of virtually instantaneous communications networks introduced time as a central feature of such interactions and facilitated

political power, since “Scarcely any question arises in the United States which does not become, sooner or later, a subject of judicial debate.” (Alexis de Tocqueville, Democracy in America, ed. J.P. Mayer, trans. George Lawrence, 1835; New York: Harper & Row, 1969, Vol. I, Chap. 8, p. 311.)

⁴ Technological change was not limited to domestic issues, for it also facilitated more numerous and more rapid transactions with other nations during peace and war. Indeed, the very boundaries of maritime sovereignty were constrained by existing technology, since the three-mile limit was determined by the maximum distance a cannon shot could reach. Innovations like submarines, underwater international cables and manned airplane flights created jurisdictional and third party effects among nations which the legal system had to address. The legal implications of naval blockades and sanctions changed as newer ships and submarines developed, and the maritime laws of agency

productivity changes through greater intensity of work and leisure. As a result of both of these factors, technologies of the nineteenth century not only engendered conflicts between transactors, they also created a world in which the pace, scale and scope of third-party effects were potentially much larger. This raised the policy question of how to ensure that technological progress increased social welfare, while minimizing potential costs such as unrestrained market power or undue redistributive effects.

Although this paper centers on the relationship between the law and technology, it is important to realize that legal institutions comprise part of a complex network of institutions that function as complements or as substitutes to the law. In certain contexts social norms or familial ties may serve as the most effective moderator of behaviour, independently of state-enforced rules; whereas circumstances that require little discretionary decisionmaking may be dealt with at least cost through administrative bureaucracies. As Montesquieu and Adam Smith pointed out, markets can be self-regulating, since the pursuit of self-interest in market-related transactions may be sufficient to ensure that participants cooperate in a civil society in a manner that promotes the common good.⁵ Courts in the seventeenth and early eighteenth centuries performed a comprehensive regulatory function that encompassed both the private and public realms. They monitored and enforced pervasive moral and religious codes, and imposed restrictions on commerce through price controls, licensing, enforcement of contracts and property rights. Soon after the first decade of the eighteenth century, as the scale of market activity increased, a division of labour across institutions led to caseloads in civil courts that primarily involved economic transactions to enforce debt contracts. The legal system was therefore well-prepared to accommodate the economic challenges of the nineteenth century.⁶

and bottomry incorporated developments in communications that meant ships at sea were no longer completely cut off from their owners on land.

5 For an empirical study of this issue, see B. Zorina Khan, "Commerce and Cooperation: Litigation and Settlement of Civil Disputes on the Australian Frontier," *Journal of Economic History*, vol. 60 (4) 2000:1088-1119.

6 For a quantitative analysis of the evolution of colonial courts that employs an extensive data set of district court cases, see B. Zorina Khan, "'Justice of the Marketplace': Legal Disputes and Economic Activity on the Northeastern Frontier, 1700-1860" (unpublished paper, 2003).

By the end of the period under review, legal institutions still formed an integral part of American life, but their orientation had altered because their activities were bolstered by an array of associative and administrative institutions. This process of bureaucratization, perhaps because more visible than the decentralized decision-making of the court system, led some observers to highlight regulation as a twentieth-century innovation. Instead, economic activity in the United States has always been subjected to the public interest: the major feature that has changed is the type of institution that accomplished this task. However, which particular institution prevails – norms, legal system, bureaucratic regulation, government or market -- may be less important than the degree of flexibility exhibited, for institutions that do not respond to social evolution will necessarily become irrelevant.

The Framers of the American Constitution had been certain that social welfare would be maximized through the “progress of science and useful arts.” They felt that this would be best achieved through a complementary relationship between law and the market. The Constitution and early statutes were carefully calibrated to ensure a democratic, market orientation towards invention. The wish to further technological innovation through private initiative created a paradox: in order to promote diffusion and enhance social welfare it would first be necessary to limit diffusion and to protect exclusive rights. Thus, part of the debate about law and technology has always centered on the boundaries of the private domain relative to the public domain. Innovations in printing and publishing added to the complexity of the issue by introducing questions fundamental to a democratic society such as equality of access, opportunity to participate in progress, and freedom of speech. Effective policies towards innovations, whether by statute or common law, therefore required a balancing of costs and benefits that was far more subtle than a monolithic promotion of the interests of any one specific group in society.

Legal institutions exerted a significant influence on social and economic interactions, and technology was no exception. Intellectual property law had a direct effect on the rate and direction

of inventive activity and cultural innovations. Patents and copyrights, as the subject of federal law, exhibited greater uniformity than if under state jurisdiction, and thus facilitated the development of a national market. As the creators of the intellectual property system recognized, inventors would be motivated to address important needs of society if they were able to appropriate the returns from their efforts. Patent laws and their enforcement also had significant distributional implications for the types of inventors who could benefit from their efforts, and the nature of their inventions. For instance, relatively low patent fees served to encourage ordinary citizens to invest in creating new discoveries, whereas an examination system increased the average technical value of patents, promoted a market in inventions, and encouraged the diffusion of information. Technology was also shaped by other areas of law, including rules regarding contract and constitutional issues.

The relationship between law and technology was reciprocal for, just as law shaped technology, technical innovations significantly influenced legal innovations. How and why the common law changed constitutes a standard debate in political and legal histories.⁷ A classic source of dissension relates to the arguments of scholars who agree that American legal institutions were flexible, but contend that the judiciary was captured by the interests of a small group in society. Morton Horwitz, in particular, admits that the antebellum legal system played a key role in the nascent industrialization of the United States, but argues that judges were biased in favour of the capitalists and industrialists whom they regarded as key to the promotion of economic development. The judiciary reinterpreted existing legal rules in property, torts and contracts in an instrumentalist fashion to place the burdens of expansion on workers and farmers. In so doing, judicial decisions led to outcomes that subsidized the efforts of industrialists, regardless of the statutes and of legal precedent. Judges assumed the role of legislators to the extent that “judge-

⁷ The standard legal histories include Morton J. Horwitz, The Transformation of American Law, 1780-1860, Cambridge, MA: Harvard University Press, 1977, and The Transformation of American Law, 1870-1960: The Crisis of Legal Orthodoxy, New York, Oxford University Press, 1992; Lawrence M. Friedman, A History of American Law, New York, Simon & Schuster, 1973; and James Willard Hurst, Law and the Conditions of Freedom in the Nineteenth-Century United States, Madison, University of Wisconsin Press, 1956. See also Kermit L. Hall, The

made law” should be viewed as a derogatory term. This “ruthless” transformation meant that the economically progressive classes were able to “dramatically ... throw the burden of economic development on the weakest and least active elements of the population.”⁸ The specifics of the subsidy hypothesis have been challenged, but it has proven to be a resilient interpretation of the American experience.⁹ Its most recent renaissance has emerged in claims that regulation in the Gilded Age was an optimal response to the failures of the legal system. Edward Glaeser and Andrei Shleifer argue that large scale corporations wielded excessive power in the courts, “routinely bribed” judges and juries, and engaged in other legal and illegal tactics to ensure outcomes that were biased in their favour. Consequently, the legal system “broke down.” This “subversion of justice” proved to be inappropriate for the needs of the time and was replaced by regulatory agencies, which allegedly were less susceptible to the same corrupting influences.¹⁰

An alternative rendering of the history of American law can be obtained from the application of economic insight to the evidence. According to the Coase Theorem, the legal system reinforces the market by ensuring that property rights are well-defined and predictable, and by minimizing transactions costs. Technological change in the era of industrialization affected the efficiency of private market solutions by creating uncertainties about property rights, by changing the costs of transacting and by increasing spillover effects. However, the legal system helped to resolve the potential for market failure by defining rights, reducing costs of transacting, and taking into account third-party effects, through innovations in legal rules. Such rules helped to ensure

Magic Mirror : Law in American History, New York : Oxford University Press, 1989.

8 Horwitz, Transformation, p. 101.

9 Critics of the subsidy thesis regard the most effective rebuttal to be simply an objective and extensive reading of lawsuits and legal procedures. They highlight the complementary relationship between legislature, common law, Constitution, and the judiciary. Peter Karsten, Heart Versus Head: Judge-Made Law in Nineteenth-Century America, Chapel Hill: University of North Carolina Press, 1997, argues that court decisions towards contracts, torts and property tended to protect workers and were not perceptibly biased towards defendants or capitalist developers. See also Tony A. Freyer, Producers versus Capitalists: Constitutional Conflict in Antebellum America, Charlottesville: University Press of Virginia, 1994. Gary T. Schwartz critically reviewed Horwitz’s interpretation of negligence doctrines in “Tort Law and the Economy in Nineteenth-Century America: A Reinterpretation,” 90 Yale Law Journal (1982): 1717-1775; and “The Character of Early American Tort Law,” vol. 36, UCLA L. Rev. (1989): 641-718.

10 According to Edward L. Glaeser and Andrei Shleifer, “During the Progressive Era at the beginning of the 20th century, the United States replaced litigation by regulation as the principal mechanism of social control of business.” See “The Rise of the Regulatory State,” NBER Working Paper No. 8650, December 2001.

that social costs and benefits were similar to private costs and benefits, facilitated the transition of resources to the highest-valued use, and also reallocated risk to those who could bear them at lowest cost. Far from “breaking down,” legal institutions stood out as an important mechanism that allowed Americans to take advantage of the new opportunities wrought by expanding markets and technological progress.

A key question in the economics of institutions relates to the extent to which rules and standards should be revised, or the appropriate boundaries between credible commitments and rigidity, or flexibility and flaccidity. New technologies in the nineteenth century raised questions about the relevance of existing legal rules, and ultimately caused changes in the law, albeit with a lag. Since the judiciary is by its nature conservative and technology is dynamic, the legal system potentially could have functioned as a significant bottleneck to further innovation. Instead, the common law was sufficiently flexible to cope with new discoveries. This flexibility did not occur because of preconceived bias towards any particular group in society nor because of opaque precepts that “subverted justice.” Instead, we can identify five transparent mechanisms through which technological change had an impact on the law: technical innovations affected existing analogies; altered transactions costs; increased the speed and scope of transactions; influenced norms and expectations at both the industry and societal levels; and changed judicial and legislative conceptions of the most effective means to promote the public interest.

In the first instance, courts attempted to mediate between parties to disputes that related to the incursions of new technologies through a process we can regard as “adjudication by analogy.”¹¹ Early on, the law was stretched to accommodate discrete changes by attempting to detect some degree of equivalence across technologies, either by form or by function. However,

11 According to the court in *Lotus Dev. Corp. v. Paperback Software Int'l*, 740 F. Supp. 37 (1990): “When strictly logical deductions from authoritative declarations of law -- in constitutions, statutes, and precedents -- do not provide answers to questions of law that must be decided in the case before the court, the court turns to analogy.” However, the court in *N.Y. Times Co. v. Tasini*, 533 U.S. 483 cautioned against rigid analogies that preclude dynamic standards: “But no definitive choice among competing analogies (broadcast, common carrier, bookstore) allows us to declare a

inappropriate analogies tended to increase the frequency of legal conflicts or appeals, which served as a signal to indicate that revisions were insufficient. Second, under these circumstances, inappropriate rulings increased the cost of transacting, and made it necessary for legal doctrines and legislation to change in order to encompass the new innovations. The third mechanism was motivated by technologies, such as major advances in transportation and communications, that led to a more rapid pace of activity, and thereby produced pressures for correspondingly rapid responses in the legal system. Fourth, judicial decisions attempted to enforce community standards and expectations, which were a function of the current state of technology. Finally, the judiciary recognized that, in order to increase overall social welfare, the law must evolve to allow citizens the most effective way to take advantage of new opportunities. In the words of the classic legal maxim: *salus populi suprema lex est*.¹²

The first section of this paper assesses intellectual property laws that the founders authorized in the very first section of the Constitution, indicating the central role they ascribed to law and technology in the future of the nation. The United States created the world's first modern patent system, and its effectiveness was reinforced by a federal judiciary that ensured property rights were secure and inventors were able to appropriate the returns from their efforts. Copyright law illustrated the difficulties and dilemmas that the legal system experienced in dealing with such new technologies as mimeographs, flash photography, cinematography, piano rolls, phonographs, radio, and "information technology." The second section of the paper analyzes the effect of new technologies – steamboats and canals, railroads, telegraphy, medical and public

rigid single standard, good for now and for all future media and purposes.... aware as we are of the changes taking place in the law, the technology, and the industrial structure related to telecommunications.....”

12 “Social welfare is the ultimate law.” It is undoubtedly true that, as the proponents of the subsidy thesis pointed out, a number of changes in the common law during the nineteenth century benefited corporations, and some decisions were harsh towards frail widows and workers. However, the tendency was not monolithic. Some doctrinal developments, such as the abolition of privity of contract, served to increase, rather than decrease, manufacturer liability. Procedural innovations that benefited low-income plaintiffs included the adoption of contingency fees and class action suits. Contingency fees were regarded with some disdain by “reputable” jurists as barratry. But even those who disapproved of them, as did Justice McSherry, of Maryland Appeals Court, acknowledged that “Cases, however, may sometimes occur in which, without the allowance of such fees, justice might be defeated, and redress denied to the poor and the oppressed, and it was upon this ground that the Courts first allowed the payment of such

health innovations, and the automobile -- on the common law itself. Technological innovations led to legal innovations, they changed the relative importance of state and federal policies, and ensured a continual debate about the effectiveness of the law in comparison to regulation by bureaucracy.

A. INTELLECTUAL PROPERTY LAWS¹³

“Not logic alone, but logic supplemented by the social sciences
becomes the instrument of advance”

--- Benjamin Cardozo¹⁴

The United States from its inception as a nation had the option of drawing on European precedents for its intellectual property system but chose to pursue very different policies towards both patents and copyrights. The American system was distinguished by its favourable treatment of inventors and the inducements held out for inventive activity, whereas the copyright regime was hedged about with caveats and restrictions. The first Article of the U.S. Constitution included a clause to “promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.” George Washington issued a plea to highlight its importance, and Congress quickly complied in 1790 by passing separate patent and copyright statutes.

i) Patents

The American patent system was arguably the most successful in the world in generating secure property rights, broad-based technological change and economic growth (Figure 1). Legislators emphatically rejected restrictions on the rights of American inventors, and ensured that the legal system facilitated the operation of a free market. Working requirements or compulsory licences were regarded as unwarranted infringements of the rights of “meritorious inventors,” and incompatible with the philosophy of U.S. patent grants. Fees were deliberately kept among the

fees. Afterwards the validity of such fees was generally recognized....” Davis et al. v. Gemmell et al., 3 Md. 530; 21 A. 712; 1891.

13 This section is largely based on B. Zorina Khan, *The Democratization of Invention: Patents and Copyrights in American Economic Development*, NBER and Cambridge University Press, (forthcoming). See also B. Zorina Khan and Kenneth L. Sokoloff, “The Early Development of Intellectual Property Institutions in the United States,” *Journal of Economic Perspectives*, vol. 15 (3) 2001: 233-246.

14 Benjamin Cardozo, *The Growth of Law*, New Haven: Yale Univ. Press, 1924, p. 73.

lowest in the world, patentees were not required to pay annuities to maintain their property, there were no opposition proceedings, and once granted a patent could not be revoked unless there was evidence of fraud. As a result, the annals of American invention were not limited to the wealthy, corporate entities, or other privileged classes, but reflected a broad spectrum of society. In an era when state policies prohibited blacks and married women from benefiting from their economic efforts, Federal patent laws did not discriminate against disadvantaged groups.¹⁵

The initial establishment of an examination system was replaced by the 1793 model in which patents were awarded through registration, with disputes being resolved in the district courts. When this system was reformed by statute in 1836, the United States created the world's first modern patent institution. The primary feature of the "American system" was an examination of patent applications for conformity with the laws. In particular, the 1836 Patent Law formally established a Patent Office that was staffed by trained and technically qualified employee examiners. The French had opposed examination in part because they were reluctant to create positions of power that could be abused by office holders, but the characteristic American response to such potential problems was to institute a policy of judicial checks and balances. In order to constrain the ability of examiners to engage in arbitrary actions, the applicant was given the right to file a bill in equity to contest the decisions of the Patent Office with the further right of appeal to the Supreme Court of the United States. The historical record indicates that the legislature's creation of a uniquely American system was a deliberate and conscious process. The basic parameters of the U.S. patent system were transparent and predictable, in itself an aid to those who wished to obtain patent rights. In addition, American legislators were concerned with ensuring that information about the stock of patented knowledge was readily available and diffused rapidly. The Patent Office was a source of centralized information on the state of the arts.¹⁶

15 B. Zorina Khan, "Married Women's Property Laws and Female Commercial Activity: Evidence from United States Patent Records, 1790-1895," *Journal of Economic History*, vol. 56 (2)1996:356-88, examines the influence of changes in state laws on patenting activities by women.

16 As early as 1805 Congress stipulated that the Secretary of State should publish an annual list of patents that were granted in the preceding year, and after 1832 also required the publication in newspapers of notices regarding expired

The designers of the American system of intellectual property envisioned that the federal legal system would be closely integrated with every phase of the life of patents and copyrights, from the initial grant, its defence and trade, through to possible extensions. The value of patents was increased because patent issues were litigated at the federal and not the state level, with a right of appeal to the Supreme Court, which contributed to uniformity and certainty in intellectual property. Federal courts from their inception attempted to establish a store of doctrine that fulfilled the intent of the Constitution to secure the rights of intellectual property owners. The judiciary acknowledged that inventive efforts varied with the extent to which inventors could appropriate the returns on their discoveries, and attempted to ensure that patentees were not unjustly deprived of the benefits from their inventions. Technology policy was conducted at the national level and this contributed to the rapid development of a national market for innovations.

Courts explicitly attempted to implement decisions that promoted social and economic development through technological change.¹⁷ The attitudes of the judiciary were primarily shaped by their interpretation of the monopoly aspect of the patent grant. In *Whitney et al. v. Emmett et al.*, 29 F. Cas. 1074 (1831), Justice Baldwin contrasted the policies in Britain and America towards the patent contract. English Courts, he pointed out, interpret the patent grant as a privileged exception from the general ban on monopolies. Apart from this proviso, the judiciary had total discretion in interpreting and deciding the ends that would promote public welfare. The patent was seen as a trade-off, a bargain between the inventor and the public with a negotiable outcome. In contrast, in the United States the patentee was not recognized as a monopolist per se, and judges had little discretion other than to fulfil the explicit intention of the Constitution. Numerous reported decisions before the early courts declared that, rather than unwarranted monopolies, patent rights were "sacred" and to be regarded as the just recompense for inventive ingenuity.

patents.

¹⁷ "The Constitution of the United States, in giving authority to Congress to grant patents for a limited period, declares the object to be to promote the progress of science and the useful arts, an object as truly national and meritorious, and well founded in public policy, as any which can possibly be within the scope of national protection." *Ames v. Howard*,

Supreme Court Justice Joseph Story, the acknowledged patent expert of the antebellum courts, indicated in *Lowell v. Lewis* (1817) that "the inventor has a property in his invention; a property which is often of very great value, and of which the law intended to give him the absolute enjoyment and possession ... involving some of the dearest and most valuable rights which society acknowledges, and the constitution itself means to favor."

The 1840s saw an increase in the number of patentees resorting to courts of equity, to obtain temporary or permanent injunctions against unauthorized users of their inventions. Preliminary injunctions could also be obtained pending common law litigation, if patentees stood to suffer severe losses. But judges were alert to the possibility of unwarranted harm to the defendants whose enterprises could be broken up. Oliver Parker's request for a wholesale injunction against 100 mill owners was disallowed because his patent was within weeks of expiring. The judge was thus reluctant to issue an injunction that would adversely affect so many enterprises, when the patentee received no benefit from closure of the mills and would later be compensated by the payment of damages if it were indeed proven that the patent was infringed. In the absence of antitrust statutes, equity provided a more flexible channel for mediating between the inventor's exclusive rights and a general monopoly.¹⁸

One of the advantages of a legal system that secures property rights is that it facilitates contracts and trade.¹⁹ Partly as a result, an extensive national network of licensing and assignments developed early on: in 1845 the Patent Office recorded 2,108 assignments, which can be compared to the cumulative stock of 7188 patents that were still in force in that year; by the

1 F. Cas. 755; 1833. See B. Zorina Khan, "Property Rights and Patent Litigation in Early Nineteenth-Century America," *Journal of Economic History*, v. 55 (1) 1995: 58-97.

18 The plaintiff in *Smith v. Downing*, 1 Fish. 54 (Mass., 1850), an assignee of Morse, sought a permanent injunction against the defendants, who operated a telegraph under assignment from Royal E. House. After a detailed exposition of the incremental nature of the development of the telegraph, the court refused the injunction. Exclusive patent rights allowed the inventor to benefit from the acknowledged property in his improvement; at the same time, such property did not extend to the entire field, because this would grant the marginal improver a monopoly that would halt general progress in the area. House's telegraph was not only different from Morse's, but technically superior; hence to mandate an estoppel against his ingenuity and the defendants' enterprise would have been an "extraordinary" measure.

19 For a synopsis of an extensive project that analyses the market for assignments, see Naomi Lamoreaux and Kenneth L. Sokoloff, "Long-Term Change in the Organization of Inventive Activity," (NAS Colloquium) *Science, Technology and the Economy* vol 93, Nov. (1996): 1286-92.

1870s the number of assignments averaged over 9000 per year, and this increased in the next decade to over 12,000 contracts recorded annually. Assignments provide a straightforward index of the effectiveness of the American system, since a market for patented inventions would hardly proliferate if patent rights were uncertain or worthless. The secondary market in patent rights was based on the legally valid assumption that the patent embodied some intrinsic technical value. The English system, which offered no protection to purchasers who were deceived into buying false patents, encouraged unproductive speculation and deterred the development of trade.²⁰ In contrast, American legal rulings voided promissory notes and other contracts for useless or fraudulent patents as part of a policy of protecting and legitimizing property rights.

The judiciary was willing to grapple with other difficult questions including the appropriate measure of damages when patent infringement likely lowered prices, disputes between owners of valid but conflicting patents, and the problem of how to protect the integrity of existing contracts when the law altered. One such question revolved around the criteria for patentability. The patent statutes required that inventions should be “new and useful,” but the judiciary treated the utility requirement as merely nominal, since it was the function of markets, not courts, to determine the value of patents. Infringers who tried to undermine the validity of the original patent on the grounds of utility were reminded that their very use of the item overturned any allegation of lack of utility. The major issue in any patent lawsuit related to the novelty of the invention, or the extent to which it promoted the progress of useful arts. To 19th century courts, patentable technology incorporated ideas and discoveries that were vested in tangible form, and “a mere abstract idea” or processes independent of a means of fixation could not be treated as the exclusive property of any one person, for this would limit diffusion and learning without any measurable social return.²¹

20 For evidence on this issue, see B. Zorina Khan and Kenneth L. Sokoloff, “Institutions and Democratic Invention in 19th Century America: Evidence from the ‘Great Inventors,’ 1790-1930,” American Economic Review, (forthcoming) May 2004.

21 *Badische Anilin & Soda Fabrik v. Kalle*, Circuit Court, S.D. New York, 94 F. 163; 1899. “Neither an idea nor a function, nor any other abstraction, is patentable,” *Goshen Sweeper Co. v. Bissell Carpet Sweeper Co.*, 72 F. 67; 1895.

Consequently, several of the early “business method” cases dealt with copyright laws.²² In 1859 Charles Selden obtained copyright in a book entitled "Selden's Condensed Ledger, or Book-keeping Simplified." His method of book-keeping was infringed by Baker, who denied the validity of copyright protection for a business method. The Supreme Court agreed that copyright protection extended only to expression, and did not provide an exclusive right in the idea itself: “The copyright of a work on mathematical science cannot give to the author an exclusive right to the methods of operation which he propounds, or to the diagrams which he employs to explain them, so as to prevent an engineer from using them whenever occasion requires.” Exclusive rights could only be granted through examination for novelty according to patent laws, although the court refused to decide whether the book-keeping method was indeed patentable.

When patents were granted for inventions that seemed to be for contracts or business methods, they were uniformly overturned by the courts, unless the idea or principle could be construed as vested in a tangible medium. The Patent Office granted an 1891 patent to Levy Maybaum of Newark for inventing a “means for securing against excessive losses by bad debts,” which he assigned to the U.S. Credit System Company. The patent covered a method of computing the industry norm for operating losses and constructing tables that allowed comparisons relative to the industry average. When the owners of the patent brought an infringement claim before the courts, the patent was dismissed as “a method of transacting common business, which does not seem to be patentable as an art.”²³ In litigation regarding the validity of an invention for "time limit" transfer tickets for use by street railways, the defendants sought to decry the patent as "a method of transacting business, a form of contract, a mode of procedure, a rule of conduct, a principle or idea, or a permissive function, predicated upon a thing involving no structural law."

22 See *Bartlette v. Crittenden*, 2 F. Cas. 981; 1847.

23 *U.S. Credit System Co. v. American Credit Indemnity Co.*, 53 F. 818; 1893. The district judge, in ruling on the same patent, 51 F. 751; 1892, noted that “One is not entitled to a patent for a plan or method of business which only requires good judgment and foresight. . . . I do not intend to decide that a man may not have a patent for a mode of keeping accounts, or for a form of tabulating amounts or statistics; but am clearly of opinion that this patent cannot be construed to cover a business principle such as a law of averages, which seems to have been the purpose of the specifications in this patent.”

The Circuit Court admitted that if the defence claim were true, then the patent would have to be invalidated. As another judge had expressed it, “advice is not patentable.”²⁴

In *Earle v. Sawyer* (8 F. Cas. 254; 1825) Justice Story rejected the argument that patents required inventive inputs or efforts that went beyond those that could be produced by an artisan who was skilled in the arts. Story was not persuaded by the “metaphysical” notion of patentability, for the standard “proceeds upon the language of common sense and common life, and has nothing mysterious or equivocal in it.... It is of no consequence, whether the thing be simple or complicated; whether it be by accident, or by long, laborious thought, or by an instantaneous flash of mind, that it is first done. The law looks to the fact, and not to the process by which it is accomplished.” This common sense standard was entirely appropriate for an era where ordinary non-technical craftsmen and women could make valuable innovations based on simple know-how. A departure from this approach occurred when *Hotchkiss v. Greenwood* (52 U.S. 248; 1850) proposed that “unless more ingenuity and skill in applying the old method ... were required in the application of it ... than were possessed by an ordinary mechanic acquainted with the business, there was an absence of that degree of skill and ingenuity which constitute essential elements of every invention. In other words, the improvement is the work of the skilful mechanic, not that of the inventor.” The *Hotchkiss* citations can be used as a proxy for the enforcement of the nonobviousness doctrine. The frequency of citations indicates that the *Hotchkiss* ruling long remained an isolated decision (Figure 2), but after the 1870s it became the precedent for decisions that invalidated patent grants on the grounds of nonobviousness and later for the absence of a “flash of genius.” The heightened standards likely functioned as a more effective filter in view of

24 *Cincinnati Traction Co. v. Pope*, 210 F. 443; 1913. However, it was decided that though “the case is perhaps near the border line, we think the device should be classed as an article to be used in a method of doing business” and, as an item to be manufactured, the ticket was patentable. See also *Berardini v. Tocci* 190 F. 329; 1911 in which a banker obtained a patent for a code to wire messages to Italy: “It might be enough to bluntly hold that a code message cannot be an art, but that perhaps is interpreting the mere language of the claims too narrowly. It is therefore thought better to inquire what is an “art” within the meaning of the patent laws. “In the sense of the patent law an art is not a mere abstraction. A system of transacting business, disconnected from the means for carrying out the system, is not, within the most liberal interpretation of the term, an art. Advice is not patentable.” *Hotel Security, etc., Co. v. Lorraine Co.*, 160 Fed. 469, 87 C.C.A. 451, 453, 24 L.R.A. (N.S.) 665 [1908].”

the great increase in patenting rates and technical qualifications among the population during the postbellum period.

Another change occurred because early insouciant judicial optimism about the coincidence between private and public welfare had begun to wane by the second half of the century. By then, the courts had experienced the network of litigation launched by patentees and their assignees, such as William Woodworth and the Parker brothers, to protect national monopolies. Justice Woodbury was prompted to dictate (*Woodworth v. Edwards*, 30 F. Cas. 567 (1847)): "The rights of inventive genius, and the valuable property produced by it, all persons in the exercise of this spirit will be willing to vindicate and uphold, without colorable evasions and wanton piracies; but those rights on the other hand, should be maintained in a manner not harsh towards other inventors, nor unaccommodating to the growing wants of the community." Later courts would continue to grapple with similar issues in deciding the extent to which patent grants were compatible with antitrust stipulations.²⁵

The United States differed from the rest of the world in terms of its treatment of foreign inventions and foreign inventors. Most countries had simple registration systems and allowed patents of importation, which supported the ability of their residents to appropriate and obtain patents for discoveries made by residents of other countries. American laws employed the language of the English statute in granting patents to "the first and true inventor." Nevertheless, unlike in England, the phrase was used literally, to grant patents for inventions that were original in the world, not simply within U.S. borders.²⁶ Although the United States varied over time in its

25 See B. Zorina Khan, "Federal Antitrust Agencies and Public Policy towards Patents and Innovation," Cornell Journal of Law and Public Policy, vol. 9 (Fall) 1999:133-169; B. Zorina Khan, "The Calculus of Enforcement: Legal and Economic Issues in Antitrust and Innovation," Advances in the Study of Entrepreneurship, Innovation, and Economic Growth, vol. 12 (1999): 61-106; B. Zorina Khan. Legal monopoly : patents and antitrust litigation in U.S. manufacturing, 1970-1998. NBER WP No. 7068.

26 This question was settled early on: "The inventor must be the original inventor as to all the world, to be entitled to a patent." See *Reutgen v. Kanowrs*, 1 Wash. 188 (Pa) 1804; *Dawson v. Follen*, 2. Wash. 311 (Pa) 1808; *Lowell v. Lewis*, 1 Mass. 190 (Mass.) 1817. See *Shaw v. Cooper*, 32 US 292 1833: "it clearly appears, that it was the intention of the legislature, by a compliance with the requisites of the law, to vest the exclusive right in the inventor only; and that on condition, that his invention was neither known nor used by the public, before his application for a patent. If such use or knowledge shall be proved to have existed, prior to the application for the patent, the act of 1793 declares

treatment of foreign inventors, its provisions were much more favourable towards aliens than was true of other countries.²⁷ The statutes of 1793, 1800 and 1832, restricted rights in patent property to citizens or to residents who declared that they intended to become citizens.²⁸ As such, while an American could not appropriate patent rights to a foreign invention, he could freely use the idea without any need to bear licensing or similar costs that would otherwise have been due if the inventor had been able to obtain a patent in this country. However, this comprised a flexible default rule, since it was quite commonplace for Congress to grant special exemptions to foreign inventors who applied for waivers.²⁹ In 1836, the stipulations on citizenship or residency were removed, but were replaced with discriminatory patent fees that retaliated for the significantly higher fees charged in other countries: foreigners could obtain a patent in the U.S. for a fee of three hundred dollars, or five hundred if they were British. After 1861 patent rights (with the exception

the patent void; and as has been already stated, the right of an alien is vacated in the same manner, by proving a foreign use or knowledge of his invention.”

²⁷“With the constitution, the English statute and the adjudication upon it before them, Congress have declared the intention of the law to be to promote the progress of the useful arts by the benefits granted to inventors; not by those accruing to the public, after the patent had expired, as in England. This is most evident from their imposing as conditions, that the invention must be new to all the world, and the patentee be a citizen of the United States. If public benefit had been the sole object, it was immaterial where the invention originated, or by whom invented; but being for the benefit of the patentee, the meritorious cause was invention, not importation, and the benefit was not extended to foreigners, in which respects the law had been otherwise settled in England.” *Whitney al. v. Emmet et al.*, 29 F. Cas. 1074; 1831.

²⁸ The option of patents for importations was specifically rejected by Congress in its deliberations over the text of the first patent laws: An amendment ordered on December 9, 1790 [HR-121]. Received and read Feb 7, 1791. Vol. vi: *Legislative Histories*: text of patents bills 41 and 121, Patents Bill [HR-41], February 16, 1790:

“Sec. 6: *And be it further enacted*, That any person, who shall after the passing of this act, first import into the United States from any foreign country, any art, machine, engine, device or invention, or any improvement thereon, not before used or known in the said States, such person, his executors, administrators and assigns, shall have the full benefit of this act, as if he were the original inventor or improver within the said States. [p. 1631] [fn 42, p. 1631: “The House struck out this section.”]

²⁹ For a small sample of such foreign inventors, see: *Journal of the Senate of the United States of America, 1789-1873*, March 28, 1816: The bill entitled “An act authorizing and requiring the Secretary of State to issue letters patent to Andrew Kurtz,” An act authorizing the Secretary of State to issue letters patent to Henry Burden, *Journal of the House of Representatives of the United States, 1819-1820*, April 12, 1820; Bill S. 38, 16th Congress, 1st Session, Feb 17, 1820: A Bill Authorizing the Secretary of State to issue letters patent to Richard Willcox; H.R. 57, 20th Congress, 1st Session, Jan 11, 1828, “An Act for the relief of Simeon Broadmeadow;” a petition of Richard Holden Approved by the President, *Journal of the Senate of the United States of America, 1789-1873*, May 8, 1822; 18th Congress, 1st Session, H.R. 230, 26th of May, 1824, Congress passed a law, authorizing the Department of State to issue a patent for a similar invention, to a certain Nathaniel Sylvester; Christopher Bechtler, praying that letters patent may be granted him for invention of two new and useful machines for the purpose of washing gold ores, without requiring the two years' residence as is by law now required. Approved by the President of the United States on March 3, 1831, *Journal of the Senate of the United States of America, 1789-1873*; Anthony Hermange, an alien, residing in the City or Washington, and Paul Steenstrup, of Kongsberg, in the Kingdom of Norway praying that letters patent for an invention may be granted, Approved by President May 1, 1828. However, not all petitions were granted; see for instance, Peter Hircgoyen's petition to be able to apply for a patent for a distilling apparatus (*Journal of the House of Representatives*

of caveats) were available to all applicants on the same basis without regard to nationality.³⁰ This liberality to foreign inventors was obtained at low cost since for most of the nineteenth century foreign patenting in the United States was trivial relative to the total. By the end of the 19th century, the United States directed its efforts towards attaining uniformity in intellectual property rights regimes across countries.³¹ A significant motivating factor was the success of American patentees in penetrating foreign markets. Americans inventors were also concerned about the lack of protection accorded to their exhibits in the increasingly more prominent World's Fairs.

The United States was the most prolific patenting nation in the world, many of the major American enterprises owed their success to patents and were expanding into international markets, and the U.S. patent system was recognized as the most successful. It is therefore not surprising that the harmonization of patent laws implied convergence towards the American model, which was viewed as “the ideal of the future,” despite resistance from other nations. Countries such as Germany were initially averse to extending equal protection to foreigners because they feared that their domestic industry would be overwhelmed by American patents. Ironically, because its patent laws were the most liberal, the United States found itself with weaker bargaining abilities than nations who could make concessions by changing their provisions. This likely influenced the U.S. tendency to use bilateral trade sanctions rather than multilateral conventions to obtain reforms in international patent policies. The movement to create an international patent system elucidated the reality that intellectual property laws did not exist in a vacuum, but were part of a bundle of rights

of the United States, 1817-1818, January 21, 1818.)

³⁰ During the proceedings to celebrate the centenary of the U.S. patent system, this liberality was noted as one of its essential features: “Our law gives to all men of all nations the same privileges, and recognizes to the fullest extent the international character of property in inventions. In this respect ... the United States may claim to have led the world and to be leading it still.” F. A. Seely, “International Protection of Industrial Property,” p. 205, in Proceedings and Addresses: Celebration of the Beginning of the Second Century of the American Patent System Wash. DC, Gedney & Roberts, 1892.

³¹ The standard reference to the development of international patent harmonization is Edith Penrose, Economics of the International Patent System, Baltimore, Johns Hopkins Press, 1951. B. Zorina Khan and Kenneth L. Sokoloff, “The Innovation of Patent Systems in the Nineteenth Century: A Comparative Perspective,” unpublished manuscript (2002), discuss American exceptionalism and highlight the importance of low fees and an examination system in accounting for the nature of American patenting relative to other countries.

that were affected by other laws and policies, as well as by the scale and scope of economic activity.

ii) Copyright and Allied Rights

Despite their common source in the intellectual property clause of the U.S. Constitution, American copyright policies provided a marked contrast to the patent system. The subsidy argument is quite implausible in accounting for the differences between patent and copyright doctrines. Copyright differed from patents precisely because the objective of both systems was to maximize social welfare, which led to an underlying rationale that was consistent with economic reasoning. The political rhetoric of copyright has always centered about the creative individual, but then (as now) copyright enforcement was largely the concern of commercial interests.³² Like other forms of intellectual property laws, the copyright system evolved to encompass improvements in technology and changes in the marketplace. Copyright decisions illustrate how adjudication by analogy economized on the costs of technological transitions. Still, many of the technological innovations of the nineteenth century were sufficiently different from existing technologies as to make judicial analogies somewhat strained, and ultimately required accommodation by the legislature instead. This area of the law indicates the extent to which judge-made policies were constrained by the statutes, and the extent to which legislative revisions were influenced by bargains among interest groups that could at times deviate from the goal of social welfare maximization.³³

The earliest federal statute to protect the product of authors was approved on May 31 1790,

32 The fraction of copyright plaintiffs who were authors (broadly defined) was initially quite low, and fell continuously during the nineteenth century. By the start of the twentieth century less than 10 percent of all plaintiffs in copyright cases were the creators of the item that was the subject of the litigation. Instead, by the same period, the majority of parties bringing cases were publishing enterprises and other assignees of copyrights. Although the judiciary attempted to ensure that the rights of all parties were fairly considered, their major concern was not to benefit publishing companies, but to protect the public interest in learning.

33 . As the Supreme Court pointed out: "From its beginning, the law of copyright has developed in response to significant changes in technology. Indeed, it was the invention of a new form of copying equipment -- the printing press -- that gave rise to the original need for copyright protection. Repeatedly, as new developments have occurred in this country, it has been the Congress that has fashioned the new rules that new technology made necessary." See *Sony Corp. of America v. Universal City Studios, Inc.*, 464 U.S. 417 (1984).

“for the encouragement of learning.” This utilitarian objective meant that, unlike European doctrines that enshrined the inalienable rights of authors, in the United States primary focus was on widespread access in order to increase public welfare, and incentives to copyright owners were viewed only as a secondary motive. Registration secured the right to print, publish and sell maps, charts and books for a term of fourteen years, with the possibility of an extension for an equal term. Major issues in copyright law primarily related to subject matter, duration, and enforcement, all of which expanded significantly during the course of the nineteenth century. The statutes were substantively revised in 1831, 1870 and 1909. The statutory extension of copyrights to musical compositions and plays was quite straightforward, as was the grant of property rights for engravings and sculpture. By 1910 the original copyright holder was granted derivative rights including translations into other languages; performances; and the rights to adapt musical works. The burgeoning scope of copyright protection that technological advances required raised numerous questions about the rights of authors and publishers relative to the public, and courts continually were confronted with the need to delineate the boundaries of private property in such a way as to guard the public domain.

Although musical works were not protected by the first copyright Act, the 1831 statute allowed protection for musical compositions, at that time limited to sheet music. The creation of mechanical means of reproducing music, such as the player piano and the phonograph, raised questions about the relevance of existing copyright rules, in part because the analogy between sheet music and these mechanical inventions appeared remote. *Stern v. Rosey* dealt with the question of whether an injunction should issue against a manufacturer of phonograph records who had used copyrighted music. The court rejected the notion that copyright protection for music extended to such a different technological transformation.³⁴ *Kennedy v. McTammany*, 33 F. 584

34 According to the court, “We can not regard the reproduction, through the agency of the phonograph, of the sounds of musical instruments playing the music composed and published by the appellants, as the copy or publication of the same within the meaning of the act. The ordinary signification of the words “copying,” “publishing,” etc., can not be stretched to include it.... these prepared wax cylinders can neither substitute the copyrighted sheets of music nor serve any purpose which is within their scope. In these respects there would seem to be no substantial difference between

(1888), which was argued in the Massachusetts Federal District Court, was brought by the copyright owner of a song entitled “Cradle’s Empty, Baby’s Gone.” Judge Colt failed to accept the plaintiff’s argument that McTammany’s perforated piano rolls infringed on the copyright for the music, because he could “find no decided cases which, directly or by analogy, support the position of the plaintiffs.” In 1908 the Supreme Court affirmed this position when it considered the claim brought by a music publishing company against the manufacturer of player piano rolls.³⁵ In 1909 Congress responded by revising the copyright law to give composers the right to the first mechanical reproduction of their music. However, after the first recording, the statute permitted a compulsory licence to issue for copyrighted musical compositions: that is to say, anyone could subsequently make their own recording of the composition on payment of a fee that was set by the statute at two cents per recording. In effect, the property right was transformed into a liability rule. The prevalence of compulsory licences for copyrighted material is worth noting for a number of reasons: they underline some of the statutory differences between patents and copyrights in the United States; they reflect economic reasons for such distinctions; and they were also the result of political compromises among the various interest groups in the music industry.³⁶

The advent of photography created a new form of “authorship” which was granted copyright protection in 1865.³⁷ Photography also offered a ready means of copying books, paintings and engravings that led to copyright infringement litigation. *Rossiter v. Hall*, 20 F. Cas. 1253 (1866), dealt with photographic copies that had been taken of a copyrighted engraving of Washington’s house that the statutes protected against unauthorized reprints. The defendant argued unsuccessfully that, since photography had not been invented at the time of the statute, it followed that this form of copying was not prohibited. Although the judiciary was reluctant to appropriate the task of Congress and create new policies, at times they were able to adjudicate

them and the metal cylinder of the old and familiar music box; and this, though in use at and before the passage of the copyright act, has never been regarded as infringing upon the copyrights of authors and publishers.” 17 App. D.C. 562; 1901.

35 *White-Smith Music Pub. Co. v. Apollo Co.*, 209 U.S. 1; 28 S. Ct. 319; 1908. Although some commentators today are derisive about the ruling in this case, it should be noted that this was the international standard set down in the British courts and in the Berne Convention.

36 One of the primary interest groups in the world of music, the American Society of Composers, Authors and Publishers (ASCAP), was founded in 1914.

37 (Act of March 3, 1865; 13 Stat. 540).

cases relating to new technologies by stretching the existing analogy. This was apparent in the development of litigation surrounding movies not long after Edison obtained his 1896 patent for a kinetoscope. The lower court rejected Edison's copyright of moving pictures under the statutory category of photographs, but this decision was overturned by the appellate court: "To say that the continuous method by which this negative was secured was unknown when the act was passed, and therefore a photograph of it was not covered by the act, is to beg the question. Such construction is at variance with the object of the act, which was passed to further the constitutional grant of power to "promote the progress of science and useful arts. ... [Congress] must have recognized there would be change and advance in making photographs, just as there has been in making books, printing chromos, and other subjects of copyright protection"³⁸

Technological innovation created new cultural properties to be protected, but many of these also facilitated infringement through mechanical means of reproduction that lowered the costs of duplicating copyrighted works. Congress responded to the creation of new subject matter by expanding the scope of the copyright laws. The legislature also repeatedly lengthened the term of copyright, arguably in order to support the value of copyright protection in the face of falling costs of infringement. In 1790 the duration of copyright protection comprised 14 years from registration, with the possibility of renewal for a further 14 years; after 1831 the maximum term was 28 years from time of registration with the right of renewal for 14 years; whereas the 1909 statute allowed 28 years plus extension for a further 28 years if the author were still alive. Nevertheless, it is worth repeating that the largely utilitarian rationale of the American statutes ("to promote learning") precluded perpetual grants, and the term of copyright protection in United States was among the most abbreviated in the world. Similarly, the United States offered the most liberal opportunities for unauthorized use if copying qualified as "fair use."

Technological innovations that facilitated unauthorized copying heightened the tension between public welfare and private interests, leading some to question whether the fair use doctrine and copyright itself could endure. However, it is vital to understand that fair use was not

³⁸ Edison v. Lubin, 122 F. Cas. 240 (1903); and American Mutoscope & Biograph Co. v. Edison Mfg. Co., 137 F. 262 (1905). Congress specifically granted copyright protection to moving pictures in the Act of Aug. 24, 1912, 37 Stat. 488.

formulated simply as a function of technologies that influenced the ability to monitor use, nor was it limited because courts recognized the (moral or other) rights of authors. Even if monitoring costs were zero, and all use could be traced by the author, fair use doctrines would still be relevant to fulfil the ultimate democratic function of legal rights in cultural products. Without fair use, copyright would be transmuted into a monopoly right that would limit public access and violate the Constitution's mandate to promote the progress of science. In short, according to American legal doctrines, fair use was not regarded as an exception to the grant of copyright; instead, the grant of copyright was a limited exception to the primacy of the public domain.

The crucial need to balance public welfare against the right of authors is partly why copyright, according to Justice Joseph Story, belonged to the “metaphysics of the law.” It was Story who first outlined the American fair use doctrine in *Gray v. Russell* (1839) and the more frequently cited *Folsom v. Marsh* (1841). Fair use allowed unauthorized use of some portion of a copyrighted work, although exactly how much copying was permissible constituted (and remains today) “one of the most difficult points that can well arise for judicial discussion.” Story offered a number of guidelines in *Folsom v. Marsh*, 9 F. Cas. 342 (1841): “we must often, in deciding questions of this sort, look to the nature and objects of the selections made, the quantity and value of the materials used, and the degree in which the use may prejudice the sale, or diminish the profits, or supersede the objects, of the original work” The fair use doctrine thus illustrates the extent to which policy makers weighed the benefits of diffusion against the costs of exclusion. If copyrights were as strictly construed as patents, it would serve to reduce scholarship, prevent public access for noncommercial purposes, increase transactions costs for potential users, and inhibit learning which the statutes were meant to promote.

The increasingly polarized debate today about the scope of patents and copyrights often underestimates or ignores the importance of allied rights that are available through other forms of the law such as contract and unfair competition. A noticeable feature of nineteenth century case law was the willingness of the judiciary to extend protection to noncopyrighted works under

alternative doctrines in the common law, although the judicial mind in 1915 balked at the thought of extending free speech protections to commercial productions such as movies.³⁹ More than 10 percent of “copyright” cases were decided using concepts of unfair competition, where the court rejected copyright claims but still protected the work against unauthorized users using fair trade doctrines. Some 7.7 percent dealt with contracts, which raised questions such as ownership of photographs in cases of “work for hire.” A further 12 percent encompassed issues of trade secrets, misappropriation, and the right to privacy.

The development of the right to privacy is especially interesting, since it illustrates the creation of a new legal concept at common law to compensate for the potential of new technologies to infringe on third-party rights. Samuel Warren and Louis Brandeis, in what has been touted as the most effective law review piece of all time, argued that “modern enterprise and invention” subjected the ordinary individual to unwarranted suffering that could not be alleviated through existing laws of copyright, tort, trespass, nor slander and libel. Instant photographs and “numerous mechanical devices” led to the “evil of invasion of privacy.”⁴⁰ The concept of a legal right to privacy immediately entered into litigated arguments, and the New York Supreme Court, in *Schuyler v. Curtis et al.* (15 N.Y.S. 787;1891), quoted directly from the law review, but distinguished between private individuals and public figures who by implication ceded the right to privacy. In a Massachusetts case three years later (*Corliss v. Walker Co.*, 64 F. 280; 1894) the wife of the great inventor George H. Corliss tried to enjoin the publication of a photograph of her late husband. The court rejected the plea because her husband was “among the first of American inventors, and he sought recognition as such,” permitting thousands of his photographs to be distributed at the Centennial Exposition in Philadelphia. In 1903, the New York legislature passed a statute that levied criminal and civil liability for the unauthorized use of the “name, portrait or

39 See *Mutual Film Corp. v. Industrial Commission of Ohio*, 236 U.S. 230; 35 S. Ct. 387 (1915).

40 Samuel D. Warren and Louis D. Brandeis, “The Right to Privacy,” Harvard Law Review Vol. IV (5) December 15, 1890: 193-220.

picture of any living person" for "advertising purposes, or for the purposes of trade," and several other states did the same.⁴¹

The legal records of patent and copyright disputes yield valuable insights into nineteenth-century society. The significant differences in international patent and copyright laws in particular illustrate the extent to which these policies were market-oriented. A nation of artificers and innovators, both as consumers and producers, American citizens were confident of their global competitiveness in technology, and accordingly took an active role in international patent conventions. Although they excelled at pragmatic contrivances, Americans were advisedly less sanguine about their efforts in the realm of music, art, literature and drama.⁴² As a developing country, the United States was initially a net debtor in flows of material culture from Europe. The first copyright statute implicitly recognized this when it authorized Americans to take free advantage of the cultural output of other countries and encouraged international copyright piracy that persisted for a century. The tendency to reprint foreign works was encouraged by the existence of tariffs on imported books that ranged as high as 25 percent. Throughout the 19th century proposals to reform the law and to acknowledge foreign copyrights were repeatedly brought before Congress without any success. It was not until 1891 when American literature was gaining in the international market that copyright protection was granted to foreign residents, in order to gain reciprocal rights for American writers and artists.⁴³

41 The first unambiguously successful application of the right to privacy in court, *Pavesich v. New England Life Insurance Co*, 50 SE 98 (1905), along with some thirty other lawsuits prior to 1920, dealt with allegations that unauthorized commercial use of the plaintiff's photograph violated a right to privacy.

42 John Ruggles, who had recommended the changes in the patent system in 1836, was also a member of an 1838 Committee to reform international copyrights. He argued that "American ingenuity in the arts and practical sciences, would derive at least as much benefit from international patent laws, as that of foreigners. Not so with authorship and book-making. The difference is too obvious to admit of controversy." According to Ruggles, an international copyright law was ill-advised, because "The answer is found in the significant inquiry of the British reviewer -- 'Who ever reads an American book?' ...the profits of trade and manufacture, and all the benefits ... would be, for us, on the wrong side of the ledger." Report to accompany Senate Bill No. 32, 25th Congress, 2d Session, June 25 (1838).

43 However, the statute also included significant concessions to printers' unions in the form of manufacturing clauses. First, a book had to be published in the U.S. before or at the same time as the publication date in its country of origin. Second, the work had to be printed here, or printed from type set in the United States or from plates made from type set in the United States. Copyright protection also depended on conformity with stipulations such as formal registration of the work. These clauses resulted in U.S. failure to qualify for admission to the international Berne Convention until 1988, one hundred years after the initial Convention.

B. TECHNOLOGICAL INNOVATIONS AND INSTITUTIONAL CHANGE

“Sooner or later, if the demands of social utility are sufficiently urgent, if the operation of an existing rule is sufficiently productive of hardship or inconvenience, utility will tend to triumph.”

--- Benjamin Cardozo (1924)⁴⁴

American society at the start of the nineteenth century was still overwhelmingly agrarian but by 1920 the United States had become the world’s foremost industrial power. The advent of industrialization and more extensive markets created conflicts between the rights of farmers and mill owners, mill owners and their workers, as well as enterprises and consumers, all of which required legal mediation. Technological advances and legal change had reciprocal and mutually reinforcing effects. Property laws and contracts attempted to define rights and allocate liability within a changing context. In particular, tort law developed as a distinct body of thought independently of property and contract, because new technologies, urbanization and more frequent exchange among strangers led to an increase in the number of accidental injuries and externalities. At the same time, the costs of injuries created incentives for inventors to direct their attentions to safety devices such as steam gauges, safety elevators, and more effective railroad couplers, air brakes and crossing signals.⁴⁵ The courts responded by quickly altering the standards of due care to incorporate existing technological options as long as they were cost effective.

i) Canals and Railroads

The development of cheap and efficient internal transportation was a prerequisite for economic development in a country as vast as the United States, so it is not surprising that this comprised a key element of state policy and private initiatives. By 1830, even though state involvement was largely limited to the grant of charters, investors and entrepreneurs privately funded an extensive network of turnpikes in the Northeast. After the state of New York financed the building of the hugely successful Erie canal, numerous other public and private canal ventures

44 Benjamin Cardozo, The Growth of Law, New Haven, Yale Univ. Press, 1924. p. 117.

45 In the entire period before 1860, only 771 patents mentioned safety in the specification; but during the 1860s some 1940 patents did so, and by the 1870s this number increased to over 3021 patents.

were undertaken throughout New England, the Middle Atlantic and Midwest. The United States also possessed ready access to natural bodies of water, and advances in steamboat technologies increased their importance as a conduit for commerce. Between 1830 and 1860 national steamboat tonnage increased by a factor of ten and rates on upriver transport fell dramatically. As a result of these technical and price savings, the effective distance between towns and markets was significantly reduced.

In the antebellum period some 650 lawsuits involved canals and another 468 dealt with steamboats. Transportation along water routes raised many of the issues that the railroads later would confront, including the nature of state charters, the role and effectiveness of canal commissioners, compensation for injuries to passengers and workers, takings and just compensation, discriminatory prices, taxation and financing. Many states, beginning with New York, altered their constitutions to restrict debt financing at both the state and municipal levels, because of their unhappy experience when financial panics adversely affected the funding of canals. In the era of canal-building mania, the courts provided well-needed ballast to the airy financial schemes of canal boosters.⁴⁶ Some of these lawsuits involved conflicts between different cohorts of technologies: could canals and turnpikes block railroads because their charters were drawn up earlier and implicitly conferred exclusive rights that could not be eroded by later technologies? The famous Charles River Bridge decision in 1837 rejected this view because if earlier charters ensured monopoly profits the benefits from competition and technological change would be reduced or eliminated. Progress also meant that already existing property rights might have to be more narrowly defined. Thus, the old common law rule that property rights in land extended upwards and downwards without limit no longer applied, and courts allowed railroads and bridges to cross privately owned waterways and turnpikes. New technologies required a balancing of the benefits to be derived from their applications against the harm that is associated

46 For instance, *Newell v. People*, 7 N.Y. 9 (1852), held that a New York state statute, which authorized the debt for the Erie Canal Enlargement and the building of the Genesee Valley and Black River Canals to be paid from future

with their use. They brought the possibility that economic and social advances could be blocked by hold-outs or by individuals with conflicting interests who threatened to make the transactions costs associated with innovations prohibitively high.

The use of eminent domain played an important part in the promotion of turnpikes, canals, railroads and telegraphs by reducing or eliminating such costs. The takings clause raised questions about the security of private property, what comprised public use, and how just compensation was to be determined in a nonconsensual nonmarket exchange. In the nineteenth-century transportation cases, just compensation for takings was ascertained through mutual agreement, by commissioners in an administrative process, or by a jury. Legislatures determined the constraints of “public use.” Their decisions were straight-forward in the specific case of canals for transportation or railroads that, though privately owned, offered valuable common carrier services to the general public. In other instances, the benefits to the public were less direct, but this did not entirely rule out the application of the doctrine of eminent domain. In 1832 Jasper Scudder brought a case in equity against the Trenton Delaware Falls Company (1 N.J. Eq. 694; 1832) which was incorporated to create water power for some seventy manufacturing mills. Scudder’s counsel argued that the corporation was created only for private purposes since the benefits of the water mills would derive solely to private individuals, thus it was inappropriate to allow the use of eminent domain. The Chancellor rejected this viewpoint because manufacturing enterprises, though admittedly private, contributed to employment and general economic prosperity, and indeed promised to generate far larger communal benefits than some turnpikes actually produced.⁴⁷

canal revenue surpluses, was unconstitutional.

47 “The water power about to be created, will be sufficient for the erection of seventy mills, and factories, and other works dependent on such power. It will be located at the seat of government, at the head of tide water, and in a flourishing and populous district of country. It will be no experiment in a country like ours; and, judging from the results in other places, we may make a sufficiently accurate calculation as to the result here. Take the town of Paterson as an example. The water power there is in the hands of individuals--a company like this. They are under no obligation to lease or sell any mills or privileges to the public; and yet see the result of a few years' operation. Paterson is now the manufacturing emporium of the state, with a population of eight thousand souls. It has increased the value of property in all that district of country; opened a market for the produce of the soil, and given a stimulus to industry of every kind. May we not hope that a similar benefit may be experienced here?” See also *The Proprietors of Sudbury Meadows versus The Proprietors of the Middlesex Canal*, 40 Mass. 36 (1839); and *Rubottom v. M’Clure*, 4 Blackf. 505 (1838).

To an even greater extent than canals, railroads quickly gained public approval and became a symbol of American progress.⁴⁸ Economic historians rightly caution against an inflated assessment of the role of locomotives in the nineteenth century economy, given the existence of viable alternatives, but it is undoubtedly true that the significance of railways increased over this period in terms of use, employment, and social impact.⁴⁹ Courts demonstrated a readiness to ensure that the common law kept up with innovations in transportation, since "To say that a new mode of passage shall be banished from the streets, no matter how much the general good may require it, simply because the streets were not so used in the days of Blackstone, would hardly comport with the advancement and enlightenment of the present age."⁵⁰

The benefits from all improvements in internal transportation came at a higher risk if only because of the growth in the number of transactions. Steamboats proved to be especially hazardous because of fires from sparks, and accidents when high pressure boilers exploded. This led to the passage of federal statutes in 1838 and 1852 that attempted to regulate safety and assigned the burden of proof in negligence cases on steamboat owners and captains.⁵¹ An enduring legal legacy arose after the scale of railroad injuries mounted rapidly after the Civil War. In 1890 over 29,000 individuals were injured in railroad accidents and 6,335 persons were killed,

48 Albert Fishlow surveys the development of transportation in "Internal Transportation in the Nineteenth and Early Twentieth Centuries," in The Cambridge Economic History of the United States, Vol. II, (eds) Stanley L. Engerman and Robert E. Gallman, Cambridge, Cambridge University Press (2000):543-642. The law of railroads has been discussed in a large number of books and articles, the most comprehensive of which is James W. Ely's Railroads and American Law, Lawrence, University of Kansas Press, 2001. Ely emphasizes the role of legislators and inefficient regulation in the decline of the railroads.

49 Justice Caruthers of the Tennessee Supreme Court lyrically wrote in 33 Tenn. 637 (1854) that "the common dirt road for wagons is superseded by turnpikes, and these again by the railroad. ... Blessings innumerable, prosperity unexampled, have marked the progress of this master improvement of the age. Activity, industry, enterprise and wealth seem to spring up as if by enchantment, wherever the iron track has been laid, or the locomotive moved." In 1840 7,000 individuals were employed in the railway industry, compared to 95,000 in ocean vessels. Also in that year 491 miles of new tracks were laid, and some 2,818 miles of road were in operation. By 1870 160,000 employees worked for the railroads, a number that surpassed ocean transportation, whereas almost 53,000 miles of tracks were in operation. The growth of passenger service was equally rapid, and in 1870 passenger revenue service exceeded \$108 million, but this was significantly lower than the \$294 million generated from freight. See Historical Statistics of the United States.

50 Hiram P. Moses et al. v. The Pittsburgh, Fort Wayne and Chicago R.R. Co. 21 Ill. 516, 523. (1859).

51 July 7th, 1838, "Act to provide for the better security of the lives of passengers on board of vessels propelled, in whole or in part, by steam," Sec. 13, 5 U.S. Statutes at Large 306 (1838). The issue of accidents on steamboats is addressed in Richard N. Langlois, David J. Denault and Samson M. Kimenyi, "Bursting Boilers and the Federal Power Redux: The Evolution of Safety on the Western Rivers," University of Connecticut Working Paper 1995. For a

and in 1913 injuries attained the quite astonishing level of 200,308 with almost 11,000 fatalities in one year alone.

The debate over the impetus for the imposition of regulations and their efficacy has still not been resolved. Some economists have argued that, while regulatory policies succeeded in generating and funding useful research, the improvements in safety were predominantly due to private initiatives which would have proceeded in the absence of federal regulation. Figure 3 presents the annual number of patents granted for railroad safety, and for safety-related inventions in general, expressed as a percent of all patents. The two series are procyclical and behave very like each other until the first World War. After this period, railroad traffic was substantially reduced, and patents for railroad safety fell relative to overall safety patents. Both series suggest that investments in safety-related innovations were primarily responding to the market rather than to regulation. In particular, Interstate Commerce Commission oversight of the railroads from 1887 and the introduction of federal railroad safety legislation in 1893 do not seem to be associated with spurts in railroad safety patents when compared to safety patents in general. These data bear out the findings of researchers who find little impact of regulation on the adoption of such devices as air brakes and automatic couplers. When government intervention succeeded in generating the development of automatic train controls, the innovation proved to be ineffective on both technical and cost bases. The patent data suggest that we should not underestimate market incentives for enterprises to invest in safety and to self-regulate.⁵²

Liability rules differed in ways that comported with economic logic. The common law for unintended torts adhered to four rules in deciding liability: industry norms; the fellow servant rule; contributory negligence; and the assumption of risk. The judiciary held enterprises to a standard of care that comprised the norm for the industry, and only punished deviations away from the norm.

different view, see John G. Burke, "Bursting Boilers and the Federal Power," Technology and Culture vol. 7 (Winter 1966): 1-23.

⁵² Mark Aldrich points out that railroads were not opposed to safety-related legislation, but they rejected provisions that mandated specific devices which might be incompatible with other forms of equipment and might become obsolete quickly. Mark Aldrich, Safety First: Technology, Labor, and Business in the Building of American Work

The industry norm criterion, by relying on established community standards, economized on information gathering by the judiciary. The fellow servant rule was first upheld in a railroad case in 1842, and absolved the railroad from liability because there was contributory negligence on the part of another employee.⁵³ A rule of contributory negligence induced bilateral care for it created incentives for workers to monitor each other. This made sense in contexts such as railroad operations where workers were mobile and had a great deal of discretion: first, many injuries occurred because workers acted without due care; and second, monitoring and enforcement costs for employers were high. Railroads that tried to introduce rules to alter hazardous but convenient habits encountered resistance from workers. The assumption of risk involved the idea that rational individuals will weigh the costs and benefits of their actions, so an employee will engage in a risky activity only if he is compensated for the expected harm either through insurance or through a higher wage premium. Thus, as long as the employer was not negligent or deficient in safety standards, there was little need for judicial intervention when employees in risky jobs were injured in the normal course of employment.⁵⁴ We can further examine variation in the application

Safety, 1870-1939, Baltimore, Johns Hopkins University Press, 1997.

53 *Farwell v. Boston & W. R. R. Corp.*, 45 Mass. 49; 1842. Liability rules give incentives for precautionary behaviour, and also have implications for informational and administrative costs: negligence rules give both parties incentives for efficient precaution but have higher informational and administrative costs; whereas, a rule of strict liability towards enterprises minimizes transactions costs, but creates little incentive for victims to invest in precaution. If firms are held strictly liable, and consumer demand is not very responsive to price changes, firms can increase prices, implying that the cost of injuries will be borne by consumers in general. If consumer demand is responsive to price changes, shareholders in the firm will bear the costs of injuries in the form of lower net earnings, and the firm will tend to over- invest in resources to reduce harm. After the Civil War a number of state legislatures limited the use of the fellow servant rule in railroad accidents and in 1908 the Federal Employers' Liability Act abolished it entirely.

54 However, it should be noted that this approach depends on the assumption that workers have many alternatives from which to choose, and that wages will adjust to reflect a risk premium. The empirical evidence on this point is hard to assess because of data inadequacies, but suggests that wages were indeed higher to compensate for risk, although workers were not perfectly compensated for risk-bearing. Moreover, workers who chose to engage in risky activities may have had few alternative opportunities. A key guide to the impact of state legislation to offer insured benefits to workers is Price Fishback and Shawn Kantor, Prelude to the Welfare State: The Origins of Workers' Compensation, Chicago: University of Chicago Press, 2000. Fishback and Kantor argue that the state laws were associated with greater certainty for working families. They show that all parties concerned – firms, workers, and insurers – benefited from the introduction of workmen's compensation, in part because workers paid for some of the increase in benefits through lower wages. However, in industries where unions predominated, such as the building trades, employees were able to successfully counter the tendency for workers to bear the incidence of the compensation laws. See also Price Fishback and Shawn Kantor, "NonFatal Accident Compensation Under the Negligence Liability System at the Turn of the Century," Journal of Law, Economics, and Organization, 11(2) (1995): 406-433; Price Fishback and Seung-Wook Kim, "Institutional Change, Compensating Differentials and Accident Risk in American Railroading, 1892-1945," Journal of Economic History 53 (December 1993): 796-823; and Price

of liability standards in the case of passengers and freight. Although employees might be held to have assumed the risk inherent in railroad or other industrial occupations, this was not entirely true of passengers. Hence, railroads were held to higher standards of care for passengers than for employees and, if a passenger was injured, the burden of proof was on the railroad to show why it should not be held liable. In the case of goods to be transported, once the items were conveyed to the train they were completely within the control of the shipper, hence railroads were strictly liable for freight. Slave passengers could not be viewed in the same liability context as freight, for “the carrier cannot, consistent with humanity and regard to the life and health of the slave, have the same absolute control over an intelligent being endowed with feelings and volition, that he has over property placed in his custody.”⁵⁵

Improvements in transportation and communications created a national market in which state laws were increasingly discordant and discriminatory.⁵⁶ These questions had arisen regarding waterways, when federal admiralty laws were applied to steamships engaged in interstate commerce, but Figures 4 and 5 highlight the role of railroad litigation in providing the impetus towards federalization. Some states refused to honour charters of ‘foreign railroads’ that were granted in other jurisdictions; others tried to add to the revenues of their treasury by taxing interim transactions, or imposing restrictions on rates and operations even though the final destination was in another state. As the figures indicate, the disproportionate appeal to federal courts relative to state courts comprised an integral part of the policies of the railroad companies well into the twentieth century. Their victories in the Supreme Court changed the interpretation of the Constitution, in particular the Commerce Clause, the prohibition of lawsuits against state governments in the Eleventh Amendment, and the due process clause of the Fourteenth

Fishback, "Liability Rules and Accident Prevention in the Workplace: Empirical Evidence from the Early Twentieth Century," *Journal of Legal Studies*, 16 (June 1987): 305-328.

55 *Wilson v. Hamilton*, Sup Ct. Oh., 4 Ohio St. 722; 1855.

56 In the landmark *Wabash* opinion, Justice Miller asserted that “It cannot be too strongly insisted upon that the right of continuous transportation from one end of the country to the other is essential in modern times to that freedom of commerce from the restraints which the State might choose to impose upon it, that the commerce clause was intended to secure.” *Wabash, St. Louis & Pacific R’wy Co., v. Illinois*, 118 U.S. 557; 7 S. Ct. 4; 30 L. Ed. 244; 1886.

Amendment.⁵⁷ Railroad companies ultimately succeeded in obtaining legal recognition that the public interest was not consistent with constraints on market expansion that benefited narrow local interests.⁵⁸

Several other significant legal doctrines were influenced by the public interest nature of the railroads, most noticeably in bankruptcy and reorganization.⁵⁹ Federal bankruptcy legislation was intermittent and largely unenforced for much of the nineteenth century until the passage of the National Bankruptcy Law of 1898. State rulings initially followed the English bias towards the rights of creditors, who were generally allowed to levy against and sell distressed property on a first-come basis. This created perverse incentives for creditors to race to force the firm into bankruptcy even when the corporation might be viable in long run. Clearly, state interests were not necessarily mutually consistent or appropriate for dealing with interstate enterprises like railroads. The result was a legislative vacuum that became especially problematic during the panic of 1873 when almost a fifth of railroad operations failed. Federal courts were reluctant to grant individual creditors the right to dissolve national corporations at the cost of losing the public

57 See Richard C. Cortner, *The Iron Horse and the Constitution*, Greenwood Press, Westport, CT, 1993.

58 This recognition did not occur instantaneously, but through a long process of appeals. Railroads questioned state regulation of rates in the Granger cases of 1877, but were defeated. The judiciary hesitated to apply the Due Process clause of the Fourteenth Amendment, and conceded the right of the states to regulate rates for undertakings that affected the public interest. However, in the California Railroad Tax Cases of 1882 (13 F. 722), the court agreed that a local tax violated the railroad's due process rights, and further was inconsistent with the equal protection provision because the railroad was taxed differently from other enterprises. The U.S. Supreme Court ultimately in 1890 upheld the view that state policy regarding rates was within the jurisdiction of the courts under the "substantive due process" clause of the Constitution. In the 1890s 41 federal cases involved questions of due process that were raised in connection with the railroads, the following decade there were 87, and by the 1920s the number had increased to 449 cases. These decisions enabled the federal judiciary to overrule state policies, and allowed them to support private property rights that the state actions would have constrained. Although the Supreme Court abandoned the use of substantive due process to protect private property in the 1930s, the concept endured in other contexts, especially in the battle to promote civil liberties. The railroads won a second victory in terms of the interpretation of the Eleventh Amendment that barred federal lawsuits against the states or state officials. In *Ex Parte Young* (1908), the Supreme Court ruled that federal courts could prevent state officials from enforcing policies that conflicted with the Fourteenth Amendment, a decision that had lasting implications for the movement to end racial segregation in schools.

59 Bankruptcy and tort laws in relation to the railroads have also been well-investigated. Bradley Hansen, "The People's Welfare and the Origins of Corporate Reorganization: The Wabash Receivership Reconsidered," *Business History Review* 74(3) 2000: 377-406, finds no evidence for the view that courts radically transformed creditors' rights in the 1880s. Instead, he proposes that the features of equity receivership in the Wabash decision were consistent with earlier precedents, and with the attempt to further public welfare. Peter Tufano points to the link between legally mandated governance mechanisms and financial innovations that allowed distressed firms to obtain funding, in "Business Failure, Judicial Intervention, and Financial Innovation: Restructuring U.S. Railroads in the Nineteenth Century," *Business History Review*, vol. 71(1) 1997: 1-40. See also Albro Martin, "Railroads and the Equity Receivership: An Essay on Institutional Change," *JEH*, vol. 34 (3) 1974: 685-709.

benefits of a functioning interstate railroad. Instead, court-appointed receivers kept the railway operating during bankruptcy while the firm was reorganized and financially restructured. Strikes were not tolerated while the railroad was under receivership, and lawsuits could not be brought against receivers during restructuring, although equity courts tried to ensure that existing management did not unduly skew outcomes in their own favour. This gradual shifting of bias towards the rights of debtors became a permanent feature of American bankruptcy policy starting with the 1898 federal legislation that was enacted after the great depression of 1893.

The process of railroad consolidation accelerated after the Civil War, and at the same time exacerbated the tensions between state and federal oversight of commerce. As discussed above, railroads appealed to federal courts to mediate, but the figures indicate that the major forces acting on railroad concerns remained at the state level until the end of the century. In 1887 the Federal Interstate Commerce Act superseded many elements of state policies, as did a number of other federal acts up to passage of the Transportation Act of 1920. At this point, federal regulation influenced content, access, ownership, safety, pricing, consolidations and operations, not only in the railroad industry, but in other key enterprises such as electric utilities and the telephone. Despite the rhetoric that accompanied the introduction of federal regulatory commissions, regulation had a long common law tradition vested in court rulings towards natural monopolies and other enterprises that involved the public interest.⁶⁰ Moreover, judicial oversight was not made redundant by the advent of regulation; instead, regulatory and antitrust enforcement depended heavily on court decisions. Although much of the historical focus has been on state and federal regulation, we also speculated about the incentives for firms to self-regulate. Indeed, some have argued that federal regulation was instigated by railroads and electric utilities as a means of reducing competition.

ii) Telegraphy

The telegraph, although not quite a “Victorian Internet,” emerged in the 1840s as the first commercially viable means of interstate electronic communication.⁶¹ Telegraphy diffused so rapidly that by 1851 the Bureau of the Census reported that 75 companies with over 20,000 miles of wire were in operation. These small scale enterprises proved to be inefficient, and a series of consolidations and exits ultimately resulted in the domination of Western Union. In 1870 Western Union alone operated almost 4,000 offices and handled more than 9 million messages. By 1890, its 19,382 offices were dealing with approximately 56 million messages.⁶² Diffusion of this form of communication was impressive but (like the Internet today) the applications were predominantly among businesses rather than consumers. Perhaps as a result of this business orientation, the law did not draw an analogy to newspapers or other print media, nor did it raise First Amendment questions about freedom of speech. Instead, the courts and legislature stressed a comparison with postal roads, turnpikes and railways. The Post Roads Act of 1866 designated telegraph companies as common carriers who were granted privileges including rights of way on public lands and waterways, access to free timber and resources, and recourse to eminent domain. In return, the telegraphs assumed the public interest duties of common carriers analogous to the transportation enterprises.⁶³

The Supreme Court of Massachusetts argued that, while the telegraph was undoubtedly a valuable means of communication, "Its use is certainly similar to, if not identical with, that public use of transmitting information for which the highway was originally taken, even if the means

60 “The act of congress known as the “Interstate Commerce Act” contains few new features and was chiefly designed to carry into the statutes of the United States ... the principles of the common law already enforced by the states in their domestic affairs.” *Western Union Tel. Co. v. Call Publishing Co.*, 44 Neb. 326 (1895).

61 See Tom Standage, *The Victorian Internet: The Remarkable Story of the Telegraph and the Nineteenth Century's On-Line Pioneers*, London, Weidenfeld and Nicolson, 1998.

62 U.S. Bureau of the Census. *Historical Statistics of the United States: Colonial Times to 1970: Bicentennial Edition*, Washington: GPO, 1976. Series R 46-55.

63 William Cook, *A Treatise on Telegraph Law*, New York, Siegrist Inc., 1920. Several law review articles have proposed the application of the common carrier model to the Internet, including James B. Speta, “A Common Carrier

adopted are quite different from the post-boy or the mail coach. It is a newly discovered method of exercising the old public easement, and all appropriate methods must have been deemed to have been paid for when the road was laid out."⁶⁴ It was initially fortunate for telegraph companies that courts supported the idea that the previously granted rights of use also extended to the newer technology. As the court in *Magee v. Overshiner*, 150 Ind. 127 (1898) pointed out, "If this were not true, ... the advancement of commerce, and the increase in inventions for the aid of mankind would be required to adjust themselves to the conditions existing at the time of the dedication, and with reference to the uses then actually contemplated." An atypical award of \$2500 in damages that was given for use of a narrow plot of land illustrates the high costs if owners of the telegraph lines had had to contract new bargains with holders of public easements.⁶⁵ In states which rejected such analogies, including California, Illinois, Maryland, Mississippi, and Missouri, property owners were able to sustain costly injunctions and compensation for trespass or reductions in the value of their land.

A second consequence was that the most significant doctrines in telegraph cases related to the duties of common carriers. English legal decisions dating back to the Middle Ages raised questions of a duty to serve the public and to charge "just rates" in so doing, especially in the case of monopolies. According to the Supreme Court of California in 1851, "The rules of law which govern the liability of telegraph companies are not new. They are old rules applied to new circumstances. Such companies hold themselves out to the public as engaged in a particular branch of business, in which the interests of the public are deeply concerned. They propose to do a certain service for a given price. There is no difference in the general nature of the legal obligation of the contract between carrying a message along a wire and carrying goods or a package along a route. The physical agency may be different, but the essential nature of the contract is the same."⁶⁶ As

Approach to Internet Interconnection," Federal Communications Law Journal, vol. 54 (March) 2002: 225-279.

⁶⁴ *Pierce v. Drew*, 136 Mass. 75 (1883).

⁶⁵ See *N.Y. Tel. Co. v. De Noyelles Brick Co.*, 154 N.Y. App. Div. 845 (1913).

⁶⁶ *Parks v. Alta California Telegraph Company*, 13 Cal. 422 (1859).

common carriers, telegraph companies were not permitted to refuse any messages, although they were not held vicariously liable for criminal transactions conveyed by telegraph.

Telegraph companies that accepted the designation of common carrier and its benefits were also obligated to charge reasonable, nondiscriminatory rates. This stipulation allowed judicial oversight over competition policy well before the antitrust statutes were enacted. Courts adopted an economic definition of discrimination, rejecting charges of anticompetitive behaviour if the differences in price were justified in terms of difference in costs. For instance, in *Western Union Tel. Co. v. Call Publishing Co.*, 44 Neb. 326 (1895), the court held that the telegraph company had not engaged in “unjust discrimination” because it faced different circumstances and costs in meeting the needs of a morning newspaper relative to an evening newspaper, which explained the differential tariffs charged. However, courts varied in their support for quantity discounts, some arguing that this pricing policy suppressed competition and encouraged the creation of monopolies.

The established telegraph law for much of the nineteenth century accepted the common carrier analogy, but quite early on some noticed that the comparison was somewhat strained.⁶⁷ The common carrier designation had an important implication for the telegraph company because it implied assumption of liability for the “goods carried.” Railroads as common carriers were strictly liable for freight entrusted to their care and thus could be viewed as insurers of goods consignments. Under this doctrine, the liability of telegraph companies for their messages could be enormous, since an error in the transmission of a buy or sell order could amount to many thousands of dollars. At the same time, unlike the value of consignments on railroads or turnpikes, clearly the intrinsic value to the telegraph company of any message was significantly lower than its value to the sender and receiver of the message. In order to insure against mistakes, the telegraph company required that the message should be repeated at a cost of half the regular rate, or else

67 For instance, a lower court in California in 1855 held that telegraph companies were not common carriers; as did the Maryland Court of Appeals: “A telegraph company is not a common carrier, but a bailee performing, through its agents, work for its employer, according to certain rules and regulations, which, under the law, it has a right to make for its government.” *Birney v. NY & Wash. Printing Telegraph Co.*, 18 Md. 341 (1862).

liability was limited to the cost of the transmission. The courts were confronted with disputes that challenged the right of companies that attempted to limit their liability in this way, since common carriers were supposed to assume that risk themselves. The stakes increased when businesses began to use abstruse codes or ciphers to protect their confidentiality and to reduce the cost of sending lengthy messages.⁶⁸ In one case, the telegraph operator transmitted the word “chatter” rather than the “charter” of the ciphered message, and the difference between the letter “r” and the letter “t” cost the sender about \$1000, leading to an action against the telegraph company for \$1054 in damages.⁶⁹

In response, the analogy to common carriers was ultimately rejected.⁷⁰ Instead of common carriers, some courts treated telegraph messages as bailments. Bailees were not expected to act as insurers, but only to hold to reasonable standards of diligence in completing their task, with damages generally limited to the price of their services. Certainly, in the case of coded messages, it was impossible for the telegraph company to determine the relative importance of the communication, and to regulate the amount of care it took accordingly. Western Union was justified in charging higher rates for important messages by requiring that they should be repeated, since “It does not exempt the company from responsibility, but only fixes the price of that responsibility, and allows the person who sends the message either to transmit it at his own risk at the usual price, or by paying in addition thereto half the usual price to have it repeated, and thus render the company liable for any mistake that may occur.”⁷¹ This was simply the standard of limiting liability to the level of foreseeable reliance, that had been set long before in the classic 1854 case of *Hadley v. Baxendale*, but its application to the telegraph industry was delayed because of the common carrier analogy.

The advent of the telegraph introduced a number of other interesting questions in the area of contract law. Previous methods of communication had depended on physical delivery through the postal service, whereas telegraphed messages ensured transmissions could be received within

68 Cotton exporters who wished to convey the message, “We make firm bid two hundred bales of fully middling cotton at 43-4d twenty-eight millimeters, January and February delivery, shipment to Havre” instead required Western Union to send the words “Holminop, New Orleans, Galeistraf, dipnoi, Granzoso, Liebsesin Dipnoi liciatorum, diomus, grapholite, Gradatos and Texas” (Minoprio, Forgan & Co., 5 Teiss. 79; 1907.)

69 . *Shaw v. Postal Telegraph & Cable Co.*, 79 Miss. 670; 31 So. 222; 1901.

70 The Supreme Court in the landmark decision, *Primrose v. Western Union*, 154 U.S. 1 (1894), ruled that “Telegraph companies resemble railroad companies and other common carriers... But they are not common carriers; their duties are different, and are performed in different ways; and they are not subject to the same liabilities.”

minutes. Time was therefore introduced as an important part of a contract conveyed by telegraph, and charges of negligence related to slight delays or errors in transmission.⁷² Other cases determined that a telegraph message could be regarded as a valid form of contract even if it was not signed in handwriting by both parties. As the California Supreme Court expressed it, “Any other conclusion than the one here reached would certainly impair the usefulness of modern appliances to modern business, tend to hamper trade, and increase the expense thereof.”⁷³ The development of international cable services further increased market efficiency and the ability to monitor agents engaged in distant transactions. At least one outcome of this was to reduce the autonomy of agents at sea, and for the first time constrained their ability while at sea to enter into contracts that would bind the owners of the ship without the owners’ previous consent.

As with other technologies, conflicts arose because of nuisance and trespass, including claims that electrolysis destroyed water pipes, and that high voltage electric lines of urban tramcars interfered with telegraph and telephone transmissions. Again, courts avoided assigning fault and instead tried to determine the lowest cost avoider, given the existing state of the arts. The opinion in an 1890 lawsuit between a telephone company and an electric railway effectively described the role of technological advances in determining the standards of liability: “In solving these questions, we are compelled to bear in mind the fact that the science of electricity is still in its experimental stage; that a device which to-day may be the best, cheapest, and most practicable, may, in another year, be superseded by something incomparably better fitted for the purpose. It is quite possible, too, that the legal obligations of the parties may change with the progress of invention, and the duty of surmounting the difficulty be thrown upon one party or the other, as a cheaper or more effectual remedy is discovered.... the question of his liability will depend upon

71 *Camp v. Western Union Tel. Co.*, 58 Ky. 164; 1858.

72 “Prompt and speedy communication between different localities is one of the most urgent wants of the present age. Persons whose messages do not require the most rapid transmission and speedy delivery, take the cheaper and slower method of communication afforded by the mails. When a telegraph company therefore receives a message for transmission, the fair inference is that the sender resorts to the telegraph because he cannot or does not choose to wait for the mail, and the telegraph company agrees by implication that his message shall be carefully transmitted by telegraph and delivered without unnecessary delay.” *Dorgan v. Telegraph Co.*, 7 F. Cas. 918; 1874.

the fact whether he has made use of the means which, in the progress of science and improvement, have been shown by experience to be the best; but he is not bound to experiment with recent inventions, not generally known, or to adopt expensive devices, when it lies in the power of the person injured to make use himself of an effective and inexpensive method of prevention.”⁷⁴

iii) Medical Technologies and Public Health

Legal doctrines towards public health and medicine drew on metaphors that echoed policies towards transportation and communications technologies.⁷⁵ Advances in steamboats, railroads and the telegraph and telephone were presented in the rhetoric of the nineteenth century as the natural object of public policy because they were integral to broad based economic and social growth. Numerous other innovations such as the water closet or faucets were more modest in terms of rhetorical flair, but could be interpreted as no less significant to social welfare, and thus the proper scope for state law and judicial intervention. Innovations that affected the quality and length of life fell into this category, including those that improved hygiene, sanitation, pollution, and medical techniques and devices. Medical and health issues in especial were at the forefront of contentious legal decisions that related to private disputes and public laws.

At the beginning of the nineteenth century it is likely that cures were regarded as being “in the hands of Him who giveth life, and not within the physical control of the most skillful of the profession.”⁷⁶ Doctors tended to be trained informally, were unattached to medical networks or hospitals, and were accorded little respect.⁷⁷ By the 1890s medicine was regarded as an eminent calling, doctors had acquired significant authority, and even general practitioners appealed to current findings in both science and technology. Health care had become specialized and organized within institutions, and the laboratory comprised an important unit in hospitals as well as

73 *Brewer v. Horst & Lachmund*, 127 Cal. 643; 60 P. 418; 1900.

74 *Cumberland Telephone and Telegraph Co. v. United Electric Ry Co.*, 42 F. 273; 1890.

75 Stanley J. Reiser, *Medicine and the Reign of Technology*, Cambridge, Cambridge University Press, 1978, is an excellent general introduction to the history of medical technology.

76 *Grindle v. Rush and Greene*, 7 Ohio 123; 1836.

77 According to one judge, “if there was any kind of testimony not only of no value, but even worse than that, it was, in his judgment, that of medical experts.” *Supreme Court of Illinois, Rutherford v. Morris*, 77 Ill. 397; 1875.

for doctors in private practice. The industrialization of medicine occurred partly because of technological advances that provided doctors with a formidable array of new diagnostic tools. By the end of the nineteenth century these included the stethoscope, ophthalmoscope, laryngoscope, microscope, X-ray machine, spirometer, neurocalometer, blood pressure gauge and electrocardiograph. Medical instruments facilitated tests and treatment for notorious diseases like tuberculosis, typhoid, cholera and diabetes and encouraged the professionalization of nascent specialties such as chiropractice.

Medical malpractice suits became more prevalent relative to population during the period of early industrialization because of shifts in demand and supply factors.⁷⁸ Technological innovation affected medical malpractice through its impact on both the demand side and the supply side. The demand for legal redress was partly related to social expectations that were raised by the achievements that had been attained in medical technology and by the diffusion of such knowledge among lay persons. The supply of disputes likely increased because more doctors were available to offer second (and different) opinions and alternative services, and because of the rapid adoption and more extensive usage of medical devices. Impersonal mechanical diagnoses and laboratory tests quickly became the gauge of effective treatment regardless of their actual efficacy. Ironically, to observers from other countries, American medicine had lost sight of the patient in its obsession with technological advances. This assessment was complicated by the desire of patients themselves for more technological inputs in their medical care, regardless of their productivity; for instance, the battery of tests that comprised the physical check-up became an annual routine early in the twentieth century.

Technological innovations in the field of medicine had varying effects on the propensity to litigate. It was true that they could facilitate more accurate diagnoses and improve the treatment of

⁷⁸ The best work on medical malpractice from an historical perspective is Kenneth Allen de Ville, Medical Malpractice in Nineteenth-Century America: Origins and Legacy, New York, New York University Press, 1990. See also James C. Mohr, Doctors and the Law: Medical Jurisprudence in Nineteenth-Century America, New York: Oxford University Press, 1993.

patients, but it was also possible that innovations led to more uniform standards of treatment which made defective practices more measurable and manifest. It might be expected that some doctors would be accused because they were less proficient with new devices or less up-to-date, and that current technologies might lead to unrealistic expectations. The application of X-rays in medical litigation illustrates the role of new technologies in malpractice suits. Wilhem Conrad Roentgen first published his discovery of “a new kind of ray” at the end of 1895 in the Proceedings of the Würzburg Phisico-Medical Society. Only a few months later the use of X-rays was introduced in the United States and related patents were being filed, but ordinary citizens were also captivated by the discovery. Doctors who failed to use the machines, despite the dangers of burns to patients, risked being accused of incompetence and a violation of their fiduciary duty.⁷⁹ Less than two years after the invention was introduced, a Midwestern jury was instructed to draw conclusions from X-ray photographs that were entered into the records.⁸⁰ Patients retained the services of expert witnesses who used X-ray evidence to prove their case, and doctors countered with their own proofs.

As with other technologies, the law varied its standard of what was acceptable according to the state of the arts. The courts considered malpractice as a physician’s breach of his fiduciary duty to offer competent services, through negligence, ignorance, or lack of due care. The physician was initially held to a standard of competence that took into consideration the type of community in which he practiced. In 1824 a dispute in the remote village of Lubec, Maine involved a patient whose local doctor had allegedly botched treatment of a dislocated joint. The judge felt that it was

79 Schmidt and Fuchs v. Balling, 91 Ill. App. 388 (1899) was brought as an appeal against a lower court judgement of \$7000 in damages, in a lawsuit where the plaintiff claimed negligence in the use of X-Rays.

80 “There have been offered in evidence two photographic negatives, taken by the Roentgen or X-ray process, of the plaintiff’s injured femur bone. Scientists, by the aid of that wonderful and mysterious force we call electricity, have discovered a process by which they are enabled to procure a photograph, showing the shape and size of the living human body with a fair degree of accuracy. The negatives offered here in evidence in this case represent the shape and size of the plaintiff’s right femur bone, somewhat enlarged, at the time the negatives were taken, namely, Exhibit A, on October 24, 1896, and Exhibit B, on May 9, 1896. ... You are to take these negatives and consider them as approximately correct representations of the shape and size of the plaintiff’s injured femur bone, at the time they were taken, and at the present time, for the purpose of aiding you in determining the extent of the plaintiff’s injury, or in any other way in the consideration of the evidence in this case.” Tish v. Welker, 5 Ohio Dec. 725 (1897).

not to be expected that a doctor in a small rural town would possess the same degree of skill as a European-trained specialist in Boston. Later courts argued that doctors should uphold a nationally accepted standard because improvements in transportation and communications had created a national market, with equality of access to information. Despite this, the locality standard proved to be enduring and was still the norm even in the early twentieth century.

The endogeneity of legal doctrines to technological changes was evident in cases that dealt with medical malpractice, but the converse was also true – that is, medical practice changed according to what was legally acceptable – as witnessed by rules about abortion.⁸¹ The Supreme Court of New Jersey in 22 NJL 52 (1849) outlined the development of the law towards abortions, and pointed out that legal precedent uniformly was in agreement that it was acceptable to procure an abortion before the point of “quickening” in the pregnancy. The opinion quoted Blackstone’s view that “Life begins in contemplation of law as soon as an infant is able to stir in the mother’s womb.” Even after quickening the removal of the unborn child was deemed to be a misdemeanor rather than murder. In the decades after the Civil War abortion at any stage was outlawed by statute throughout the country and criminalized as a felony. However, in a number of states an abortion was still held to be acceptable at any point in the pregnancy if there were valid medical reasons for the procedure in order to save the mother’s life, or to prevent serious bodily injury. Thus, the legality of each abortion depended heavily on the interpretation and state of medical knowledge regarding its alleged therapeutic necessity, itself a function of current diagnostic technology.⁸²

Public health likewise had long been considered a legitimate concern of the state.⁸³ From the earliest years of settlement, local governments regulated the provision of food and sanitation,

81 For the history of abortion, see Leslie J. Reagan, *When Abortion Was a Crime: Women, Medicine, and Law in the United States 1867-1973*, Berkeley :University of California Press,1997; and James C. Mohr, *Abortion in America: The Origins and Evolution of National Policy, 1800-1900*, Oxford University Press, 1979.

82 In 1899, medical justifications for abortion included Bright’s disease of the kidney, cancer of the womb and malformation of the pelvis, among others (191 Pa. 207).

83 A good survey of public health administration and law is James A. Tobey, Public Health Law, New York, Commonwealth Fund, 1947.

enacted laws to prevent nuisances, and called upon formidable police powers to deal with perceived dangers to community welfare. Measures to counter infectious diseases could lead to especially draconian measures, including lengthy quarantines, forcible entry and the seizure or destruction of private property, criminal prosecution and imprisonment. In 1796 a Congressional statute (1 Stat. 474) pledged federal support for state measures to ensure effective quarantines. In 1809 Massachusetts introduced the first law to require vaccination against smallpox. In an age of widespread danger of epidemics, many towns used funds from their treasury to pay for preventative measures. For instance, in 1828 the Connecticut town of Salisbury paid \$50 to local physicians to inoculate its residents with the cowpox bacillus.⁸⁴ Public health policy in the nineteenth century was closely aligned with sanitation technology and engineering. For instance, the police power of the state to ensure the health and safety of the public was used to enforce the provision of running water and the use of water closets in private properties. These measures led to protests, such as occurred when the City of New York passed an act in 1887 that required tenement houses to provide running water on all floors because of health and safety reasons. The owners of one such tenement (oddly enough, a church) claimed that the costs of installing such facilities were so high as to constitute a taking of private property. And indeed, Ellen Richards, an MIT chemist, estimated that the cost of improved sanitation and fittings in homes had increased the cost of house construction by \$15,000 in the period between 1850 and 1900. The takings argument was rejected by the appellate court, which pointed out that “Hand rails to stairs, hoisting shafts to be inclosed, automatic doors to elevators, automatic shifters for throwing off belts or pulleys, and fire escapes on the outside of certain factories, Under the police power persons and property are subjected to all kinds of restraints and burdens in order to secure the general comfort and health of the public.”⁸⁵

84 *Landon v. Humphrey*, 9 Conn. 209; 1832. Similarly, the Philadelphia City Council in 1798 commissioned the eminent engineer Benjamin Henry Latrobe to design a public water system, in order to counter fears that contaminated water was responsible for outbreaks of yellow fever. However, the subjects of quarantines such as merchant ships or owners of tenements were just as likely to be forced to underwrite the expenses themselves.

85 *The Health Department of the City of New York, Appellant, v. The Rector, Church Wardens and Vestrymen of*

The U.S. Supreme Court tended to support the actions of state health officials acting in the public interest, to extent that it was argued that the state did not have to provide evidence to justify its public health policies as long as they were in accordance with “common beliefs.”⁸⁶ The dangers of such unfettered powers were illustrated in the eugenics movement that developed towards the end of the nineteenth century. At that time genetic science, studies of evolutionary biology and heredity, as well as biostatistics and sociology, combined to reach the conclusion that the genetic composition of the population should be regulated by statute.⁸⁷ These supposedly scientific rationales provided an impetus for policies that ranged from restrictive immigration laws, to the forced sterilization of individuals with allegedly undesirable genetic characteristics. In 1896 Connecticut restricted the ability of epileptics and mentally disabled persons to marry, and similar laws were enacted in more than twenty states including Kansas, New Jersey, Ohio, Michigan and Indiana. In *Re Thomson*, 169 N.Y.S. 638 (1918), examined the constitutionality of a 1912 law that New York passed to permit the sterilization of mentally disabled adults in its institutions.⁸⁸ The court ruled that the statute violated the equal protection clause of Fourteenth Amendment, noting that a similar law had been declared unconstitutional by the Supreme Court of New Jersey. Although a number of state judges joined in restricting or overturning such laws, the Supreme Court of the United States affirmed these policies on the grounds of public interest. Advances in medical technology meant that sterilization could readily and safely be effected in males by vasectomy and in females by salpingectomy rather than more drastic invasive measures. The

Trinity Church in the City of New York, 145 N.Y. 32; 39 N.E. 833; 1895.

86 “The possibility that the belief may be wrong, and that science may yet show it to be wrong, is not conclusive; for the legislature has the right to pass laws which, according to the common belief of the people, are adapted to prevent the spread of contagious diseases,” *Jacobsen v. Massachusetts*, 197 U.S. 11 1905.

87 Philip R.Reilly, *The Surgical Solution: A History of Involuntary Sterilization in the United States*, Baltimore: Johns Hopkins University Press, 1991, provides an overview of the eugenics movement. Paul A. Lombardo, “Medicine, Eugenics, and the Supreme Court: From Coercive Sterilization to Reproductive Freedom,” vol. 13 *Journal of Contemp. Health L. & Policy* 1 (1996) contends (p. 1) that “the most powerful vehicle of the eugenic ideology was the law.”

88 The court’s opinion noted that “This statute grows out of studies and efforts of those who are interested in the subject of eugenics, which has to do with the improvement of the population by taking advantage of laws of heredity; with improving through better breeding. It deals with the inheritance of traits; with changes in population through differential fecundity; the greater or less fecundity of the different classes of population; with changes of population from emigration; or better or worse strains, with hereditary basis of the traits of population.”

court's approval of compulsory sterilization drew on the public health analogy of compulsory vaccination, which served the public interest as well as the interest of the parties directly involved irrespective of their individual wishes.⁸⁹

iv) Automobiles

The automobile for some is the most characteristic icon of the American way of life. In 1920 only 1 percent of American homes had central heating, but 26 percent owned automobiles; by 1930 this number had increased to 60 percent, and as early as 1917 the United States accounted for 85 percent of the world's motor cars. The automobile, to an even greater extent than the railroad or other transportation innovations, changed patterns of work, crime, leisure and residence. As early as 1906, the author of a legal treatise pointed out that, although "... many of the cases merely have called for the application of established rules of law, in dealing with the motor vehicle," it was also true that "many branches of the law are being affected by the horseless carriage figuring in litigation. Where the automobile's permeating influence will stop is beyond prophesy. It is certain, however, that the motor car, including everything connected with it, is bound to be the subject of a vast amount of litigation in the future..."⁹⁰ By 1931, the same author's Encyclopedia of Automobile Law ran to twenty volumes. Figure 8 confirms his assessment of the legal impact of the automobile, as demonstrated by the rapid increase in both state and federal litigation.

Although litigation increased markedly, the figure also indicates that federal courts did not play a major role in the public policies that developed towards motor vehicles. We may speculate

⁸⁹ Oliver Wendell Holmes wrote that "The public welfare may call upon the best citizens for their lives. It would be strange if it could not call upon those who already sap the strength of the state for these lesser sacrifices, often not felt to be such by those concerned, in order to prevent our being swamped with incompetence. It is better for all the world, if instead of waiting to execute degenerate offspring for crime, or to let them starve for their imbecility, society can prevent those who are manifestly unfit from continuing their kind. The principle that sustains compulsory vaccination is broad enough to cover cutting the fallopian tubes. Three generations of imbeciles are enough." Only Justice Butler dissented. (*Buck v. Bell*, 274 U.S. 200 (1927)).

⁹⁰ Preface, pp. vi-vii. Huddy, Xenophon P., The Law of Automobiles, Matthew Bender & Co., 1906. The family agency doctrine is described in the seventh edition of this work, published in 1924. Arthur F. Curtis, who wrote the preface for the 1924 edition, noted that "The ever increasing number of decisions relating to the law of automobiles brings new burden to the lawyer. The question constantly before him is "How can I keep step with the progress in this, the most actively litigated branch of the law?"

whether this would have been the case if the interstate highways had been constructed more rapidly, or whether the decentralized nature of motor vehicle ownership necessarily encouraged state governance. The common carrier concept was applied to commercial motor vehicles, but analogies from the era of the railroads proved to be of limited relevance, and the doctrine was modified almost beyond recognition. Rate regulation of common carrier motor vehicles was viewed as redundant, because the number of alternative modes of transportation ensured that competition protected the public from exorbitant prices. States established commissions to issue licences or “certificates of public convenience and necessity” that regulated the numbers of carriers, their routes, modes of operation, and ownership issues such as whether railroads should be allowed to offer vehicular common carrier service. As with all licensing, an argument can be made that, despite the stated objectives, the end result was to limit competition rather than uphold standards that benefited public safety or convenience.

The case of the automobile illustrates the ambiguities of attitudes towards overt constraints on individual behaviour as opposed to regulations that affected enterprises in the name of the public. Little controversy occurred when states introduced consumption taxes in order to fund the expansion and maintenance of public highways.⁹¹ These taxes proved to be as popular as any tax could be, since the revenues financed roads that benefited all motorists and nonusers of highways (such as farmers running machinery) were reimbursed. However, the dual standard towards regulation was evident in responses to measures to deal with automobile torts, which were far more costly than those associated with railroads or mining. Increased use of motor vehicles was accompanied by increased harm.⁹² The majority of automobile accidents were caused by human

91 In 1919 Oregon introduced gasoline taxes (one cent per gallon), as did New Mexico (two cents) and Colorado (one cent). Other states quickly followed suit, and over time the taxes were increased, so by 1929 gasoline taxes were raising \$431 million annually.

92 In 1920 automobiles caused some 11,000 deaths (half of whom were children); in 1924 this number more than doubled, over 700,000 injuries were sustained, and property damage was substantial. The fatality rate for automobile accidents rose from below five deaths per million persons in 1906 to 72 deaths per million a decade later. Fatalities were highest in urban areas, and in 1920 the largest number of fatalities relative to population occurred in Los Angeles, followed by Buffalo, both of which experienced rates that exceeded 200 per million. New York injury rates in 1920 were approximately 25 times that of fatalities, and Boston alone recorded 21,182 injuries in the same year.

error rather than mechanical flaws, and terms such as “speed maniac” or “road hog” had already entered the public lexicon at the turn of the century. Public policy was again required to mediate among competing claims. Efforts included the passage of legislation to provide rules and regulate behaviour, appeal to the courts, and third party means of compensating those who were harmed. Safety measures that regulated individual behaviour -- drivers’ tests and licences, vehicle registration, age limits, and traffic regulations -- were introduced in a slow and haphazard fashion. In the 1920s and 1930s states imposed an inconsistent jumble of regulations on drivers, but enforcement was lax and such legislation was not at the forefront of policies towards automobiles.

Instead, the state courts were rapidly clogged with disputes brought by victims of “jitneys,” taxicabs, trucks and privately operated vehicles. As in all tort cases, the key issues centered on liability and on compensation. When conflicts appeared between existing and former technologies, judges refused to assign unilateral blame, and instead ensured that the lowest cost outcome prevailed. For instance, over 900 lawsuits dealt with the harm caused by cars frightening horses. In *Macomber v. Nichols*, 34 Mich. 212 (1876), the judge declared that “Persons making use of horses as the means of travel or traffic by the highways have no rights therein superior to those who make use of the ways in other modes. ...Horses may be, and often are, frightened by locomotives in both town and country, but it would be as reasonable to treat the horse as a public nuisance from his tendency to shy and be frightened by unaccustomed objects, as to regard the locomotive as a public nuisance from its tendency to frighten the horse.”⁹³ The standard of the time required the driver of the car to defer to horses, since the latter were more common. However, when automobiles became the norm, the standard shifted to reflect that fact.⁹⁴

93 *Indiana Springs Company v. Brown*. 165 Ind. 465; 1905: “In all human activities the law keeps up with improvement and progress brought about by discovery and invention, and, in respect to highways, if the introduction of a new contrivance for transportation purposes, conducted with due care, is met with inconvenience and even incidental injury to those using ordinary modes, there can be no recovery, provided the contrivance is compatible with the general use and safety of the road. It is, therefore, the adaptation and use, rather than the form or kind of conveyance, that concerns the courts.”

94 *In Re Thomas Berry*, Supreme Court of California, 147 Cal. 523; 82 P. 44; 1905: “Of course, if the use of automobiles gradually becomes more common, there may come a time when an ordinance like the one here in question would be unreasonable...”

A significant legal development occurred when courts overturned the privity of contract doctrine to take into account the circumstances of automobile manufacture and the complexity of the vehicle structure. Before 1906 there were no cases involving manufacturer's liability except when the item was held to be inherently dangerous. In *Johnson v. Cadillac Motor Co*, the plaintiff was seriously injured by a defective tire on his automobile, which had been sold by a retail dealer. The court held that no contractual relationship existed between the driver and the manufacturer and dismissed the complaint. Judge Coxe, in his dissent from this decision, implied that the buyer of complicated mechanisms of new technologies could not readily judge their safety as well as the manufacturer. Coxe's argument was similar to the decision in *MacPherson v. Buick Motor Co.*, 217 N.Y. 382 (1916), which stated that a manufacturer had a duty of care even to third parties who were not directly involved in contractual relations with the firm. Cardozo rejected the privity of contract defence because the standard approach had to change with the times: "The maker of this car supplied it for the use of purchasers from the dealer.... The dealer was indeed the one person of whom it might be said with some approach to certainty that by him the car would not be used. Yet the defendant would have us say that he was the one person whom it was under a legal duty to protect. The law does not lead us to so inconsequent a conclusion. Precedents drawn from the days of travel by stagecoach do not fit the conditions of travel to-day. The principle that the danger must be imminent does not change, but the things subject to the principle do change. They are whatever the needs of life in a developing civilization require them to be."

The appellate court in the Johnson case (*Johnson v. Cadillac Motor Co*, 261 F. 878;1919) affirmed this view. They drew on a shaky analogy to a principle that had always been accepted by the common law, likening the automobile manufacturer to a producer of poisonous drugs or "imminently dangerous articles" who had a duty of care to the public. However, Cardozo correctly highlighted the extent to which harm could be foreseen: "foresight of the consequences involves the creation of a duty." Predictability of outcomes was also emphasized in *Chittenden v. Columbus*, 5 Ohio C.C. 84 (1904). When the court imposed a fine of \$25 on a motorist who was

exceeding the town speed limit of seven miles, the plaintiff protested that the law illegally discriminated against automobiles, since streetcars were allowed to go faster. The court disagreed since, unlike automobiles, streetcars ran on set tracks and could thus be more easily avoided by others. If injury could be foreseen, efficiency required that the law offer incentives to avoid such harm by placing liability on those who could avoid it at lowest cost. As Coxe had presciently pointed out, the automobile was such a complicated mechanism it was unlikely that the ordinary driver could detect a structural deficiency, whereas it was readily within the capability of manufacturers to test each part and ensure that it was safe. A corollary of this doctrine was that the federal courts later upheld GM's right to stipulate that their dealers should use only GM replacement parts: exclusive contracts of this sort did not lessen competition but ensured quality control, since any defects would have adverse effects on GM's reputation.⁹⁵

Automobiles influenced the rise of enterprise liability and motivated legal doctrines that absolved users from responsibility for their actions on the grounds that technology had outpaced their understanding. However, the majority of automobile accidents did not occur because of tortious actions by enterprises, but involved harms caused by negligence on the part of drivers or pedestrians. A number of legal innovations were a response to falling prices for the new technology that encouraged its diffusion throughout the population. The first automobile owners were wealthy individuals who were likely to hire chauffeurs, which led to legal questions of agency that could be subsumed in the existing law of master and servant. However, the law of agency had to be modified when the price of cars fell to the point where ordinary families could afford to purchase vehicles that they drove themselves. The family agency doctrine took into account the likelihood that other family members would be just as likely to drive the car as the owner, and courts held the owner (generally the father) vicariously liable for the actions of the rest of the family. This holding encouraged the owner of the vehicle to monitor and regulate the actions of family members in order to ensure that their behaviour was consistent with safe use.

⁹⁵ Pick Mfg. Co. v. General Motors Corp., 80 F.2d 641; 4935.

Another result of automobile ownership by ordinary families was that insurance soon comprised an important public policy issue.⁹⁶ Plaintiffs, even if successful in obtaining a judgment for damages, were often unable to collect their dues because the impecunious automobile owner had purchased the vehicle on an installment plan and was financially unable to pay. Early insurance companies lacked information to compute and rate risks, so the majority chose to avoid universal coverage and limited their policies to specific contingencies such as theft or fire. The problems for insurance writers of uneconomical risks were compounded by inconsistent state and municipal regulations. In some states, insurance liability only applied to commercial vehicles or major urban centers, and some cities like Los Angeles and Cleveland passed local ordinances independently of state laws. Safety advocates turned to the analogy of workers' compensation to lobby for state-sponsored automobile insurance or regulation of the insurance industry. After 1910 the National Workmen's Compensation Service Bureau computed rates for liability and property damage insurance for automobiles. However, lobbyists for state-sponsored insurance plans along the lines of workmen's compensation failed to achieve their objectives and states continued to vary in their treatment of insurance. The major policy towards automobile torts remains that of insurance or compensation for harm done, rather than self-insurance or limitations on use.

CONCLUSION

“The final cause of law is the welfare of society.”
--Benjamin Cardozo⁹⁷

We live in interesting times; but so did the population of the nineteenth and early twentieth centuries. The elevation in standards of living during this period was associated with the rapid diffusion of inventions that transformed the daily life of ordinary citizens. Technological change was not uniformly benevolent and it is appalling to modern observers to assess the costs in terms of injuries, mortality, morbidity and environmental damage. Innovations also had redistributive effects, such as interference with existing water rights, the fall in returns to railroad stockholders

⁹⁶ Contemporary discussion of insurance issues include Robert Riegel, “Automobile Insurance Rates,” Journal of Political Economy, Vol. 25, No. 6. (Jun., 1917): 561-579; and Morris Pike, “Some Aspects of the Compulsory

when automotive vehicles substituted for passenger and freight transportation, or even the increased benefits to personal beauty that resulted from the rise of service-oriented occupations. The incentives to invent and innovate were influenced by the rules and standards of social and economic exchange, and in turn those rules had to accommodate the new technologies: “the great inventions that embodied the power of steam and electricity, the railroad and the steamship, the telegraph and the telephone, have built up new customs and new law.”⁹⁸

This paper suggested that one of the reasons for the relative success of the United States during the long nineteenth century was its dependence on an array of institutions that proved to be sufficiently flexible to provide incentives for the creation of technological innovations and also the means to manage their use and consequences in the public interest. These institutions included (but clearly were not limited to) the private market, the political process vested in the legislature, administrative regulation, insurance, and the legal system. I have deliberately highlighted the role of the market economy and that of the common law. President Roosevelt did likewise in his 1908 address to Congress, noting that “for the peaceful progress of our people during the twentieth century we shall owe most to those judges who hold to a twentieth century economic and social philosophy and not to a long outgrown philosophy, which was itself the product of primitive economic conditions.” In short, the democratic market orientation of the American legal system played a key role in the advances of this era.

The United States benefited from the talents of the extraordinary cadre of individuals who comprised the judiciary. Courts confronted the continuous stream of mankind about its commonplace business of life, and from these unpropitious materials created decisions that were based on analogies drawn from historical experience, logic, and the attempt to serve the community in general. An analysis of law reports supports the notion that the judiciary objectively weighed costs and benefits, and ultimately the decisions that prevailed promoted social welfare

Automobile Insurance Movement,” in Proceedings of the Casualty Actuarial Society, Vol. 9 (1922): 23-37.

97 The Nature of the Judicial Process, New Haven, Yale Univ. Press, 1921, p. 66.

rather than the interests of any single group. American judges understood that one of the best means to protect the rights of customers and to constrain the power of corporations was through market competition. The legal system formed a decentralized method of mediation that was continuously calibrated to the changes that affected society, technological or otherwise. This is not to say that every judge was of the calibre of Joseph Story or Benjamin Cardozo, but a system of appeals assured that “the tide rises and falls, but the sands of error crumble.”⁹⁹

Regulation, on the other hand, was too often a function of a unique cataclysmic event -- a stock market crash, a fire or train collision that results in much loss of life, a single epidemic or terrorist attack, the sinking of a ship -- that gripped the public imagination and provided the political impetus for policies that might have been appropriate for that event but subsequently proved to be ineffective guides for future actions or outcomes. Regulation and “protective” legislation typically occurred because of political interests rather than economic reasons, and often constituted a veiled attempt at raising barriers to entry, or a way to increase the costs of competitors and of disdained social groups. Regulatory provisions were most effective when they simply codified the historical tendencies of the common law and ultimately depended on enforcement from the federal legal system. Administrative bodies such as the ICC and the FTC at times were headed by legal practitioners: Brandeis is credited (or blamed) for the establishment of the FTC and SEC, and Cooley was the first ICC Commissioner. Rather than substitutes, the legal system was a valuable and necessary complement to state and federal regulatory systems, but their relative importance varied with time and circumstance.

Although the nineteenth century is frequently characterized as the heyday of untethered competition, one is impressed with the extent to which new technologies were both enabled and constrained by common law holdings in order to conform to prevailing conceptions of social welfare. The major innovations that we considered here – the railroad, the telegraph, medical

98 Benjamin Cardozo, The Nature of the Judicial Process, p. 62.

99 Benjamin Cardozo, The Nature of the Judicial Process, p. 177.

technologies and public health – were regarded as integral to social progress. Because they were vested with a public purpose, private enterprises were conscripted to serve the needs of the community. It is therefore not surprising that judges such as Cardozo saw the ultimate objective of law to be the promotion of “social utility.”¹⁰⁰ From this perspective, neither is it surprising that courts ensured the protection of railroad passengers, consumers, children, debtors and other classes of society, at the same time that they were attempting to provide incentives for the growth of private enterprise.

The advent of each new technology created uncertainty about how the law would be interpreted, which analogies will be applied, and what the prevailing standard would be. This likely accounts, at least in part, for the increase in the number of lawsuits that initially occurred, even after adjusting for the scale of use. The courts were typically at the forefront of policies towards technology in the nineteenth century, and provided a gauge of legislative needs. Legislation encountered the technologies of the day with a lag and tended to follow signals emanating from the conflicts before the courts. Thus, legal decisions, although statute-bound and based on historical experience, were to some extent forward-looking. We can only speculate about the subsequent decline in litigation rates that all of the figures exhibit, but the number of litigated disputes likely fell because of learning by all parties involved, greater certainty about standards, the introduction of new legislation that resolved outstanding issues, or in some instances as a result of a shifting of oversight from the courts to other institutions.

Patents and (to a lesser extent) copyrights were regarded as fundamental to industrial and cultural progress, and protected as such at the federal level from the very beginning of nationhood. As a result, interstate markets developed early on with extensive trade in rights and subdivided rights. Inventors were regarded as public benefactors, because (unlike monopolists) they contributed new improvements that expanded the frontiers of production and consumption.

100 “Where then shall we look for the revelations of the folk-spirit if not in the prevailing standards of utility and welfare?” Cardozo, The Growth of Law, New Haven, Yale Univ. Press, 1924. p. 104.

Therefore, the law was quite unambiguous in its objective of protecting legitimate patent rights in order to provide incentives for inventive activity and diffusion. However, it was necessary for judges in equity jurisdiction to thwart patent owners who attempted to extend their rights beyond their just bounds to obtain monopoly control over the entire industry. Copyrights, on the other hand, provided weaker incentives for new expression and risked reducing public access to knowledge. New technologies presented further dilemmas because they increased the scope and duration of copyright protection and had potentially deleterious effects on the public domain. In the attempt to protect public welfare, legal innovations expanded beyond traditional copyright doctrines to noncopyright holdings under unfair competition, trade secrets, and the right to privacy.

In the context of technological innovations, market integration ran up against the constraints of individual state policies that inhibited standardization and increased the costs of transacting. The first national enterprises -- the railroads and the telegraph companies -- appealed to the federal courts to apply provisions of the Constitution. Had they failed, the consequences would have been pervasive not just for big business and market integration, but for the attempts of social reformers who wished to override the political biases of state legislatures in areas as disparate as racial segregation and abortion. While federalism was a prerequisite for market integration, the converse did not necessarily hold, since general market integration did not preclude state oversight, especially for technologies whose use was predominantly local. During the period under review roads were largely intrastate and unconnected, making long distance travel prohibitively costly for most purposes. This comprised at least one reason why the law towards automobile users was predominantly state-oriented, and relatively few federal questions arose in the courts. Instead, federal policies were mainly directed towards resolving free-rider problems among states by matching state funding to construct interstate highways.

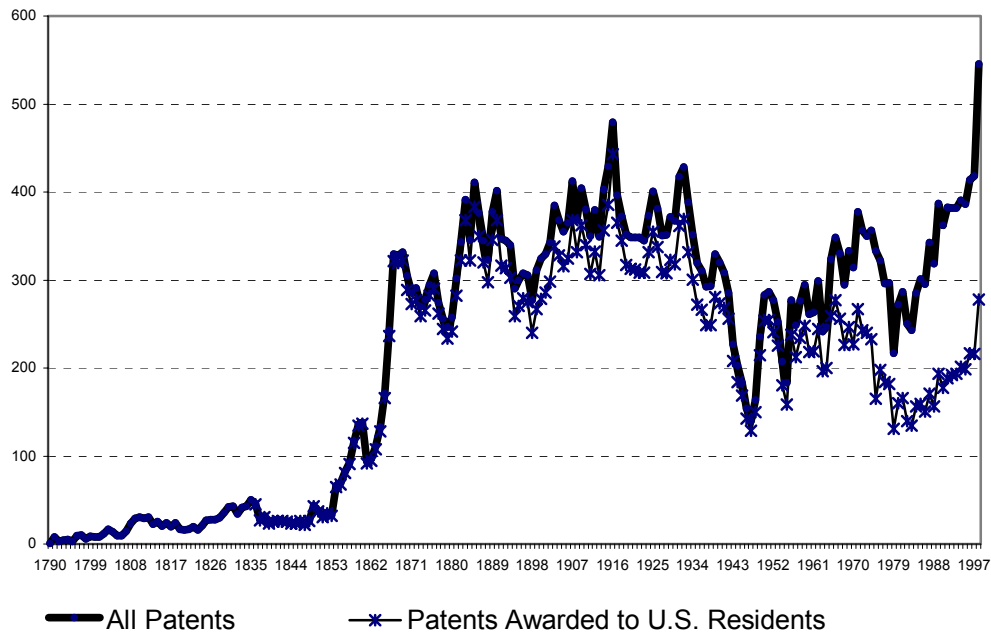
The automobile industry quickly made important contributions to law, economy and technology. Despite its prominence, few scholars have addressed the legal implications of the automobile, an omission that is all the more noticeable when compared to the attention accorded to

other major innovations such as the railroad. Although the transportation function of both railroads and automobiles was the same, few analogies were drawn between them. It might be argued that the railroad's legal significance owed to the public need for laws to deal with the harms to consumers and workers from accidents, and the need to regulate its monopolistic strategies. Yet, third party effects associated with automobiles, in the form of injuries to children and other bystanders, was far greater than in the case of railroads. In contrast, even with growing market integration, the automobile was associated with decentralized consumer use, harms to ordinary citizens by other ordinary citizens, few interstate issues and increased oversight by states and municipalities. The decentralization of activities that occurred with widespread automobile ownership meant that the public would have had to bear the consequences of pervasive regulation. Instead of legal or regulatory measures to significantly limit private use, the scale of harms afflicted by automobile users motivated an institutional shift towards private insurance. Policy makers were reluctant to follow the vaccination analogy that allowed incursions into the private sphere of consumer activities in the name of the public interest.

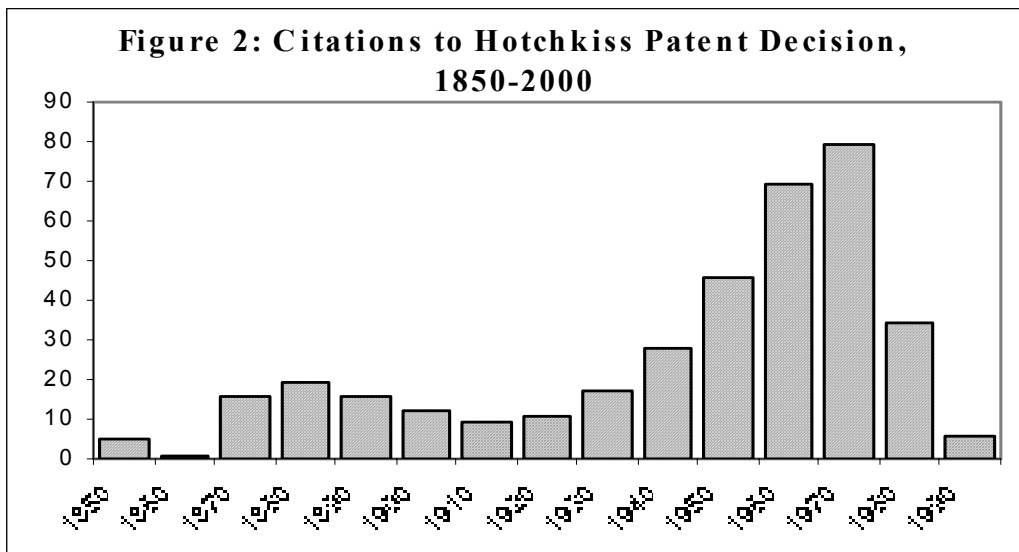
This survey of innovations in law and technology has not identified discrete transformations in law; neither does it detect monolithic tendencies towards centralization or increased administrative regulation. Still less does the evidence support the claims of subsidy hypothesis. Effective policies towards innovations required a social calculus that was far more subtle than the promotion of the interests of any one specific group in society. Technological advances altered the costs and benefits of transacting within a particular network of rules and standards, and institutions proved to be sufficiently flexible to encompass these changes. In short, since the founding of the Republic, institutions have altered as the scale and scope of market and society have evolved, but the central policy objective of promoting the public interest has remained the same. That is, after all, one of the chief virtues of a society that is bound and enabled by prescient Constitutional principles.

The perusal of legal decisions to detect prevailing tendencies is a hazardous undertaking. The analyst, however objective and well-meaning, risks misinterpretation or selective use of the evidence to reconfirm a pre-existing bias. However, we can gain some insights from the experience of developing countries today. In many nations political elites have captured institutions to further the narrow self-interest of these privileged groups. Institutional sclerosis, the prevalence of inefficient regulatory bureaucracies, corruption and inadequate legal systems have resulted in widespread poverty, despair, and the absence of incentives for increased productivity. If the subsidy thesis is correct, and the American legal system was early on captured to promote the interests of a favoured few, it is quite unlikely that the United States would have experienced more than a century of relatively democratic economic growth and technological progress.

Figure 1
Rate of Patenting Per Capita in the United States, 1790-2000

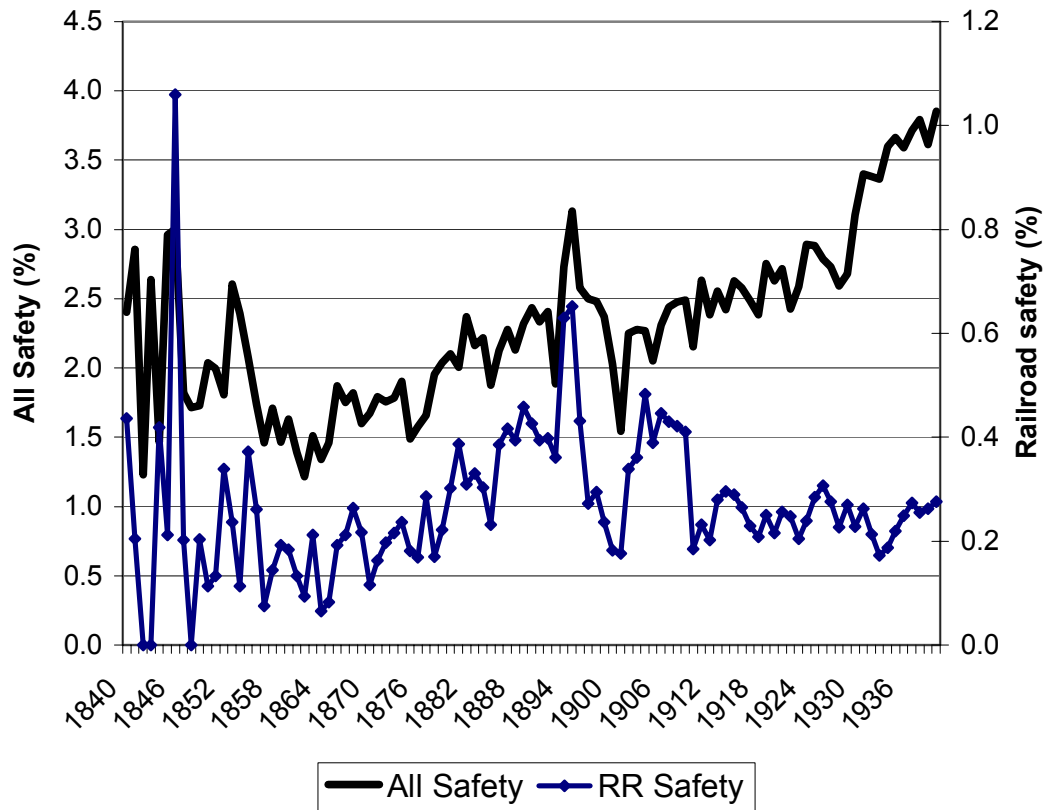


Source: B. Zorina Khan and Kenneth L. Sokoloff, "The Early Development of Intellectual Property Institutions in the United States," *Journal of Economic Perspectives*, Vol. 15 (3) 2001: 233-246. Notes: The figure shows patents granted, per million residents in the U.S. population.



Notes and Source: Lexis-Nexis, federal lawsuits database. The count comprises the number of cases in which *Hotchkiss v. Greenwood* was cited in relation to the doctrine of nonobviousness, by decade. Note the dramatic decline in applications of this doctrine in the 1990s, coinciding with the rise of software, the Internet, and business method patents.

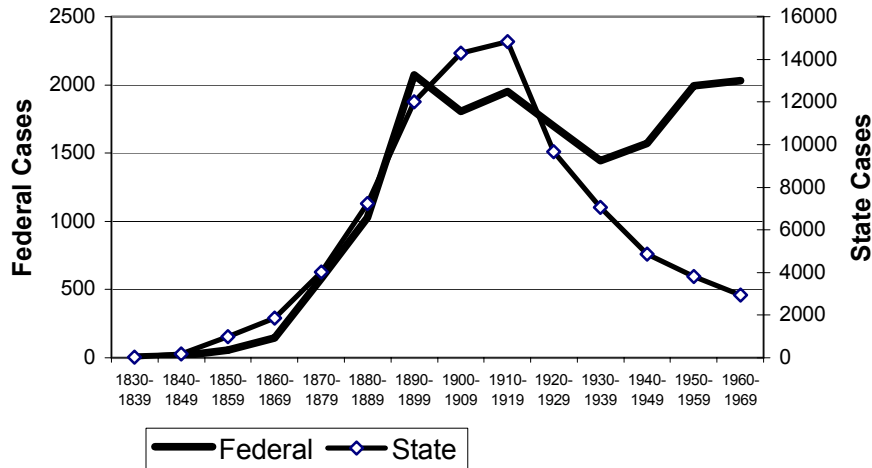
Figure 3
Safety Related Inventions in Railroad and All Sectors,
1840-1940 (percent of all patents)



Source: U.S. Patent Office, 1840-1940.

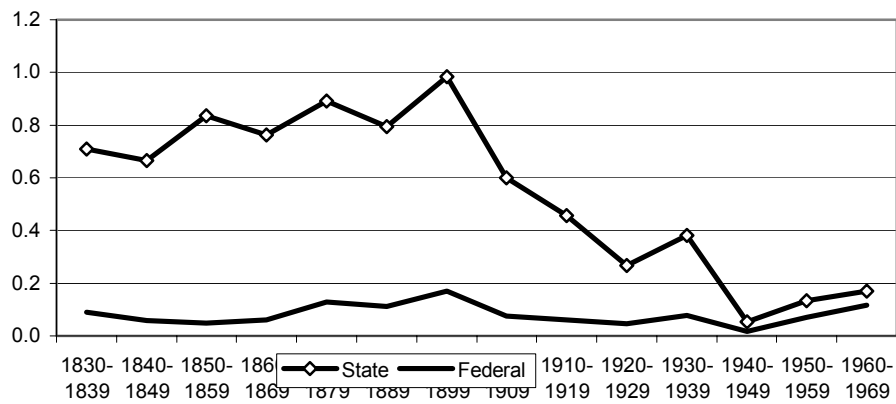
Notes: Inventions are considered to be safety related if the patent specification includes two or more appearances of variations of the word “safe.” Changing the frequency affects levels but does not substantively affect the patterns.

Figure 4
Railroads: State and Federal Litigation, 1830-1970



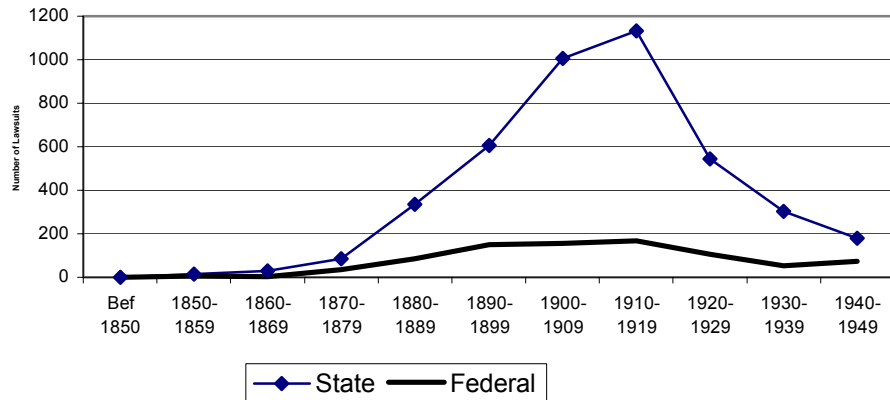
Source: Lexis-Nexis database of state and federal reported cases.

Figure 5
Railroads: State and Federal Lawsuits Relative to Usage, 1830-1970 (per million miles travelled)



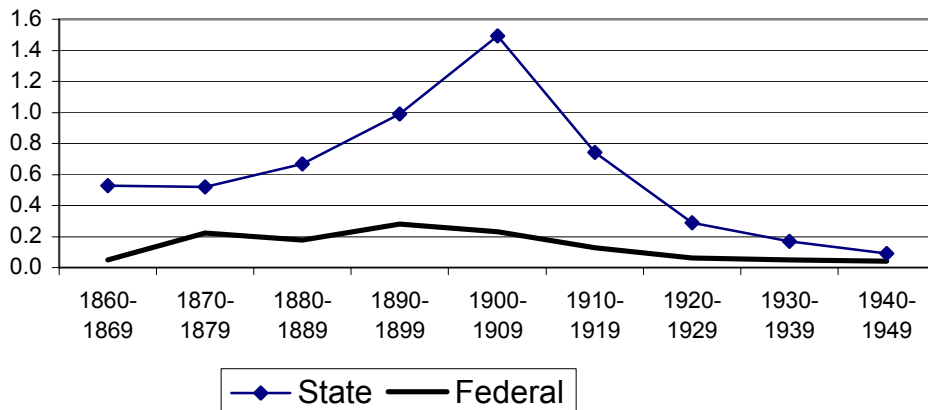
Notes and Sources: Lexis-Nexis. Usage reflects millions of passenger miles traveled, from the Historical Statistics of the United States, series Q274-312.

Figure 6
Telegraph: State and Federal Lawsuits, 1840-1950



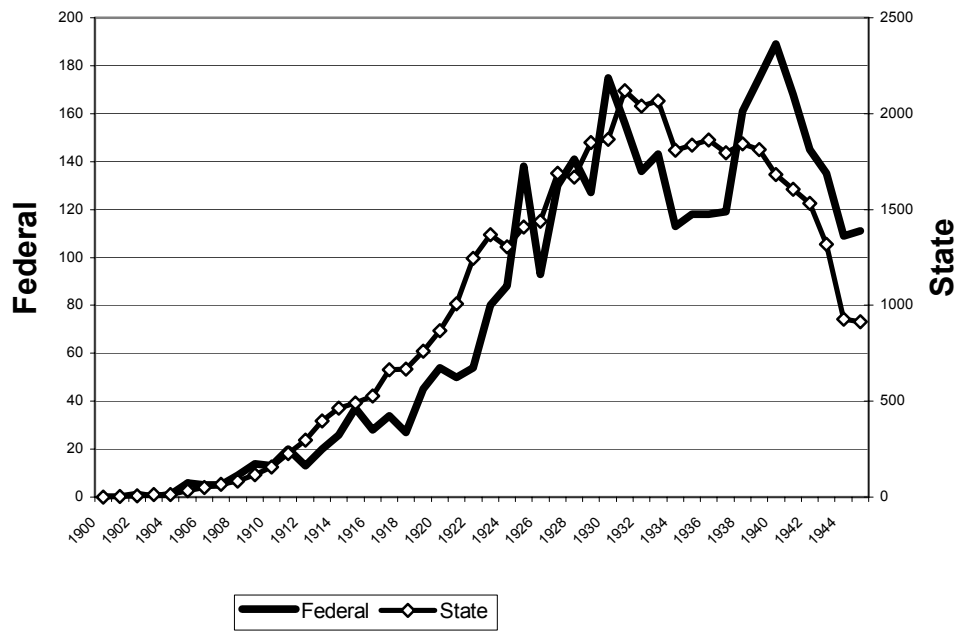
Sources: Lexis-Nexis; see above.

Figure 7
Telegraph: State and Federal Lawsuits relative to Usage, 1860-1950



Notes and Sources: Lexis-Nexis (see above). Usage data from Historical Statistics of the United States, millions of messages sent.

Figure 8
Automobiles: State and Federal Lawsuits, 1900-1945



Source: Lexis-Nexis database of state and federal reported cases.