

CHAPTER ONE
INTRODUCTION: INSTITUTIONS, INVENTIONS AND ECONOMIC GROWTH

"We showed the results of pure democracy upon the industry of men."
--Edward Riddle, "Report on the World's Exposition," 1851

Supreme Court Justice Joseph Story, whose brilliant decisions are enshrined in modern patent and copyright laws, exhorted an audience of ordinary mechanics in 1829: "Ask yourselves, what would be the result of one hundred thousand minds ... urged on by the daily motives of interest, to acquire new skill, or invent new improvements."¹ The answer was not long in coming, for the next few decades would lay the foundation for American industrial and cultural supremacy. Contemporary observers were dazzled by the rate of cumulative attainments, and it is worth recalling that since the days of canal-building the optimistic notion of a "new era" has persisted throughout American history.² At first, the British were dismissive of American efforts, and even declared it was unlikely that their former colony would ever progress beyond facile emulation of superior European technologies and culture. However, by the time of the Crystal Palace Exhibition in 1851, Europeans were surprised and alarmed to find that the United States was marshalling its resources in a way that promised to propel it to the first rank among nations. Numerous observers tried to uncover the reasons for the rapid trajectory in American development, and many explicitly pointed to the advantages of a democratic society for technical and cultural inventiveness.³

At the most general level, this book provides an historical perspective on similar questions that are being posed today regarding the relationship between institutions, inventions (broadly defined to include cultural goods) and economic growth. Speculations about the sources of growth have always been central to economic analysis. However, the focus, methods and policy recommendations of economic growth theorists have changed significantly within the past fifty years. Neoclassical models featured an accounting decomposition of traditional inputs in the production function, and interpreted the residual in terms of exogenous advances in technology.⁴ More recent contributions have modified conventional growth models to incorporate ideas, knowledge and endogenous technological change but there is a lack of empirical research on the topic.⁵ The approach to economic growth of the new

institutional economists underlines the importance of credible commitments on the part of the state, the need for an independent judiciary, and a transparent legal system that enforces contracts and private property rights. At the same time, an influential set of papers in the past decade echo the concerns of eighteenth-century social commentators. They attribute a critical role to fundamental, country-specific variables such as factor endowments, climate, and geography in determining the nature of institutions and the path of economic development.⁶

Another longstanding debate centers on the link between political institutions and economic outcomes. Democracy is defined in terms of widespread participatory political access or “voice,” and the ability of nonelites to alter the existing rules and standards, as well as in economic terms such as respect for private property rights and equality of opportunity.⁷ As such, democracy might be viewed as a “meta-institution” or a prerequisite for the formation of other appropriate institutions.⁸ Although it is conventional to propose a causal relationship between democracy and higher economic growth, a number of economic studies are more ambivalent.⁹ For instance, Robert Barro posited a nonlinear relationship, in which democratic institutions might reduce potential economic progress after a certain level of freedom had already existed.¹⁰ Stanley Engerman and Kenneth Sokoloff, the authors of an extensive project to explain differential growth paths in New World colonies, find that equality and democratic institutions are a function of a country’s factor endowments, broadly defined.¹¹ They caution against the notion that any particular set of institutions is a prerequisite for achieving growth. Moreover, empirical studies suggest that successful democracies are by nature dynamic: the inputs that democratic growth requires evolve over time. Some economic historians find that property rights and contract enforcement were important explanatory variables only up to the early part of the nineteenth century, whereas human capital formation was key after that period.¹² Flexibility is critical in this process, since the rules and standards that promote economic growth need to respond to such incentives for change as rapid technological progress. Moreover, an emerging consensus seems to suggest that, rather than one specific growth path, economic progress may require policies that are tailored to the particular needs of each

society. These different approaches all agree that technological change is fundamental to sustained economic development, but how and why such changes occur and succeed are less well understood. In short, the record on growth studies indicates the need for comparative institutional analyses, especially of the way in which specific rules and standards are revised and implemented, and their consequences over time.

This book sheds light on these issues for it considers the evolution of intellectual property institutions in the United States during the long nineteenth century. Such scholars as Douglass North have suggested that intellectual property systems had an important impact on the course of economic development. Appropriate institutions to promote creations in the material and intellectual sphere are especially critical because ideas and information are public goods that are characterized by nonrivalry and nonexclusion. Once the initial costs are incurred, ideas can be reproduced at zero marginal cost and it may be difficult to exclude others from their use. Thus, in a competitive market public goods may suffer from underprovision or may never be created because of a lack of incentive on the part of the original provider who bears the initial costs but may not be able to appropriate the benefits. Such market failure can be ameliorated in several ways, for instance through government provision, rewards or subsidies to original creators, private patronage, and through the creation of intellectual property rights..

Numerous economic studies have analyzed intellectual property rights from both a theoretical and empirical perspective. Patents and copyrights allow the initial producers a limited period during which they are able to benefit from a right of exclusion. If creativity is a function of expected profits, these grants to authors and inventors have the potential to increase social production possibilities at lower cost. Disclosure requirements promote diffusion, and the expiration of the temporary monopoly right ultimately adds to the public domain. Overall welfare is enhanced if the social benefits of diffusion outweigh the social costs of temporary exclusion. This period of exclusion may be costly for society, especially if future improvements are deterred, and if rent-seeking such as redistributive litigation results in wasted resources. Much attention has also been accorded to theoretical features of the optimal system,

including the breadth, longevity, and height of patent and copyright grants.¹³

However, strongly enforced rights do not always benefit the producers and owners of intellectual property rights, especially if there is a prospect of cumulative invention where follow-on inventors build on the first discovery. Thus, more nuanced models of patents and copyrights are ambivalent about the net welfare benefits of strong exclusive rights to inventions. Indeed, network models imply that the social welfare of even producers may gain from weak enforcement if more extensive use of the product increases the value to all users. Under these circumstances, the patent or copyright owner may benefit from the positive externalities created by piracy. In the absence of royalties, producers may appropriate returns through ancillary means, such as the sale of complementary items or improved reputation. In a variant of the durable-goods monopoly problem, it has been shown that piracy can theoretically increase the demand for products by ensuring that producers can credibly commit to uniform prices over time. Also in this vein, price and/or quality discrimination of non-private goods across pirates and legitimate users can result in net welfare benefits for society and for the individual firm. If the cost of imitation increases with quality, infringement can also benefit society if it causes firms to adopt a strategy of producing higher quality commodities.

Theoretical analyses of this nature have advanced our understanding in this area, but the mechanisms through which property rights and their enforcement are translated into outcomes are still unclear.¹⁴ Economic models necessarily fail to capture many complexities, such as the potential for greater corruption in the administration of alternatives to patents, the role of private property rights in conveying information and facilitating markets, and their value in reducing risk and uncertainty for independent inventors with few private resources. The analysis becomes even more complex when producers belong to different countries than consumers. Thus, despite the flurry of academic research on the economics of intellectual property, we have not progressed far beyond Fritz Machlup's declaration that our state of knowledge does not allow to us to either recommend the introduction or the removal of such systems.¹⁵ Existing studies leave a wide area of ambiguity about the causes and consequences of

institutional structures in general, and their evolution or innovation across time and region. This is especially true of copyrights, which are less amenable to empirical economic assessment than patents.

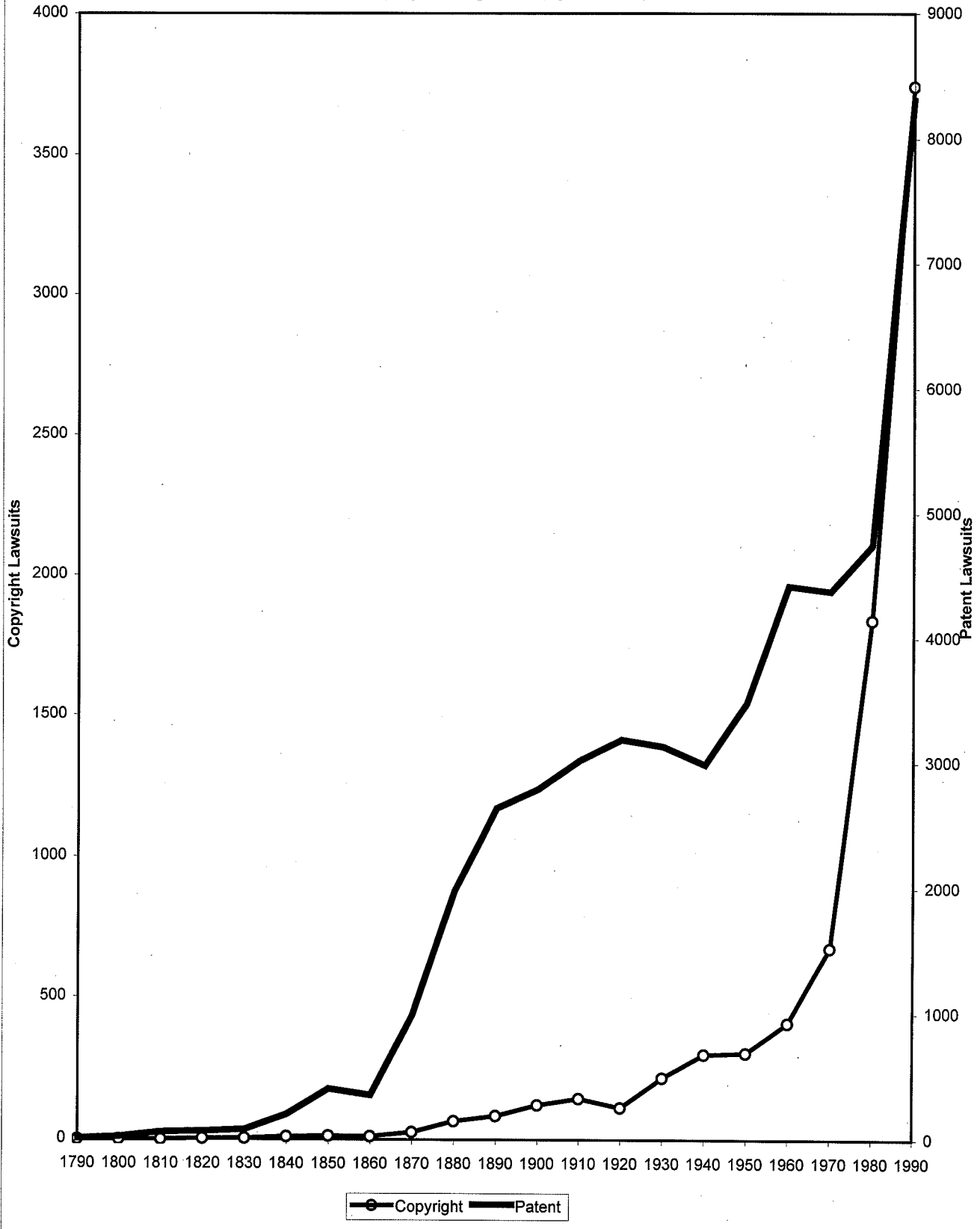
While it may be impossible to draw up a uniform and universally applicable blueprint for effective institutions, a detailed examination of the historical record can provide valuable information for understanding current issues and policies. It goes without saying that such an exercise must be conducted with due caution because the modern period is different from previous eras. The intellectual property system of the twenty first century encompasses new technologies and issues that range from the enforcement of rights to digital music in cyberspace, biodiversity and plant protection, the privatization of genetic information and resources, the patentability of software and business method patents, through public health and human rights concerns. Today, the ownership of intellectual property rights is concentrated among large corporations whereas their costs are distributed among millions of users, making it more likely that policy trade-offs will be resolved in favour of producers relative to consumers. This is especially true of developing countries, which are subject to political economic pressures and potential sanctions that are more compelling relative to the early nineteenth century. The majority of innovations originate from the largest industrial countries, and access to new technologies is even more unequally distributed both within and across nations. The costs of piracy for developing countries in the current period extend beyond incentives for innovation, to include the prospect that weak intellectual property rights might deter foreign direct investment and technology transfer.

A number of scholars are so impressed with technological advances in the twenty first century that they argue we have reached a critical juncture where we need completely new institutions.¹⁶ Such claims indicate a lack of historical insight. Although one readily grants the premise that the telegraph was not simply a “Victorian Internet,” this does not imply that the issues of the online era are entirely novel.¹⁷ In the realm of intellectual property, questions from four centuries ago are still current, ranging from whether patents and copyrights constitute optimal policies towards inventions, to the growing concerns of international political economy.¹⁸ Throughout their history, patent and copyright regimes have confronted and accommodated technological innovations that were no less significant and

contentious for their time. Controversies over the power of elites and their alignment to publishing interests, and the need for explicit mechanisms to protect the democratic public interest in learning, are coterminous with copyright itself. Our understanding of democratic processes would be enhanced by studies of the specific consequences of broadening economic opportunities to nonelites, a topic which dominated nineteenth century discourse about policies. An economist from the nineteenth century would have been equally familiar with considerations about whether uniformity in intellectual property rights across countries harmed or benefited global welfare, and whether piracy might be to the advantage of developing countries.¹⁹ Similarly, the link between trade and intellectual property rights that informs the TRIPS agreement was quite standard two centuries ago.

Figure 1 shows the patterns of intellectual property litigation in U.S. federal courts, and indicates a rapid increase in recent decades in conflicts regarding patents and (to an even greater extent) copyrights. This is not entirely surprising, given the growing importance of intangible assets both in terms of industrial and strategic value, but part of the rise is also due to greater uncertainty regarding fundamental features of the intellectual property system. These patterns signal that today a reassessment of patents and copyrights from an historical perspective is timely and warranted for a number of reasons. First, and most generally, an understanding of the intellectual property system allows us to investigate the role of democratic institutions, legal systems, markets and property rights in economic growth. Second, a number of analysts argue that the two centuries' old American system of intellectual property needs to be revised. In a country whose institutions must conform to the Constitution, such a revision should be based on a systematic knowledge of the origins of the existing system. Legal scholars argue that decisions are being made daily that contradict the Constitutional mandate and that landmark Supreme Court rulings manifest a great deal of confusion about the nature of the American intellectual property system. They contend that part of the loss of clarity is due to the capture of political fora by corporate interest groups that have reversed the historical balance of private rights and the public domain in their own favour. Moreover, harmonization of international laws has unsuccessfully melded diametrically

Patent and Copyright Litigation (by decade), 1790-2000



opposed principles from the American and European systems. Finally, the United States not only supports laws to protect and enforce patents and copyrights in this country, but also influences the policies of developing countries. Under these circumstances, historical insights from the period when the United States itself was a developing country, besides being valuable in themselves, seem to offer a useful perspective on contemporary controversies.

The United States today is the most powerful nation on earth but, as Stanley Engerman and Kenneth Sokoloff remind us, early in U.S. history its standard of living was lower than the level enjoyed by many of its contemporary South American and West Indian neighbours.²⁰ Even on the eve of the Declaration of Independence the United States was an undistinguished developing country with an agricultural economy and few pretensions to local cultural output of any distinction. How did this former colony make the transition from follower to a leading economy in the course of one century? According to many observers of the time, the answer could be found in its intellectual property system. This conclusion is obviously overstated, since American economic and social progress was a function of a number of other causal variables, including (among others) a relatively equal distribution of income, an educated and enterprising populace, and favourable factor endowments. Nevertheless, it is a question that is worth exploring further by considering the reinforcing relationships between intellectual property institutions, the legal system, markets, and democracy in America.

Summary of The Democratization of Invention

This book first of all examines American experience in a European mirror, and contrasts intellectual property institutions in Britain, France and the United States. European societies were organized in ways that concentrated power in the hands of elites and facilitated rent-seeking by favoured producers. Intellectual property systems were derived from the grant of “privileges” or monopoly rights from the Crown, and subsequent grants reflected their provenance. In Britain, after the reform of the more egregious abuses of monopoly grants, patents were regarded as “pernicious monopolies.” High

transactions and monetary costs, as well as the prevailing prejudices towards nonelites, combined to create barriers to entry that excluded the poor or relatively disadvantaged from making contributions to economic growth. For instance, patent fees in England were so costly that they effectively (and indeed, consciously) excluded working class inventors from patenting their discoveries. These institutions created a bias towards certain types of inventions and inventors that favoured capital intensive industries and unbalanced economic growth patterns.

At the same time, the system generated revenues to groups such as patent agents and administrators who had an incentive to block reforms. Consequently, despite their inefficiencies, patent rules and standards in England remained essentially unchanged for two centuries. A society that restricts access to elites can generate exceptional gains early on, but the initial spurt is unlikely to be sustained. These privileged groups would have little inducement to adopt techniques that infringed on their rents, and might have the power to suppress competing technologies. As long as their private benefits were enhanced by such a strategy, they might even have the ability and incentive to shift the growth path onto a lower trajectory. This book makes the argument that England and France initially benefited from protecting the private property rights of elite producers, but the social benefit of such protection was relatively short-lived, because the system failed to offer inducements for investments by all potential inventors regardless of their background.

In contrast, a belief in the ability of democracy and technology to enhance the common good uniquely defined American society since the founding of the Republic.²¹ To the men who gathered in Philadelphia to “promote the general Welfare,” it was self-evident that ideas, industrial and cultural inventions, and democratic values were integrally related.²² American democratic institutions would ensure that rewards accrued to the deserving based on productivity rather than on the arbitrary basis of class, patronage or privilege. Consequently, the intellectual property clause was included in the very first Article of the U.S. Constitution, a document that distilled the precepts of a democratic society. The proposal passed without any debate and with unanimous approval, because it was viewed as a

prerequisite for progress.²³ The growth of science and literature in tandem with broad-based access to an intellectual property system was even declared to be “essential to the preservation of a free Constitution.”²⁴ Congress was given the mandate 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.”²⁵ Instead of adhering to the European model, the United States consciously created patent and copyright institutions which were unique to this country. Scientific American would later proclaim that the United States advanced “not because we are by nature more inventive than other men – every nationality becomes inventive the moment it comes under our laws – but because the poorest man here can patent his devices ... In the aggregate the little things – which in England or on the continent either could not be or would not be patented, owing to the excessive cost of the papers or other onerous conditions – probably add more to the wealth and wellbeing of the community, and more to the personal income of the inventor, than the great things do.”²⁶

According to Douglass North, “the most interesting challenge to the economic historian is to account for changes in the structure and enforcement of property rights over time.”²⁷ One way in which to do so is through the analysis of legal records, and I assess extensive samples of patent and copyright lawsuits. 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. The economic history of intellectual property laws and their enforcement leads to the inevitable conclusion that the federal judiciary and the U.S. legal system played a central role in facilitating social and economic progress during the nineteenth century. In other work I examined several thousand suits at common law that dealt with major innovations including canals, railroads, the telegraph, automobiles and medical technologies.²⁸ Those records likewise support the finding reported here that the judiciary objectively weighed costs and benefits, and ultimately the decisions that prevailed promoted social welfare rather than the interests of any single group. This is not to say that every judge was of the caliber of Joseph

Story or Benjamin Cardozo, but a system of appeals assured that “the tide rises and falls, but the sands of error crumble.”²⁹ There was little support for the notion that judges subsidized economic development by transferring resources from the working class to corporations.³⁰ Effective policies towards innovations required a social calculus that was far more subtle than a blind 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, while open and accessible institutions proved to be sufficiently flexible to encompass these changes. In short, since the founding of the Republic, legal institutions altered as the scale and scope of market and society evolved, but the central policy objective of promoting the public interest remained the same. That is, after all, one of the chief virtues of a society that is bound and enabled by prescient Constitutional principles.

Unlike England, where the Crown reserved the right to expropriate patent property, in the United States even federal government claims could not trump the “supreme law of the land.” American judges understood that the most effective means to counter oligarchic tendencies was through secure private property rights and market competition. The legal system comprised a decentralized method of mediation that was continuously calibrated to the changes that affected society, technological or otherwise. A century before the introduction of formal antitrust laws, judges in the courts of equity and the Supreme Court attempted to resolve the paradox of promoting inventive rights without suppressing economic progress through the defense of monopolies. The early judicial optimism about the coincidence between private and public welfare waned somewhat by the second half of the century, as equity courts mediated the efforts of patentees to protect national monopolies. Courts also responded to changes in the nature and organization of technology, through legal innovations regarding the rights of employers, and the degree of inventive inputs that patent grants required, among others. In so doing, the central principle of favouring true inventors as public beneficiaries remained unchanged.

It is a standard libertarian claim that free markets evolve in tandem with democratic principles. However, the link between markets and democracy is often made in terms of consumer sovereignty or the

freedom to choose among competing offers. My analysis emphasizes the role that patents and copyrights play in the securitization of ideas through the creation of tradeable assets: intellectual property rights facilitated market exchange, a process which assigns value, helps to mobilize capital, and improves the allocation of resources. It is worth emphasizing that the market orientation of the American intellectual property system aided the democratization of invention because it enhanced the opportunities of nonelite inventors. Access to markets and trade in inventions led to greater specialization and division of labour among inventors, and furthered the diffusion of new technologies. Extensive markets in patent rights allowed inventors to extract returns from their activities through licensing and assigning or selling their rights. The ability to transform their human inventive capital into tradeable assets disproportionately helped inventors from disadvantaged backgrounds who lacked the financial resources or contacts that would have allowed them to extract returns by commercializing their inventions on their own.

One of the most striking innovations of the framers of the American Constitution was their recognition of the value of contributions from the less exceptional, so the extension of intellectual property rights to ordinary citizens was not haphazard. Alexis de Tocqueville, still the shrewdest observer of the American national character, argued that "You may be sure that the more a nation is democratic, enlightened, and free, the greater will be the number of these interested promoters of scientific genius, and the more will discoveries immediately applicable to productive industry confer gain, fame, and even power on their authors. For in democracies the working class take a part in public affairs; and public honours as well as pecuniary remuneration may be awarded to those who deserve them."³¹ The creators of supposedly "heroic inventions" were lauded in the European nations; inventors and innovators of all classes were universally celebrated in the United States. Indeed, according to Thomas Jefferson, "a smaller [invention], applicable to our daily concerns, is infinitely more valuable than the greatest which can be used only for great objects. For these interest the few alone, the former the many."³²

American conceptions of Utopia, such as Edward Bellamy's Looking Backward, were coloured by rosy visions in which technological innovations conjured up a benign world of plenty that allowed the

attainment of the highest social and political ideals. The belief in the power of technology and industry to serve the many was not unmixed, as we know from the conflicts between Thomas Jefferson and Alexander Hamilton. However, the early Jeffersonian fear of the negative consequences of monopolies and industrialization was soon lost in the optimistic conviction that democracy was a crucible that would convert the resources of man and nature into wealth for everyone in the nation, and not just an arbitrary few. Ultimately, the intellectual property system would have to incorporate the more complex idea that it was necessary to construct a system that induced patentees and copyright holders to contribute to social welfare, but at the same time did not create undue obstacles to the diffusion of their creations, nor to the accumulation of products that built on their pioneering contributions.³³

The American system of intellectual property was based on the conviction that individual effort was stimulated by higher expected returns. Abraham Lincoln – who was himself a patentee – declared that the rate and direction of inventive activity were determined by “the fuel of interest.” “Genius” was redefined as the province of the many, not the rare gift of the few, and only wanted the assurance that the inventor would be able to benefit from his investments. The patent system exemplified one of the most democratic institutions in early American society, offering secure property rights to true inventors, regardless of age, colour, marital status, gender or economic standing. Who were the individuals contributing to the transformation of technology and society in the United States during this critical period, and what induced them to redirect their attention to creating additions to the existing stock of useful knowledge? The patterns of patenting, when linked to biographical information, show that the expansion of markets and profit opportunities stimulated increases in inventive activity by attracting wider participation from relatively ordinary individuals. The technical skills and knowledge required for effective invention during this era were widely diffused among the general population. Rather than an elite who possessed rare technical skills or commanded large stocks of resources, the rise in patenting was associated with a democratic broadening of the ranks of patentees to include individuals, occupations and geographic districts with little previous experience in invention. One finds among the

roster of patentees not only engineers and machinists, but also candidates for the Greenback Party, school teachers, poets, humble factory workers, housewives, farmhands, teenagers, and even economists.

American democracy, it is sometimes proposed, benefited men at the expense of women, and many women – especially those who lived in rural areas – were excluded from the mainstream of economic progress. The patent records that I collated obviously do not capture all of the inventions that exist, but they do demonstrate that nineteenth-century women were active participants in the market for technology. The diffusion of household innovations in both rural and urban regions were more pervasive than previously thought. Patents by women comprised only a small fraction of total patents, but the overall patterns of patenting and the pursuit of profit opportunities by women inventors were similar to male inventors. A notable departure from the parallels between male and female patenting was manifested in the higher fraction of rural women who obtained patents, relative to the patterns for men. Women in frontier regions were especially inventive, and devised ingenious mechanisms to ease the burden of an arduous existence far from the conveniences of cities and extended social networks. However, even if patent rights were well-protected by the federal courts, state laws also influenced the ability to benefit from innovations. For much of the nineteenth century married women lobbied for reforms in state laws that prohibited or hindered their capacity to hold property, engage in contracts and keep their earnings. I find that legal reforms in married women’s property rights encouraged women to increase their investments in patenting. The barriers to individual initiative that state legislatures initially placed in this and other contexts illustrates the wisdom of maintaining enforcement of intellectual property rights at the federal level.

The democratization model presented so far highlights the cumulative effect of ordinary patentees attempting to profit in the marketplace from incremental improvements to existing technologies, in a manner that supports the predictions of endogenous growth theory. Some scholars argue that these nonspecialized inventors merely created trivial “microinventions” that had little impact on total value or on economic growth.³⁴ They reject the idea that important “macroinventions” were induced by the prospect of economic returns, and contend that important inventions were either

exogenous, or else related to supply factors such as the number of technically educated individuals.

Kenneth Sokoloff and I co-authored several studies based on biographies of “great inventors” to examine such issues, the results of which were also consistent with endogenous growth models. We found that the experience of the “great inventors” dispelled several “myths of invention.” The overwhelming majority of great inventors were also patentees, and most of them had little or no formal schooling. The occupations of great inventors were similar to those of ordinary patentees, since the majority were artisans, manufacturers, farmers, and others whose jobs did not require technical skills. Indeed, one of the most striking features of the records for the great inventors is how similar their characteristics and patterns of patenting were to those of ordinary patentees.

The early twentieth century is usually characterized as the age of professional, science-based invention conducted by teams in research laboratories. Indeed, during this period college education and connections to capital through corporate ties became more important, but independent inventors from more modest backgrounds were still able to exploit and benefit from the market for invention. At least up to the time of the Second Industrial Revolution, such relatively uneducated inventors or those from rural areas were no less likely to produce valuable inventions. The Second Industrial Revolution was a transitional period that hinted at the changes to come in the nature and organization of technology, but even in the 1920s American technology reflected the open access highlighted here. For all classes of inventors in the “long nineteenth century,” technological progress in the United States involved a process of democratization in response to increases in expected benefits when markets expanded. In sum, the American patent system was a key institution in the progress of economy and technology, and it also stood out as a conduit for creativity and achievement among otherwise disadvantaged groups.

The U.S. patent system was acknowledged to be the most advanced in the world, and other countries drew causal connections between American achievements and its protection of inventive activity through patent property rights. Sir William Thomson, a British inventor and scientist, attended the 1876 Centennial Exhibition in Philadelphia, which featured displays for Bell’s telephone, the

Westinghouse airbrake, Edison's improved telegraph, sewing machines, refrigerator cars and numerous other patented discoveries. He stated, "I was much struck with the prevalence of patented inventions in the Exhibition: it seemed to me that every good thing deserving a patent was patented ... If Europe does not amend its patent laws ... America will speedily become the nursery of useful inventions for the world."³⁵ Even the Swiss Commissioner to the Philadelphia Exhibition, Edward Bally (a noted shoe manufacturer), urged his own countrymen to introduce a patent system in order to counter the finding that "American industry has taken a lead which in a few years may cause Europe to feel its consequences in a very marked degree."³⁶ Towards the end of the nineteenth century Japan reorganized its patent system after a special commission visited the U.S. Patent Office in 1886. According to the Japanese envoy, Assistant Secretary of State Korehiyo Takahashi, they wished to discover "What is it that makes the United States such a great nation?" and we investigated and we found it was patents, and we will have patents."³⁷

However much they praised and emulated the patent policies of the United States, other countries (as well as many American citizens) failed to understand the rationale for its copyright policies. The intellectual property clause of the U.S. Constitution was the common source of both patent and copyright policies; and the same individuals were responsible for their formulation and implementation. Yet, American copyright policies provided a marked contrast to the procedures comprising the patent system. I contend that copyrights differed from patents precisely because the objective of both systems was the attempt to "promote the general Welfare." Despite the rhetoric that drew on the phrases from eighteenth century philosophy, U.S. rules and standards were not based on esoteric ideas of inherent rights of personhood nor creativity, but rather on purely pragmatic and utilitarian grounds that weighed costs and benefits. These costs and benefits differed across technical inventions ("the useful arts") and cultural goods ("science"), and also altered over time. The design of the intellectual property system, and subsequent revisions, comprised an endogenous selection of features that would best fulfill the primary objective of furthering the common good for all citizens of the United States.

Calibration of different institutional inputs to achieve these ends resulted in significant policy variation across patents and copyrights, assignees and licensees, citizens and noncitizens, as well as producers, competitors and consumers. Society benefited on net from the creation and commercialization of additions to the useful arts that were induced by profit incentives, despite the temporary inhibitions on diffusion, higher prices during the term of the patent, and the potential effects on cumulative inventions. Thus, to a large extent, the objectives of policy-makers and the legitimate aims of patentees coincided. In the case of copyrights, the trade-offs were regarded with greater concern, for three primary reasons. First, many copyrighted items such as academic research or religious tracts would be produced even in the absence of financial incentives because their producers could benefit from ancillary returns such as enhanced reputations or greater demand for complementary goods. Second, the risk of unwarranted monopolies (that appropriated what belonged to public and made it private and exclusive) was higher, because cultural goods incorporated ideas that belonged to the public domain in ways that made it difficult to distinguish between the contributions of the author and those of society in general. Third, and most important, the enforcement of copyright had much more serious implications for a democratic society. Restrictions on free diffusion could result in significant social costs in terms of learning, education and free speech, in ways that promised to bolster and perpetuate the narrow redistributive claims of elites and interest groups.

It is therefore not surprising that patents were treated differently from copyrights, nor that U.S. copyright policies departed radically from European policies. Both of these distinctions have been true from the earliest statute in 1790 through to the present day. As with patents, the syntax of American copyright laws echoed that of the English statutes, but the structure of the U.S. copyright system was again unique to the world. As Senator John Ruggles explained, “inventors and authors stand on somewhat different ground.” He noted that strong copyrights had important negative implications for the diffusion of useful knowledge “on which depends so essentially the preservation and support of our free institutions.”³⁸ However, patentees needed greater encouragement to create new inventions and also to

commercialize them into valuable products. The first copyright statute granted protection to both authors and “proprietors” for the instrumental purpose of learning whereas only the true inventor could claim patent rights. Similarly, for much of the nineteenth century work for hire doctrines led to weak employee rights in the case of copyrights, but not in the case of patents. Copyrights were administered in a registration system, but patents through an examination system. Compulsory licences and unauthorized use of patent rights were prohibited, whereas “fair use” doctrines allowed free access to copyrighted materials if such access did not significantly reduce the author’s returns.

American intellectual property policies contrasted with those from the European continent because the utilitarian orientation of a democracy supported a patent system that offered strong protections to inventors, but required much weaker copyrights. The rhetoric of copyright in oligarchic European societies increasingly centered about the creative individual, and their “natural rights.” Publishers in both France and Britain lobbied heavily for so-called author’s rights, because these rights paradoxically redistributed income to publishing interests to a greater extent than to authors. Natural rights expanded in scope until they were enshrined in the international Berne Convention in the form of “moral rights.” In contrast, U.S. copyright policies ignored natural rights arguments, and focussed in a pragmatic fashion on the requirements of a developing society based on democratic principles. Although they were concerned with security of property rights, their major objective was not to benefit publishing companies but on the creation and dissemination of information: by rejecting the notion of copyright as an inherent and absolute right of creativity, the benefits to a privileged few were circumscribed in order to protect the public domain and to promote the interests of the community in lower costs of learning.

Like other forms of intellectual property laws, the copyright system evolved to encompass improvements in technology and changes in the marketplace. 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”

including the stock ticker and the telegraph. Even the preliminary decision about whether these technologies fell under the subject matter to be protected by the law created deep conflicts which were complicated by Constitutional questions about freedom of speech and democracy. Copyright comprised a pervasive right against society, so judges attempted to resolve copyright disputes in ways that reduced spillovers. Thus, legal innovations expanded beyond traditional copyright doctrines to noncopyright holdings such as unfair competition, trade secrets, and the right to privacy. These legal substitutes maintained bilateral rights without imposing undue costs on society.

One of the most dramatic proofs of the infusion of cost-benefit analysis in early U.S. intellectual property policy appears in the treatment of international patent rights and international copyrights. 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 that aimed to strengthen the rights of patentees. As a German judge at the Philadelphia exhibition in 1876 pointed out, "the United States of America already outstripped most of the older nations, except in matters of art, and as art required time, America would eventually not be behind other nations even in that."³⁹ Although they excelled at pragmatic contrivances, nineteenth-century Americans were advisedly less sanguine about their efforts in the realm of music, art, literature and drama, and this country 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. Until 1891 American policies deemed the works of foreign citizens to be in the public domain because legislators warned that reforms would not benefit the United States, and the net effects "would be, for us, on the wrong side of the ledger (sic)." I assess the costs and benefits of copyright piracy and find that Americans likely profited from acting as "continental Brigands," so it is hardly surprising that a century of lobbying only resulted in a succession of failed legislative proposals. It was only when the balance of trade in cultural goods was more favourable to the United States that an international copyright law was finally

passed. This policy was a marked departure from the evolution of international copyright grants in Europe, which early on accorded national treatment to all countries. The significant differences in international patent and copyright laws highlight the extent to which American intellectual property policies were endogenously market-oriented.

The finding that policies towards patents and copyrights to a large extent conformed with economic conceptions does not imply that outcomes are or will be optimal. The American Jurist in 1833 warned that a representative democracy gives rise to the danger of “infractions of the constitution by those who have temporary objects or their own personal aggrandisement in view.”⁴⁰ The history of copyright illustrates the dangers inherent in a system based on decentralization and democratic choice, whereby institutions can be subverted into redistributing wealth and power to a few rather than serving the common good. Copyright decisions illustrate how adjudication by analogy economized on legal inputs, and how judges introduced innovations in their interpretation of the law in order to “promote the progress of science,” but they also reveal the extent to which judge-made policies were constrained by the statutes. 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. Thus the resolution of copyright conflicts drew upon the key institutions of courts, markets and the legislature, which ideally were intended to provide a system of checks and balances. That balance was initially effective because all parties deferred to the Constitution, but it also highlighted the potential for harm to the public domain if the legislature were captured by interest groups. Those dangers and infractions were always latent and have now become apparent in American legislation, since copyright doctrine is largely formulated by negotiations among industry representatives. For instance, ever since the eighteenth century, publishers have lobbied to gain copyrights in perpetuity, but they were continually defeated by defenders of the public domain including the judiciary in both Britain and America. In 2003 the Supreme Court of the United States allowed Congress to grant a virtually perpetual copyright in defiance of the Constitution’s stipulation that such

grants should only be “for limited Times.” The majority seemed to acknowledge the validity of the economic arguments cited in Justice Breyer’s dissent, but dismissed them with the declaration that “it is doubtful, however, that those architects of our Nation ... thought in terms of the calculator.”⁴¹

Other sceptics no doubt would also question the validity of an economic interpretation of the history intellectual property, or the notion that early American institutions were deliberately designed to increase social welfare and varied to accommodate changes in external circumstances in accordance with this objective. This book adopts a cliometric approach because quantitative economic history serves to reject the view of history as simply a Rorschach blot for one’s previous convictions. The cliometric approach helps us to formulate testable hypotheses that can lead to the rejection of untenable claims that are inconsistent with the evidence. If the architects of our Nation did not think in terms of the calculator, then we should expect to find policies and outcomes that were inconsistent with economic predictions; inefficient rulings would be reflected in the common law in the form of surges in disputes and litigation; key policy statements that weigh costs and benefits such as those of John Ruggles would be atypical; and comparisons within and across countries would yield few systematic patterns.

Instead, this books finds that the rapid expansion of markets and national wealth in the United States during the long nineteenth century was supported by institutions and policies that were designed and interpreted in ways that favoured economic growth. First, economic development and technological change in the nineteenth century were based on the democratic belief that everyone, regardless of social status or economic standing, could make a valuable contribution to social welfare. Second, policy reflected the view that institutions mattered -- indeed, institutions in the United States were carefully calibrated to promote social and economic welfare – and that appropriate rules and standards towards the protection of intellectual property were especially important in achieving these ends. Third, it was felt that individuals would be best induced to contribute to material progress if offered the opportunity to appropriate returns from their efforts through secure private property rights in their intangible assets. Fourth, in order to achieve democratic ends patent rights were strongly enforced whereas the copyright

grant was weaker and more hedged about with restrictions. Fifth, flexible and effective legal institutions played a key role in accommodating and facilitating the radical transformations that industrialization and technological change brought. Finally, the conviction that American democracy should value the contributions of ordinary citizens led to the conclusion that commercialization and improvements in social welfare were best achieved through the decentralized mediation of markets rather than through allocations that were based on the values and actions of elites or bureaucrats. In sum, American institutions during the nineteenth century created an ambience that encouraged the participation of a broad spectrum of the population, and succeeded in motivating relatively ordinary men and women to dramatically expand the existing stock of knowledge in science and literature. Patent and copyright institutions played a central role in ensuring that social and economic development were characterized by a process of “democratization.”

This book should be of interest to economists, historians, legal scholars, and students of technology. The discussion draws on original data sets compiled from an array of sources including patent records, city directories, manuscript censuses, assignment contracts, lawsuits and legal treatises, the book trade, and copyright filings. However, readers who do not share the economic historian’s fascination with data can simply ignore the tables and read the text without losing track of the general arguments. The first section discusses the economic history of patent institutions and analyzes variation in patterns of patenting. Although there are well-rehearsed reasons why one should be careful to avoid equating patents with inventive activity, there are just as well-rehearsed reasons why patent data can provide valuable insights into technological creativity, as I hope the following chapters will show.⁴² Chapter Two compares the evolution of patent systems in Britain, France and the United States. Chapter Three outlines changes in the laws toward patents and their enforcement in the United States. The notion of the democratization of invention, or the involvement of a broad spectrum of the population, is introduced in Chapter Four and extended to the discussion of women inventors in Chapters Five and Six. Great inventors and their patenting (Chapter Seven) underlines the extent to which even important

inventions were generated through a process of democratization. The next section (Chapters Eight and Nine) considers invention from the perspective of property rights in cultural goods. This section highlights the evolution of copyright institutions, the relationship between copyright and technology, and the effects of American international copyright piracy on economic and social welfare. Chapter Ten concludes with a review of the experiences of “follower countries” in the nineteenth century, and briefly discusses a number of central issues regarding intellectual property and economic development in the twenty first century.

ENDNOTES

1. Reported in American Jurist and Law Magazine, vol. 1 (1829).
2. Writing at the start of the year of 1844, Commissioner Ellsworth marvelled that "The advancement of the arts, from year to year, taxes our credulity, and seems to presage the arrival of that period when human improvement must end." Report of the Commissioner of Patents for 1843, 28th Congress, 1st Session, [Senate] [150]February 13, 1844.
3. For instance, see The American System of Manufactures:the report of the Committee on the Machinery of the United States 1855, and the special reports of George Wallis and Joseph Whitworth 1854, (ed) Nathan Rosenberg, pp. 388-9. Edinburgh, Edinburgh U.P., 1969. They noted the favourable attitudes of American workers towards new improvements, in marked contrast to the sullen disapproval of the British working class. These commentators tried to find the causes for the pervasive inventiveness and pointed to the beneficial influence of laws in the United States, the widespread education and literacy that characterized ordinary citizens. An American observer of the Exhibition similarly declared that the items produced and displayed by the United States contingent provided "evidence of the ingenuity, industry and capacity of a free and educated people ... We demonstrated the progressiveness of the human mind when in enjoyment of liberty." Edward Riddle, "Report on the World's Exposition," Report of the Commissioner of Patents for the Year 1851, Washington, DC, 1852: 347-485. This is also the source of the epigraph to this chapter.
4. For a general discussion, see Robert J. Barro and Xavier Sala-i-Martin, Economic Growth, Cambridge, Mass.: MIT Press (1998).
5. For instance, see Phillippe Aghion and Peter Howitt, Endogenous Growth Theory, Cambridge, Mass.: MIT Press (1998); and Paul Romer, "Endogenous Technological Change," Journal of Political Economy, vol. 98 (October) 1990: S71-102.
6. For an excellent overview, see Stanley L. Engerman and Kenneth L. Sokoloff, "Institutional and Non-Institutional Explanations of Economic Differences," NBER Working Paper 9989 (2003).
7. Peter H. Lindert's, "Voice and Growth: Was Churchill Right?" (JEH, 63 (2), June 2003: 315-50) argues that "Using too little historical information, and mistaking formal democratic rules for true voice, has understated the gains from spreading political voice more equally."
8. See Dani Rodrik, "Institutions for High-Quality Growth: What They are and How to Acquire Them," NBER Working Paper no. w7540 (Feb. 2000).
9. Relative to authoritarian regimes, some have argued that democracies may raise the costs of achieving a given level of future output: they may increase the propensity to consume and support other inefficient or short-sighted policies such as protectionism, foster ethnic conflicts, reduce the responsiveness to external crises, and redistribute income from producers to consumers. Adam Przeworski and Fernando Limongi ("Political Regimes and Economic Growth," Journal of Economic Perspectives, Vol. 7, No. 3. (Summer, 1993), pp. 51-69) survey empirical studies of this subject, most of which were "seriously flawed." They conclude that economic models of democracy are a "house of cards" (p. 10) and "we do not know whether democracy fosters or hinders economic growth" (p. 15).
10. Robert J. Barro, Determinants of Economic Growth: A Cross-Country Empirical Study. Cambridge, Mass.: MIT Press, 1997.

11. These authors have produced a significant number of insightful studies on this subject, including Stanley L. Engerman and Kenneth L. Sokoloff, "Factor Endowments, Inequality and Paths of Development Among New World Economies," Economia vol. 3 (Fall) 2002: 41-109; and "The Evolution of Suffrage Institutions in the Americas." NBER Working Paper 8512 (2001)..

12. See Peter H. Lindert, "Voice and Growth: Was Churchill Right?" JEH, 63 (2), June 2003: 315-50.

13. Breadth refers to the amount of related claims that are secured by the patent or copyright. Novelty requirements or "height" protects the rights holder against attempts to invent around their claim, or against minor improvements that might compete with the initial grant. The length indicates the life or term of the property right. There is some degree of substitutability across these different elements in attaining the same value for the property right. See Nancy T. Gallini, "The Economics of Patents: Lessons from Recent U.S. Patent Reform," Journal of Economic Perspectives, vol. 16 (2) 2002:131-154; Richard Gilbert and Carl Shapiro, "Optimal Patent Length and Breadth," RAND Journal of Economics, vol. 21 (Spring) 1990: 106-112; and Theon Van Dijk, "Patent Height and Competition in Product Improvements," in Journal of Industrial Economics, vol. 44 (2) June 1996: 151-167. Michael A. Heller and Rebecca.S. Eisenberg "Can Patents Deter Innovations? The Anticommons in Biomedical Research." Science, vol. 280 (May) 1998: 698-701, caution against the problem of patent thickets that potentially block innovation.

14. "The failure to develop systematic property rights in innovation up until fairly modern times was a major source of the slow pace of technological change," p. 164, Douglass C. North, Structure and Change in Economic History, New York: W. W. Norton (1981); as well as North and Robert P. Thomas, The Rise of the Western World, Cambridge: Cambridge University Press (1973).

15. Fritz Machlup, An Economic Review of the Patent System. Study of the Subcommittee on Patents, Trademarks, and Copyrights of the Committee on the Judiciary, U.S. Senate, study no. 15. US Government Printing Office, Washington DC, 1958, p.80: "If we did not have a patent system, it would be irresponsible, on the basis of our present knowledge of its economic consequences, to recommend instituting one. But since we have had a patent system for a long time, it would be irresponsible, on the basis of our present knowledge, to recommend abolishing it." See also Edith Penrose, The Economics of the International Patent System, Baltimore: John Hopkins University Press, 1951.

16. See, for instance, David R. Johnson and David Post, "Law and Borders - The Rise of Law in Cyberspace," 48 Stan. L. Rev. 1367, May, 1996. John Perry Barlow argues that "We will need to develop an entirely new set of methods as befits this entirely new set of circumstances," in "Selling Wine without Bottles: The Economy of Mind on the Global Net," p. 10 in P. Ludlow, High Noon on the Electronic Frontier: Conceptual Issues in Cyberspace, Cambridge, Mass.: MIT Press (1996).

17. An entertaining book by Tom Standage, The Victorian Internet, London: Weidenfeld & Nicolson (1998), claims that the telegraph industry in the nineteenth century comprised "online pioneers."

18. See Brian Wright, "The Economics of Invention Incentives: Patents, Prizes, and Incentive Contracts." American Economic Review vol. 73 (1983): 691-707; and Steven Shavell and Tanguy van Ypersele "Rewards versus Intellectual Property Rights," Journal of Law & Economics, Vol. 44, No. 2, October 2001. A number of scholars have made a "case against intellectual property," such as Michele Boldrin and David K. Levine, "The Case Against Intellectual Property," CEPR Discussion Paper No. 3273, March 2002. However, even critics of patents and copyrights express concerns that such rights might be superseded by private contracting that has the potential to bypass Constitutional oversight and the balancing of costs and benefits that protects social interests.

19. Several studies of harmonization conclude that uniformity in intellectual property laws can “either enhance or reduce global welfare.” See, for instance, Suzanne Scotchmer, “The Political Economy of Intellectual Property Treaties,” NBER Working Paper No. w9114 (August 2002)

20. Stanley Engerman and Kenneth Sokoloff, “Factor Endowments, Institutions and Differential Paths of Growth among New World Economies,” in Stephen Haber (ed), How Latin America Fell Behind, Palo Alto: Stanford University Press, 1997.

21. According to the American Jurist (vol. 10, 1833, p. 121), “no government of magnitude or power, whether free or arbitrary, has hitherto been sustained without the help of the distinction of classes.” Democracy is a concept that is easily recognizable in its entirety but more contentious in the details, which can be as subtle as they are multifarious. This is not a treatise in political philosophy, so I will adopt the Alice in Wonderland approach, and merely specify a list of features that indicate what I mean by the term. Democracy entails the protection of private property, freedom of choice and speech, equality of opportunity and equal access to political and economic institutions and their benefits (but not necessarily equality of outcome), an independent judiciary that protects the rule of law, an elected government that represents the majority of the population, a system of checks and balances to prevent subversion or capture by a self-interested minority, and flexible institutions that respond to changes in social costs and benefits.

22. A common view in the eighteenth century held “That it is impossible for the arts and sciences to arise, at first, among any people unless that people enjoy the blessing of a free government... The first growth, therefore, of the arts and sciences can never be expected in despotic governments.” [“Of the Rise and Progress of the Arts and Sciences” Volume two of David Hume's Essays, Moral and Political (1742).]

23. George Washington’s First Annual speech to Congress on January 8, 1790 in Federal Hall, New York City, stated “The advancement of agriculture, commerce, and manufactures, by all proper means, will not, I trust, need recommendation; but I cannot forbear intimating to you the expediency of giving effectual encouragement as well to the introduction of new and useful inventions from abroad, as to the exertions of skill and genius in producing them at home; Nor am I less persuaded, that you will agree with me in opinion, that there is nothing which can better deserve your patronage, than the promotion of science and literature. Knowledge is in every country the surest basis of publick happiness. In one, in which the measures of government receive their impressions so immediately from the sense of the community, as in ours, it is proportionably essential.”

24. “Literature and Science are essential to the preservation of a free Constitution: the measures of Government should, therefore, be calculated to strengthen the confidence that is due to that important truth,” U.S. Senate Journal, 1st Cong. 8-10 (1790); U.S. Annals of Congress, 1st. Cong. 935-36; cited in Bruce W. Bugbee, p. 137, Genesis of American Patent and Copyright Law, Wash., D.C., Public Affairs Press (1967).

25. U.S. Constitution, Art. I, § 8, cl. 8.

26. Scientific American, Oct. 21, 1876, vol. 35 (17), p. 256.

27. Douglass C. North, p. 250, “A Framework for Analyzing the State in Economic History,” EEH vol. 16 (3): 249-59.

28.B. Zorina Khan, “Innovations in Law and Technology, 1790-1920,” in Cambridge History of Law in America, (eds) Michael Grossberg and Christopher Tomlins, Cambridge: Cambridge University Press

(forthcoming 2005).

29. Benjamin Cardozo, The Nature of the Judicial Process, New Haven: Yale University Press, [c1921], p. 177.

30. According to Morton Horowitz's influential book, The Transformation of American Law, 1780-1860, Cambridge, MA: Harvard University Press (1977), (p. 101) judicial decisions were biased in favour of industrialists and were able to "dramatically ... throw the burden of economic development on the weakest and least active elements of the population."

31. Alexis de Tocqueville, Democracy in America, trans. by Henry Reeve (2 vols., London, 1889), II, 35-42.

32. From a letter Jefferson sent to George Fleming in 1815, excerpt from The Jeffersonian Encyclopedia, <http://etext.lib.virginia.edu>.

33. See for instance the testimonies before Congress when patentees applied for extensions to their existing patent term. As the editors of Scientific American noted, "special acts of Congress in extending patents often do injury to inventors in general; they also tend to retard the progress of invention, and for this reason we oppose the extension of patents by Congress, in cases where patentees have been sufficiently remunerated. One patentee, under a democratic government like ours, has no more right to special privileges than another...." Scientific American, 21 January vol. 9 (19) 1854, p 149.

34. The concepts of microinventions and macroinventions appear in Joel Mokyr, The Lever of Riches: Technological Creativity and Economic Progress, New York: Oxford University Press (1990).

35. Scientific American, Oct. 21, 1876, vol. 35 (17), p. 256.

36. "Another factor which favors the education of the people (of the United States) is the excellent system of patents, by means of which, at a very moderate expense, a patent is obtained; not only the inventor is protected against infringement, but the invention is made known; ... We must introduce the patent system. All our production is more or less a simple copy... It is evident that this absolute want of protection will never awaken in a people the spirit of invention.... America has shown us how in a few years a people, in the midst of circumstances often embarrassing, can merit by its activity, its spirit of enterprise, and its perseverance, the respect and admiration of the whole world, and acquire in many respects an incontestable superiority." cited in "Arguments before the Committee on Patents of the Senate and House of Representatives," 45th Congress, 2nd Session, Mis. Doc. No. 50, Washington, Government Printing Office, 1878: 448-449

37. Cited in "Patents in relation to Manufactures," Story B. Ladd, 12th Census of the United States, vol. X (IV) pp. 751-66. The first Japanese patent laws were introduced in 1885, and reformed in 1888 and 1899.

38. Report to accompany Senate Bill No. 32, June 25, 1838, Senate Reports, 25th Congress, 2d Session, No. 494, pp. 1-7.

39. "Arguments before the Committee on Patents of the Senate and House of Representatives," 45th Congress, 2nd Session, Mis. Doc. No. 50, Washington, Government Printing Office, 1878: 445.

40. American Jurist and Law Magazine, vol. 10 (1833), p. 120.

41. Eldred v. Ashcroft, 537 U.S. 186 (2003): "JUSTICE BREYER several times places the Founding Fathers on his side. ... It is doubtful, however, that those architects of our Nation, in framing the "limited Times" prescription, thought in terms of the calculator rather than the calendar."

42. For a survey of the basic issues, see Erich Kaufer, The Economics of the Patent System, Chur: Harwood Academic Publishers (1989).