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# On the Importance to Economic Success of Property Rights in Finance and Innovation

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# On the Importance to Economic Success of Property Rights in Finance and Innovation

Stephen H. Haber  
F. Scott Kieff  
Troy A. Paredes\*

## *Abstract*

*This Essay surveys recent developments across the fields of finance and innovation to highlight some common themes concerning the importance of property rights to economic success. Society regularly makes choices when shaping the precise contours of the legal institutions that govern the behavior of market actors, often in response to high profile issues like the collapse of Enron and the patenting of life-saving AIDS drugs. Recognizing that no set of legal institutions or related enforcement mechanisms will be perfect, this Essay explores some particularly helpful institutional features based on property rights that too often are overlooked by policy makers and commentators, even though these property-based institutional features have long been associated with economic success in a number of diverse settings.*

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## I. INTRODUCTION

In this Essay, we offer various observations to illustrate the importance of property rights, highlighting as examples certain key institutional mechanisms that have spurred economic success in the United States. We think that debates over property rights too often are focused on questions of how many property rights would be best, generally with owners demanding more property rights and users demanding fewer, or on the number of government approvals required for a private party to engage in some enterprise. While these are important considerations, we urge that attention instead be focused on the different question of how these entitlements are structured. Rather than endeavor to develop a formal definition or theory of property, we presume that property rights, like most things, have “good” and “bad” features; and we endeavor to highlight the ways in which a particular entitlement can be structured to employ the “best” features of property rights while avoiding their “worst” features.

For purposes of this Essay, we conceptualize a property right as an interest that is easy to predict and find; easy to bundle and divide; structured so that those concerned with the subject matter that the right protects can and should deal directly with the private owner holding the right; and not readily reconfigured by a judge or other government decision-maker. When property rights are structured this way, they are easier for market actors to use (i.e., transact over). It is in this way that property rights promote economic growth, competition, and jobs. When property rights have these attributes, we think of them as being “at their best.”

When property rights are “at their worst,” they have fixed owners who are not freely able to contract over them. Furthermore, property rights are “at their worst” when their contours can be changed either only at the discretion of government actors or too easily at the discretion of government actors, which puts those interested in the subject matter the rights protect in the position of needing to deal with the relevant government decision-makers. When property rights are structured this way, they are easier for government actors to abuse. The government actors we envision include not only government legislators, regulators, and judges who make and enforce

the legal rules, but also powerful political constituents who influence these government actors. The effect of structuring property rights in this way too often is to concentrate wealth and power and compromise private sector transacting. We would view legal institutions like these more as regulatory entitlements than private property.

To be sure, most real-world legal institutions are located somewhere on a continuum between the two stylized poles summarized above, combining elements from each. For purposes of the discussions that follow, the more a particular legal institution resembles property “at its best,” the more we would call that institution “property” or “property-like.”

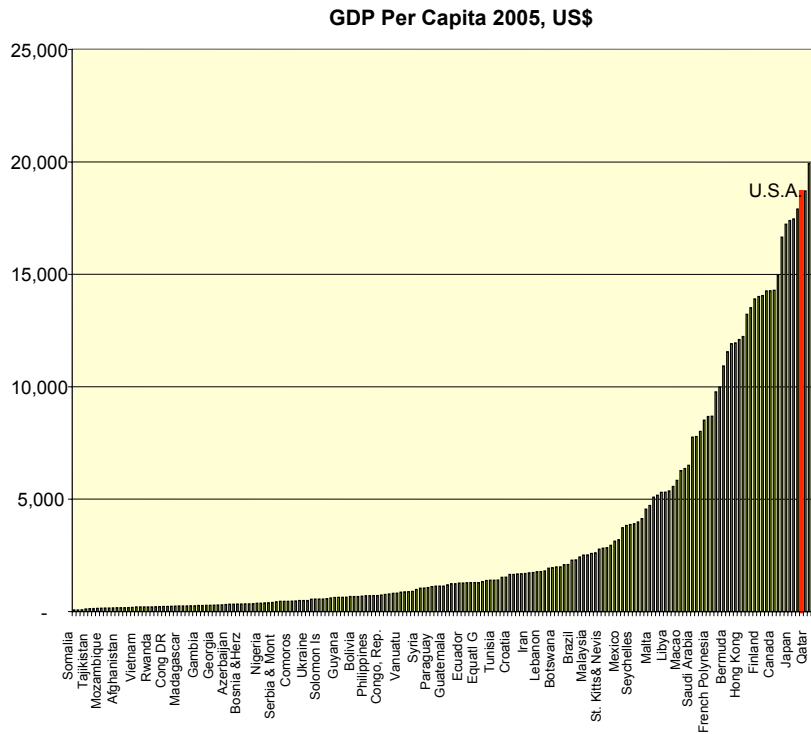
## II. PROPERTY RIGHTS AND ECONOMIC SUCCESS

To illustrate the link between property rights and economic success, we begin below with two different comparative examples of legal system pairs, with one system in each pair essentially lacking important property rights. The first pair compares the banking system of the United States with that of Mexico; and the second compares the biotechnology innovation system of the United States with those of Europe and Japan. We then use the example of venture capital to highlight a particular economic success story in the United States at the interface between finance and innovation.

### *A. Comparing Banking Systems in the United States and Mexico*

The United States is a particularly wealthy country. Figure 1 shows a common measure of national wealth, gross domestic product (GDP) per capita. On this measure, the United States is one of the richest countries in the world. In fact, the only countries that show up as slightly richer than the United States by this measure are countries which have vast natural resources but a very small population, such as Qatar.

FIGURE 1



(Source: World Bank, World Development Indicators 2006)

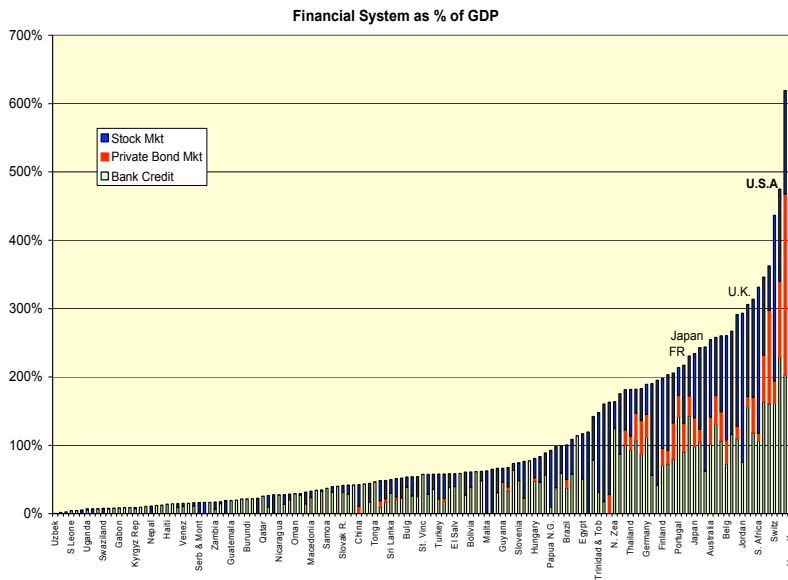
As with any complex system, the cause of this success is based on many factors. We think that one important factor is the impact of property rights. When we discuss property rights, we are not only talking about rights in physical assets like homes and land. We are also talking about property rights in intangibles—the types of interests that are key to finance and innovation—which are of particular relevance to the modern economy.<sup>1</sup>

1. Cf. Troy A. Paredes, *A Systems Approach to Corporate Governance Reform: Why Importing U.S. Corporate Law Isn't the Answer*, 45 WM. & MARY L. REV. 1055 (2004)

We are not focusing on making the rich richer. We think that property rights in intangible assets help make everyone richer, including the developing world, by stimulating economic opportunity.<sup>2</sup>

One area of the U.S. economy that depends heavily on property rights is the financial system. The U.S. financial system is especially large, as illustrated in Figure 2, which shows the sizes of various countries' national financial systems compared to their GDP. The only countries with higher ratios of financial system size to GDP are those whose entire economy is based on finance, such as Hong Kong, which is basically a city with a capital market.

FIGURE 2



(Source: World Bank Financial Structure Database)

(considering shareholder property rights).

2. Cf HERNANDO DE SOTO, THE MYSTERY OF CAPITAL (2000).

The role of property rights in strengthening a national financial system can be seen by comparing the current Mexican banking system with the one in the United States. Banking systems rely on various forms of property rights, including the types of property rights that convey ownership in tangible things like land, as well those in more intangible things that enable stable business relationships, such as freedom to strike diverse contracts that will be reliably enforced, which is bolstered by predictable regulatory environments. For example, bank depositors want property rights in their deposits so that they can be assured that they can get back the money they deposit. Banks want property rights in the contingent interests in collateral that they take when loaning money, such as through home mortgages or other security interests, so they can be assured that they can get back the money they loan. Banks also want any executed guarantees to be enforceable. Borrowers, on the other hand, need to be confident that lenders will fulfill their obligations to extend credit in accordance with the terms of the loan documents. A bank's other constituencies, such as any minority shareholders and various stakeholders, want property rights in the investments they make so that they can be assured that insiders, such as controlling shareholders and managers, will not run off with the investments or otherwise expropriate value for themselves. Banks want reliable banking and currency regulations, as well as a credible central bank, so that they know they will be able to continue to operate.

Although a high degree of property-rights treatment in each of these respects is present in the United States, it is largely lacking from the Mexican banking system. One salient consequence is that the home mortgage market in Mexico is so small as to almost be nonexistent. Across the entire country of Mexico, only about 18,000 home mortgages were originated on sales of existing homes in 2004, which is about as many as originate each year in the small suburban area surrounding Stanford University.<sup>3</sup> Not only does an anemic home mortgage market deprive a national financial system of an important source of capital and target for investment, but it also bites

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3. Stephen Haber, *Why Banks Don't Lend: The Mexican Financial System* 26 (Feb. 22, 2007) (unpublished manuscript on file with authors).

particularly hard against those individuals who lack access to the large quantities of cash it typically takes to buy a home.<sup>4</sup>

*B. Comparing Biotechnology Innovation Systems in the United States, Europe, and Japan*

Property rights also are important for national innovation systems. The U.S. intellectual property (IP) system is huge. By some accounts, IP-based companies are the largest sector of the U.S. economy and account for about \$5 trillion of U.S. GDP, which represents about half of U.S. GDP and makes the IP component of the U.S. economy larger than the entire GDP of any other nation.<sup>5</sup>

The mechanisms by which property rights in IP advance economic growth are often misunderstood, leading many to suggest that IP rights, such as patents, could easily be replaced by direct payments like tax credits or cash rewards.<sup>6</sup> It is undoubtedly true that the possibility of a financial payoff incentivizes people to engage in inventive activity. Other considerations, however, also spur invention. Necessity, after all, often is the mother of invention, as are many other factors like an individual's job as an academic, government, or corporate researcher. Indeed, IP itself may not be as powerful of an incentive to invent as many believe, given that the financial payoff may not come until after years of multi-million dollar litigation, if at all.

In any case, the emphasis on direct incentives for inventive individuals is misplaced, overlooking that the central role of patents backed up by property rights is other than getting inventions made. Patents play two other roles more effectively, and for these roles, patent substitutes, like cash rewards handed out by the government, are particularly poor stand-ins. First, patents get inventions put to use.

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4. *Id.*

5. Robert J. Shapiro & Kevin A. Hassett, *The Economic Value of Intellectual Property* 3 (Oct. 2005), [http://www.usaforinnovation.org/news/ip\\_master.pdf](http://www.usaforinnovation.org/news/ip_master.pdf). See also John Dudas, Director, U.S. Patent Office Director Address at Chapman University School of Law (Apr. 19, 2007).

6. See, e.g., Steven Shavell & Tanguy van Ypersele, *Rewards Versus Intellectual Property Rights*, 44 J.L. & ECON. 525, 535 (2001).



Second, patents are powerful antimonopoly weapons—the vital slingshots “Davids” use to take on “Goliaths.”<sup>7</sup>

When patents are enforced with clear and robust rules, and backed up by a strong right to exclude, they serve an essential role in the complex process of getting inventions commercialized. Patents help get inventions put to use broadly and rapidly and help new businesses enter and compete against established players. Bringing an invention to market requires coordination among many complementary users of that technology, including capitalists, developers, managers, laborers, other technologists, manufacturers, marketers, and distributors.

Patents help this diverse group act in a coordinated fashion in at least two distinct ways. First, the right to exclude associated with a published patent acts like a light in a dark room, drawing to itself those interested in the patented subject matter. This beacon effect gets these diverse parties to interact with each other and with the patentee. Second, the expectation that the patent can be enforced is what provides these parties with the required incentive to strike deals with each other. This bargain effect falls apart if the parties know the patent cannot be enforced.

The profit potential associated with an enforceable patent gives everyone an incentive in the commercialization process. For example, the promise of financial payoffs is what brings in the essential capital investments to start and sustain businesses. But because many of these deals hinge on complex contractual promises over unique assets, even the promise of money from a damages award in the event of either breach or infringement is not enough to consummate deals, which is why the credible threat of an injunction can be so important.

The field of modern biotechnology provides a particularly stark example of the role played by property rights in the form of patents. The landmark *Chakrabarty* decision by the U.S. Supreme Court in 1980 resolved what some thought was an open question when it confirmed the availability of patents in basic biotechnology.<sup>8</sup> The rest

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7. See generally F. Scott Kieff, *Coordination, Property, and Intellectual Property: An Unconventional Approach to Anticompetitive Effects and Downstream Access*, 56 EMORY L.J. 327 (2006).

8. *Diamond v. Chakrabarty*, 447 U.S. 303, 309–18 (1980) (holding that living organisms are not per se unpatentable).

of the world made the opposite decision, and still has various legal and regulatory regimes that block effective patent protection for biotechnology. As a result, only in the United States, and only since 1980, have patents been available in modern biotechnology.

The United States, Europe, and Japan each had large biotechnology companies, often collectively called “Big Pharma,” before 1980, and have continued to have large biotechnology companies since then. Throughout this time period, companies in all three regions have had access to comparable technological and capital resources. But what has distinguished the United States is that only the United States added patents to the mix in 1980. Notably, only in the U.S., and again only since 1980, has the biotechnology industry also included a steady pool of roughly 1400 small- and medium-sized companies that is consistently turning over.<sup>9</sup> Although we recognize that numerous factors impact the growth of any industry, a natural reading of this data suggests that adding patents helped spur the U.S. biotechnology industry to be the most vibrant and competitive in the world, as measured by the number of competitors doing business in the area and the number of new products brought to market. The unique growth in the U.S. biotechnology industry has directly benefited both the basic biological research community, by providing expanded resources like funding, and the general public, by providing better goods and services in important industries like healthcare.<sup>10</sup>

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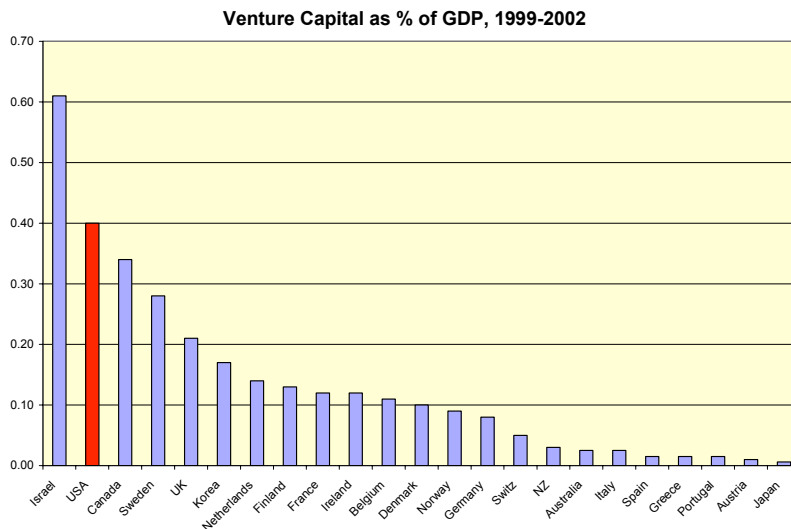
9. *NIH: Moving Research from the Bench to the Bedside: Hearing Before the Subcomm. on Health of the H. Comm. on Energy and Commerce*, 108th Cong. 47 (2003), available at <http://energycommerce.house.gov/108/action/108-38.pdf> (statement of Phyllis Gardner, Senior Associate Dean for Education and Student Affairs, Stanford University) (detailing the differences between the biotechnology industry and the pharmaceutical industry). Although inventorship and ownership for U.S. patents are open to those outside the U.S., a variety of practical reasons—such as the general “sticky” nature of local practices, as well as what is generally known as “home bias” or “domestic bias”—explain why those who are outside the U.S. are less likely than those within the U.S. to have sought U.S. patents in fields that are closed to patenting within most other nations of the world.

10. Iain Cockburn et al., *Pharmaceuticals and Biotechnology*, in *U.S. INDUSTRY IN 2000: STUDIES IN COMPETITIVE PERFORMANCE* 389–92 (David C. Mowery ed., 1999) (reviewing relative performance of the U.S. biotechnology industry).

*C. Venture Capital: An Interface Between Finance and Innovation*

Property rights also are important for a key interface between finance and innovation—namely, venture capital. The U.S. venture capital system is particularly large compared with that in other countries. Figure 3 shows the sizes of various countries’ national venture capital systems compared to their GDP. As in earlier figures, the United States is on the far side of the scale, leading the way with only one country, this time Israel, ahead of it.

FIGURE 3



(Source: OECD Venture Capital Database)

Venture capital interacts in several ways with both the rest of finance and IP. Venture capital helps finance and IP by helping investors and inventors. Venture capital gives financial capital a new target for investment, just as it gives IP a new source of investment. Venture capital also depends upon property rights in finance and IP. Property rights in finance and IP help investors and inventors exploit these assets and unleash value. In short, the freedom to divide and bundle these assets helps get them put to use as circumstances and needs change. By structuring venture capital deals carefully, as

property-based approaches to contract law and corporate law allow, those investing financial and human capital in risky ventures are able to protect themselves from their teammates. Similarly, a property-based approach to IP helps parties protect themselves from competitors.

The net impact of venture capital appears impressive. By some accounts, it generated over 17% of U.S. GDP, while investment in venture capital was only about .2% of GDP, yielding a fantastic direct return on investment.<sup>11</sup> The indirect returns appeared even more impressive. Venture capital also creates jobs, by some accounts having employed 9% of the private sector work force, and generates tax receipts, having contributed total sales of \$2.1 trillion in 2005.<sup>12</sup>

### III. PROPERTY RIGHTS AND CHALLENGES

In several high profile areas of both finance and IP, the law is being shaped in ways that make it work less like property rights, or less like property rights “at their best.” The overall net impact of these changes is a topic of legitimate debate. The narrower goal of this Essay is to highlight some important elements within a few areas of contemporary policy debates to show how several popular reforms might be expected to have negative effects because of their common approach in shifting relevant legal institutions to be less like property or, in other words, to resemble property rights “at their worst.”

#### *A. Finance: SOX and the SEC’s Regulation of Hedge Funds*

Both the Sarbanes-Oxley Act of 2002 (SOX)<sup>13</sup> and the Securities and Exchange Commission’s (SEC) recent effort to regulate hedge funds imposed mandatory rules intended to protect investors, leaving relevant market actors less freedom to negotiate with each other over which investor protections they actually preferred. A central problem with such mandatory approaches (as compared with default approaches that allow participants to opt in, opt out, or contract

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11. NATIONAL VENTURE CAPITAL ASSOCIATION, VENTURE IMPACT: THE ECONOMIC IMPORTANCE OF VENTURE CAPITAL BACKED COMPANIES TO THE U.S. ECONOMY 5 (2007).

12. *Id.*

13. Sarbanes-Oxley Act of 2002, Pub. L. No. 107-204, 116 Stat. 745 (2002).

around) is that they can prove too costly given their benefits, interfering with economic success. Additionally, burdensome mandates can end up uniquely disadvantaging smaller startups as compared to their larger, more-established competitors. Smaller enterprises often have a particularly hard time complying with one-size-fits-all legal requirements.

Passed in response to the debacles at Enron and WorldCom, SOX is the most far-reaching corporate governance and securities legislation enacted since Congress adopted the original federal securities laws. SOX meaningfully increased the role of government mandates and decreased the role of private ordering, as government mandates displaced market discipline as a tool for cabining behavior.

When SOX was adopted, criticism was mostly muted. Many believed that Congress had to react to the wave of corporate scandals that began with Enron. Further, it was politically unpopular to criticize stronger regulation as U.S. stock markets tumbled, new scandals broke, and people lost their jobs. Not surprisingly given the political atmosphere at the time, SOX was adopted 99–0 in the Senate and 423–3 in the House.<sup>14</sup>

Those who were skeptical stressed a variety of concerns.<sup>15</sup> For example, critics of SOX claimed that the overwhelming congressional support for SOX reflected a rush to judgment and politicking by elected officials to appease voters. Critics also stressed that the costs of the heavy-handed government crackdown that SOX represented would offset the benefits. In short, critics of SOX warned that more vigorous regulation and enforcement would be expensive as managers became more risk-averse in how they ran their enterprises and as senior executives and boards became distracted

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14. Richard B. Schmitt et al., *Corporate-Oversight Bill Passes, Eases Path for Investor Lawsuits*, WALL ST. J., July 26, 2002, at A1.

15. See Troy A. Paredes, *Enron: The Board, Corporate Governance, and Some Thoughts on the Role of Congress*, in ENRON: CORPORATE FIASCOS AND THEIR IMPLICATIONS 495 (Nancy B. Rapoport & Bala G. Dharan eds., 2004). For the views of others, see HENRY N. BUTLER & LARRY E. RIBSTEIN, THE SARBANES-OXLEY DEBACLE: WHAT WE'VE LEARNED; HOW TO FIX IT (2006); Stephen M. Bainbridge, *A Critique of the NYSE's Director Independence Standards*, 30 SEC. REG. L.J. 370 (2002); Larry E. Ribstein, *Market vs. Regulatory Responses to Corporate Fraud: A Critique of the Sarbanes-Oxley Act of 2002*, 28 J. CORP. L. 1 (2002); Roberta Romano, *The Sarbanes-Oxley Act and the Making of Quack Corporate Governance*, 114 YALE L.J. 1521 (2005).

from running their businesses in having to focus more time and attention on legal compliance. In addition, SOX critics recognized that the out-of-pocket costs of compliance could be considerable, particularly for smaller companies.

Unfortunately, the need for swift action seemed to have outweighed the need for in depth cost-benefit analysis in the push to go after corporate malfeasance in the post-Enron climate; recent experience has, to a notable degree, borne out the worries concerning the costs of SOX.<sup>16</sup> Consider two well-known examples. First, section 404 of SOX, which imposes new internal control requirements on public companies, has turned out to be much more costly than initially projected. Regulatory efforts have since been made to scale back section 404, particularly for small public companies. Second, U.S. markets are losing listings to foreign markets. Today, issuers can travel the globe in search of financial capital. As U.S. regulatory requirements become more burdensome, issuers can simply raise capital elsewhere or remain private. Indeed, companies that already are public may choose to go private to avoid

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16. See Alan Murray, *Panel's Mission: Easing Capital-Market Rules*, WALL ST. J., Sept. 12, 2006, at A2 ("A new commission, 'The Committee on Capital Markets Regulation,' will be unveiled today. Chaired by former White House economic adviser Glenn Hubbard and former Goldman Sachs President John Thornton, the group plans to recommend changes to the 2002 Sarbanes-Oxley Act and other laws and regulations that they conclude hinder the competitiveness of U.S. capital markets."). The private-sector Committee on Capital Markets Regulation, with support of U.S. Treasury Secretary Henry M. Paulson, issued a report in November 2006 addressing the concern that U.S. capital markets are losing their competitive edge, in part because of a much more burdensome legal environment in the aftermath of Sarbanes-Oxley and more aggressive government enforcement. COMMITTEE ON CAPITAL MARKETS REGULATION, INTERIM REPORT OF THE COMMITTEE ON CAPITAL MARKETS REGULATION (2006), [http://capmktreg.org/pdfs/11.30Committee\\_Interim\\_Report\\_REV2.pdf](http://capmktreg.org/pdfs/11.30Committee_Interim_Report_REV2.pdf).

Shortly after the Committee on Capital Markets Regulation issued its 2006 report, New York City Mayor Michael Bloomberg and U.S. Senator Charles Schumer (NY) issued a similar report on the need to sustain the financial leadership of New York and the United States. See, e.g., Aaron Lucchetti, *Moving the Market: Identity Crisis for New York?*, WALL ST. J., Jan. 22, 2007, at C3. The report responds to concerns that U.S. financial firms are being adversely impacted as U.S. capital markets become relatively less attractive as compared to foreign markets because of, among other factors, a more demanding U.S. regulatory and enforcement environment in the aftermath of Enron's collapse and SOX. To the extent that U.S. capital markets lose some of their competitive edge, it uniquely impacts New York at the center of the U.S. financial system.

The U.S. Chamber of Commerce also weighed in with a report in early 2007 on U.S. competitiveness in global financial markets. See, e.g., Kara Scannell, *Panel Urges Steps to Boost Allure of U.S. Markets*, WALL ST. J., Mar. 12, 2007, at A1.

the regulatory burdens of being a public company. A number of studies suggest just this has been happening post-SOX.<sup>17</sup> Those companies going public are increasingly turning to overseas stock markets instead of listing in the United States.

As the SOX experience illustrates, any assessment of financial regulation should start with a basic cost-benefit analysis. Ideally, the cost-benefit analysis will not focus just on the costs and benefits of a particular proposal, but will compare costs and benefits of all available options, including those presently in use. That is, a properly robust cost-benefit analysis assesses different approaches to a supposed problem in comparison to one another, without presuming that existing approaches are best. Such a comparative institutional analysis post-Enron should have highlighted that a desire for greater corporate accountability does not necessarily warrant more mandates and stiffer sanctions.

Indeed, the urge for more corporate accountability in Enron's aftermath should only have started the discussion. If more accountability in fact was needed, it did not follow that more legal mandates or more aggressive government enforcement was the answer. While a government crackdown is an option, it is not necessarily the best option in every circumstance. Take market discipline, for example, as an alternative to more laws on the books and more litigation. Once certain corporate misconduct is brought to light, investors, analysts, and other securities market participants, along with the so-called gatekeepers (attorneys, investment bankers, accountants, and credit rating agencies), are better informed and better equipped to ask tough questions and to scrub a company's SEC

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17. For examples of relevant studies, see William J. Carney, *The Costs of Being Public After Sarbanes-Oxley: The Irony of "Going Private,"* Emory Law & Econ. Research Paper No. 05-4 (Feb. 2005), available at <http://ssrn.com/abstract=672761>; Ellen Engel, Rachel M. Hayes, & Xue Wang, *The Sarbanes-Oxley Act and Firms' Going Private Decisions* (May 2004), available at <http://ssrn.com/abstract=546626>; Kate Litvak, *The Effect of the Sarbanes-Oxley Act on Non-US Companies Cross-Listed in the US*, Univ. of Texas Law & Econ. Research Paper No. 55 (Dec. 2005), available at <http://ssrn.com/abstract=876624>; Ehud Kamar, Pinar Karaca-Mandic, & Eric Talley, *Going-Private Decisions and the Sarbanes-Oxley Act of 2002: A Cross-Country Analysis*, USC Center in Law, Econ., & Org. Research Paper No. C06-5 & USC Legal Studies Research Paper No. 06-10 (Apr. 2006), available at <http://ssrn.com/abstract=901769>.

Companies might choose to avoid U.S. public stock markets for several financial and business reasons, but it cannot be gainsaid that a factor in the decision to list overseas or go or remain private is the heavier regulatory burden a U.S. public company must now shoulder.

filings more carefully. The market itself can demand corporate governance reforms and more corporate transparency without new legal mandates. One such example is the present push for majority voting for boards of directors that has gained steam recently, even as the SEC did not adopt its proposal to allow shareholders limited access to the corporate ballot for nominating directors. Shareholders, led by institutional investors and increasingly by hedge funds, have been much more active in recent years.

The potential benefits of market-based responses over government mandates are straightforward: markets are more flexible than regulation, and market-based responses can be more narrowly tailored than regulation to meet the needs of a particular company, which may change over time. In short, market-based approaches are not one-size-fits-all and are not mandatory. Further, if a company changes its corporate governance system under market pressure, it can always unwind the decision if it turns out to be unwise. This give-and-take allows a more efficient set of governance techniques to evolve over time across companies. Some argue that market reforms are too short-lived and that good corporate governance will go by the wayside during the next bull market. These are legitimate concerns. But on the other hand, regulation often overstays its welcome. This is a particular concern in the case of SOX, aspects of which were hastily adopted in a politically-charged atmosphere.

Although not as high profile as SOX, another recent instance of reform that more closely resembles property rights in finance “at their worst” comes from the recent effort of the SEC to regulate hedge funds. In 2004, the SEC adopted a new rule<sup>18</sup> requiring hedge fund managers to register as investment advisers under the federal Investment Advisers Act of 1940.<sup>19</sup> While requiring hedge fund managers to register with the SEC gave some protection to hedge fund investors from fraud and other abusive practices,<sup>20</sup> the rule was

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18. Registration Under the Advisers Act of Certain Hedge Fund Advisers, Inv. Adv. Act Release No. 2333 (Dec. 2, 2004).

19. Investment Advisers Act of 1940, 15 U.S.C. § 80b-1 to -21 (2000).

20. It is not clear that the institutional investors and wealthy individuals who invest in hedge funds need the SEC’s protection. See generally Troy A. Paredes, *On the Decision to Regulate Hedge Funds: The SEC’s Regulatory Philosophy, Style, and Mission*, 2006 U. ILL. L. REV. 975, 990–98.



also costly. Registration under the federal Investment Advisers Act would subject hedge funds to a host of costly requirements and subject a manager and its fund to SEC examination and inspection. Accordingly, critics of the rule argued that it would drive hedge funds offshore and chill hedge fund managers from undertaking at least some new and innovative investment strategies, leading to less efficient, less liquid, and less stable financial markets.

The SEC hedge fund rule did allow some room for private ordering but of a distorting variety. Hedge fund managers could opt out of the investment adviser registration requirement if the fund's investors were "locked up" (i.e., could not withdraw their capital from the fund) for at least two years. Ostensibly, the purpose of the lock-up period was to distinguish hedge funds, on the one hand, from private equity and venture capital funds, on the other. The two-year lock-up provision gave rise to three related predictions: first, hedge funds would try to use longer lock-up periods; second, it would be difficult for smaller and newer hedge funds whose managers are less well-known to convince investors to lock up their money for longer periods, because the threat of capital withdrawals is an important means by which investors hold their managers accountable; and third, the cost and burden of compliance with the federal Investment Advisers Act would be too great for some smaller funds to bear. Thus, the SEC's hedge fund rule appeared to erect an entry barrier that undercut competition in the hedge fund industry by giving established firms an advantage over upstarts. Accordingly, established firms might have welcomed the SEC's foray into hedge fund regulation. Not only did the regulation, as suggested, seem to undercut competition for capital, but a two-year lock-up period would compromise the disciplining effect of threatened capital withdrawals. Not long after it went into effect, the SEC's rule requiring hedge fund manager registration was overturned on other grounds by the U.S. Court of Appeals for the D.C. Circuit in the *Goldstein* decision.<sup>21</sup>

In sum, a defining characteristic of property rights "at their best" is that they accommodate private ordering, allowing parties to order their affairs as they see fit. Yet SOX is, and the SEC's hedge fund

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21. *Goldstein v. SEC*, 451 F.3d 873 (D.C. Cir. 2006).

rule was, mandatory in nature. With only a few exceptions, no room was allowed for parties to opt out or otherwise contract around either set of reforms without going offshore. Not only do such mandatory approaches to regulation often impose high costs on the market, thereby impeding economic success, but they also often hit market entrants harder than large established players, thereby undercutting competition.

*B. Intellectual Property: Commercialization and the Right to Exclude*

The difference between property rights “at their best” and property rights “at their worst” also can be seen in the context of three contemporary areas of debate about intellectual property. The first is the call for patent reform that in essence would give government actors more discretion to reject or revoke patents. The second is the call for greater antitrust scrutiny of IP cases and deals. The third is the greater avoidance of IP rights in the name of increasing economic development and human health, especially in developing countries. Regrettably, an element common to each of these reform efforts is that they shift the applicable legal rules to make IP more like property “at its worst.”

1. Patent Reform and Government Discretion

The first example of the erosion of the property-like treatment of IP comes from the set of so-called patent reforms presently pushed in Congress. After multiple hearings<sup>22</sup> in early 2007 concerning a joint House and Senate bill sponsored by Democrats and Republicans alike,<sup>23</sup> the House voted to adopt a version of the legislation in

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22. See *Patent Reform: The Future of American Innovation: Hearing Before the Senate Judiciary Committee*, 110th Cong. (2007); *H.R. 1908, The Patent Reform Act of 2007: Hearing Before the Subcomm. on Courts, the Internet, and Intellectual Property of the H. Comm. on the Judiciary*, 110th Cong. (2007); *The Importance of the Patent Reform on Small Business: Hearing Before the Subcomm. on Courts, the Internet, and Intellectual Property of the H. Comm. on the Judiciary*, 110th Cong. (2007).

23. See Patent Reform Act of 2007, introduced as a bicameral and bipartisan bill under the titles H.R. 1908 and S. 1145 on April 18, 2007, by, *inter alia*, Sens. Leahy (D) and Hatch (R), as well as Reps. Berman (D) and Smith (R).

September 2007;<sup>24</sup> and throughout the first part of 2008 it kept appearing as though the Senate may have been poised to act as well. The crux of the changes urged in Congress is to make it more difficult to obtain or keep a patent by granting a government administrator or judge greater discretion to determine whether a patent should issue or remain in force. Lining up in very vocal support of the legislation have been some notable big companies in favor of this added flexibility because they say they are more likely to be ensnared in a thicket of patent cases.<sup>25</sup>

These efforts to change the patent system seem to forget flexibility's Achilles Heel, and that what is good for some big businesses is not always good for business overall. In short, by affording government bureaucrats and judges more discretion, flexibility increases uncertainty, undercuts predictability, and gives a built-in advantage to large companies with hefty lobbying and litigation budgets. That may be one reason why some big firms want the change.

Many of the specific changes to the patent system that have been proposed are similar in effect, although they go by various names, such as enhanced examination, opposition, re-examination, and second-window review. These proposed changes are like the recent U.S. Supreme Court's decision in the *KSR* case, which many see as having raised the bar for the obviousness standard by injecting more discretion into the obviousness determination, a central issue for most patent cases.<sup>26</sup> The stated goal of the proposed legislative changes, as well as the stated goal of those urging the Court to act in *KSR*, is to make it easier for government decision makers to reject patents, usually on the basis of what is known as prior art—that is, whether the claimed invention had been previously known or used (novelty) or was just about to be (obviousness).

Under today's patent law, determinations about the prior art are largely questions of fact, based on evidence like documents and factual testimony, as opposed to opinion testimony. Most patent

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24. H.R. 1908 passed 220–175 on September 7, 2007.

25. See, e.g., Bruce Sewell, *Patent Nonsense*, WALL ST. J., July 12, 2007, at A15 (opinion piece by Intel's general counsel).

26. *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727 (2007).

litigators well remember the famous cases of the single student theses catalogued and shelved in the libraries at Frieburg University in Germany or Reed College in Portland, Oregon, reinforcing how factual proof is required to show not just what such documents contain, but also when they were both physically available to the public and logically available to an interested searcher through some meaningful indexing system like a subject matter catalog.<sup>27</sup>

The central issue presented in the *KSR* case is whether expert opinion testimony in court, when adopted at the discretion of a federal judge, is enough to prove what would have been obvious to a person having ordinary skill in the art of the patentee at the time in history when the patentee made an invention. Those who asked the Court to act in *KSR* see that case as standing for the proposition that government decision makers, such as judges, now have increased discretion to pronounce what the prior art teaches; and they applaud that result, hoping to see it applied generously in court and during initial Patent Office examinations. For example, based on this reading of the case, a patent examiner now would be able to block patents on the basis of the examiner's own assertions about what the state of the art was at a particular time in history, without having to rely on the same amount of factual proof that has long been required, such as the teachings from specific documents and sample products. Others read the *KSR* decision more narrowly, arguing that the case was narrowly decided on its facts. In this view, the relevant inquiry remains an objective determination of precisely what was taught by the particular combination of relevant pieces of prior art.<sup>28</sup>

The debate over the actual legal impact of the Supreme Court's *KSR* decision may be moot if the proposed statutory changes are

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27. See *In re Hall*, 781 F.2d 897, 898–900 (Fed. Cir. 1986) (counting a single catalogued student thesis at Frieburg University in Germany as prior art because it was, *inter alia*, physically available to the public); *In re Cronyn*, 890 F.2d 1158, 1161 (Fed. Cir. 1989) (not counting three student theses at an American university as prior art, even though they were physically accessible to the public, because there was no evidence that they were logically accessible to the interested public by, for example, being indexed in the library's subject catalog).

28. For more on *KSR* and the problems of flexibility, see Richard A. Epstein & F. Scott Kieff, *Flexible Patent Law . . . and Its Achilles Heel*, WALL ST. J., May 11, 2007, at A19 (Letter to the Editor); Stephen H. Haber, F. Scott Kieff, & Troy A. Paredes, *Patent Reform Legislation: No Final Cut for Examiners*, NAT'L L.J., May 14, 2007, at 22.

adopted in Congress, as those changes would implement the same type of flexible approach that a broad reading of *KSR* is said to usher in. Even if the statutory regime does not change, judges and patent examiners in the Patent Office will have at least some additional flexibility while lower courts hash out the proper interpretation of *KSR*.

As a result, it is important to consider more fully the wisdom of affording judges and Patent Office examiners more discretion in deciding a patent's validity and subsequent enforceability. Regrettably, the call for more discretion relies on two false premises about how the patent system actually works.

The first false premise is that beefing up the patent examiner's resources would meaningfully help her find the key prior art. Of course, our examining corps should have good access to Internet databases and ample time and training to peruse them. But no realistically available amount of time and training will help an examiner at her desk obtain the laboratory notebook of an individual researcher at some company or university or an obscure student thesis on the bookshelf of a foreign library, which are the types of places where the key prior art often is found.

The second false premise is that decisions in court or in an agency like the Patent Office that are made on the basis of discretion, rather than facts, can be immune from political and other pressure. Giving courts and examiners a pass from having to get and explicitly rely on hard evidence concerning the prior art does not come without a serious cost. Asking a decision maker to use her legal or technical expertise to inform what she thinks the state of the art was at a particular time in history gives her greater discretion than asking an ordinary jury whether a particular document or sample product existed at a particular time and what that document actually contains. Even ordinary lay juries can be particularly adept at making such factual determinations, which is a central reason we have a constitutional right to jury trials in every criminal case and in civil cases involving a legal remedy, such as damages (as opposed to only an equitable remedy, such as an injunction).<sup>29</sup> Because large firms

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29. See F. Scott Kieff, *How Ordinary Judges and Juries Decide the Seemingly Complex Technological Questions of Patentability over the Prior Art*, in PERSPECTIVES ON PROPERTIES

have fatter lobbying and litigation budgets than smaller innovators, such discretion risks converting the patent system into a tool for suppressing competition by making it too easy for big firms to tie up or invalidate any patent owned by a small innovator.

The pernicious impact of such discretion is not a mere possibility, but has become a reality in the recent history of the patent system. In the late 1960s and early 1970s, the lobbying and litigation efforts of the U.S. computer hardware industry beat out those of the computer software industry to make sure that every software patent was subject to plenary discretionary review, thereby rendering it practically worthless. This absence of meaningful patent protection from the U.S. computer software industry lasted throughout the 1970s and '80s, and was infamously associated with the dominance of that industry by a single large player, Microsoft.<sup>30</sup>

The interest of large companies in using their considerable litigation and lobbying budgets to direct government discretion towards efforts to block the patents of their smaller competitors is further exemplified by the many troubles facing Rambus in the DRAM market. Rambus, a relatively small research firm, has been frustrated by many of the world's largest DRAM manufacturers who have argued that the Rambus patents cover technologies that are too basic and, as upstream patents, are blocking downstream development. The fundamental problem with this rhetorical dichotomy between upstream and downstream is that it is false and narcissistic. Terms like upstream and downstream are so relative that they amount to synonyms for things to be bought and things to be sold by a party, who will want everything the party needs to buy to be

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OF THE HUMAN GENOME PROJECT (F. Scott Kieff ed., 2003).

30. Patent protection for computer software was effectively eviscerated through the Supreme Court's *Benson* decision. *Gottschalk v. Benson*, 409 U.S. 63 (1972). For a discussion of the lead-up to *Benson* and its impact, see *In re Johnston*, 502 F.2d 765, 772-74 (C.C.P.A. 1974) (Rich, J., dissenting) (noting normative problems with such a rule against software patents but pointing out the appellate court's duty to follow the Supreme Court case law on the issue). The *Benson* approach remained in effect throughout the 1970s, until finally, perhaps due in part to a shift in its makeup, the Court changed views in *Diamond v. Diehr*, 450 U.S. 175 (1981) (holding there to be no per se exclusion for software patents). Nevertheless, it was not until *In re Alappat*, 33 F.3d 1526 (Fed. Cir. 1994) (en banc) and perhaps even *State Street Bank & Trust Co. v. Signature Fin. Group Inc.*, 149 F.3d 1368 (Fed. Cir. 1998), that the market fully responded to the availability of patent protection for software.

free and everything the party wants to sell to be protected with property rights. This is neither a principled nor an effective basis upon which to design the U.S. patent system. Notably, even though the Federal Trade Commission found against Rambus, the Commission itself had trouble identifying the exact wrong it found Rambus to have committed, holding the company liable under the Commission's broadest general authority—noting that the U.S. Court of Appeals for the Federal Circuit already had determined that the company had not committed the fraud and breach of contract on which Rambus' larger competitors had based their complaint.<sup>31</sup> This lack of support explains why the Commission's decision was set aside by the U.S. Court of Appeals for the District of Columbia Circuit.<sup>32</sup> The particular irony is not only that courts and agencies have agreed that Rambus did not commit the particular bad acts relating to standard setting that had been originally alleged; but also that the complaining DRAM manufacturers, Hynix and Infineon, have recently settled with the U.S. government in one of the largest criminal antitrust price fixing cases ever, involving fines now totaling over half a billion dollars and jail sentences for several of the conspiring executives.<sup>33</sup>

## 2. Patents and Competition

A second example from IP of the risks associated with adopting features of property rights “at their worst” is the way patents are

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31. *In re Rambus, Inc.*, 2007 WL 431522 (F.T.C., Feb. 2, 2007) (final order).

32. *Rambus Inc. v. F.T.C.*, 2008 WL 1795594 (D.C. Cir. Apr. 22, 2008).

33. *See, e.g.*, U.S. Dept. of Justice Press Release, Samsung Agrees to Plead Guilty and to Pay \$300 Million Criminal Fine for Role in Price Fixing Conspiracy, available on-line at [http://www.usdoj.gov/opa/pr/2005/October/05\\_at\\_540.html](http://www.usdoj.gov/opa/pr/2005/October/05_at_540.html):

Samsung Electronics Company Ltd. (Samsung), a Korean manufacturer of dynamic random access memory (DRAM) and its U.S. subsidiary, Samsung Semiconductor Inc., have agreed to plead guilty and to pay a \$300 million fine for participating in an international conspiracy to fix prices in the DRAM market, the Department of Justice announced. Samsung's fine is the second largest criminal antitrust fine in U.S. history and the largest criminal fine since 1999. . . . Including today's charge, three companies and five individuals have been charged and fines totaling more than \$646 million have resulted from the Department's ongoing antitrust investigation into price fixing in the DRAM industry.

*Id.*

alleged to give rise to antitrust concerns. In fact, the concerns raised at the patent-antitrust interface often get backwards the nature of the competitive impact of property rights.

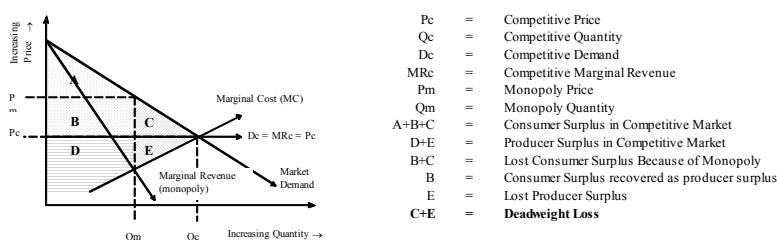
Admittedly, every property right creates some form of market power. But an antitrust analysis is more complicated than simply uttering “market power” or “monopoly.” The purpose of antitrust laws is to protect against a large player dominating a market through unreasonable restraints on competition to cause higher prices, less output, or lower quality goods and services. But a company’s dominant market share alone is not anticompetitive. Sound theory and practice teaches regulators to instead focus on whether the company’s behavior causes actual economic harm to consumers. This requires regulators to consider tough questions of technology and economics. In this regard, several points must be kept in mind when considering the interface between patents and antitrust.

First, it is important to recognize that the antitrust laws are designed to focus on power over a market, not over a particular good or service sold in a market in competition with other goods or services. A patented technology faces competition from yesterday’s technologies, other technologies available today to address similar consumer demand, and the threat imposed by those technologies coming tomorrow. Indeed, the greater a patentee’s market power at any given time, the greater the incentive spurring others to invent alternative non-infringing substitutes for the patented technology.

Even if a patent conferred market power, it is now widely accepted that the antitrust laws are designed to remedy only one feature of a monopoly, the resulting inefficiency, but not the impact market power might have on the fairness of how wealth is allocated between producers and consumers. More particularly, the antitrust laws are designed to avoid the deadweight loss that can be caused by monopolies. The economic inefficiency associated with the deadweight loss is shown by the triangle C+E in Figure 4.



FIGURE 4



The deadweight loss triangle shown in Figure 4, however, need not arise with every monopoly. While perfect price discrimination is of course impossible, the magnitude of the deadweight loss decreases to the extent the monopolist can engage in some form of price discrimination. The complex contracting that most IP owners would like to engage in precisely because it makes them more money is also the type of contracting that facilitates price discrimination. For example, a patentee might structure her sales arrangements of expensive machinery so that customers pay only per use—metered perhaps by some inexpensive input like a sheet of paper—rather than for the entire cost of the machine. Whatever the approach to price discrimination, it will depend heavily on courts enforcing the actual terms of the complex contractual arrangements that will have to be entered into by the patentee with those making, providing, and using the patented technologies.<sup>34</sup>

While some might think that price discrimination is hard to conduct and can create dissatisfaction among consumers who suffer the realization that they are not paying the same price as others for the same good or service, the routine practice of the passenger airline industry shows that these problems are not insurmountable. Today, a passenger on a flight will frequently have paid a different price for her seat than the person sitting next to her, yet the airline is able to

34. For more on how price discrimination can be used by patentees and how dependent this is on predictable contracts and property rights, see F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697, 727–32 (2001).

charge those passengers different prices based on their willingness to pay (some having paid lower prices for booking earlier, for example), and the passengers are able to travel next to each other without causing social unrest.

Not only are patents not the serious threat to competition that many assert, but, contrary to popular belief, the weakening of patent protection actually can facilitate the concentration of market power. As discussed above, coordination can be “good” in that it leads to increased commercialization by bringing complementary users of an IP asset together. But there is a “bad” type of coordination as well — “bad” because it decreases competition and access to goods and services by better enabling coordination among large, established businesses to keep out competitors. What is paradoxical about many of the reforms urged by patent critics is that the statutory changes would end up facilitating this “bad” type of coordination.

Consider what might be called a *keiretsu* strategy for dealing with patents. The term *keiretsu* refers to the large conglomerates in Japan, where the patent system is well known to be replete with a great deal of essentially weak patents and devoid of strong ones. The transaction costs of litigation and conflict that are likely to ensue in a system populated by large numbers of low value patents can be of real help to the *keiretsu* because they make it easier to have large numbers of skirmish battles while avoiding the threat of death blows.

While large numbers of skirmish battles do have high transaction costs, those costs are worth it to those doing battle because they buy a great deal of benefit. These battles help the *keiretsu* in two important ways to communicate with each other when trying to engage in anticompetitive coordination efforts.

First, the repeated skirmishes over low value patents allow the battling *keiretsu* to communicate with each other in a way that may be more forthright than a direct conversation (i.e., they help solve an information sharing and related trust problem). Seeing where an opponent will spend resources to fight can communicate more than a direct conversation about what territory is most coveted. In addition, the extensive exchanges of documents and sworn deposition testimony that are so infamous in the U.S. litigation system communicate vast quantities of detailed information.

Second, these lawsuits allow the battling *keiretsu* to communicate with each other in a way that may be more protected from antitrust review than a direct conversation (i.e., they help solve an antitrust problem). The taking of one territory while yielding up another through a set of court battles and related settlements will more easily escape antitrust scrutiny—and will also more easily mitigate the damages awarded if any antitrust action were brought and won—than would a direct conversation to divide these territories.

Third, having large numbers of patents can be a simple tool for extracting a higher price after regulatory interventions, because in the big antitrust actions brought against large patentees, such as the well-known IBM patent litigation in the United States, the amount the regulators allow the companies to charge is often based in part on the simple total of the number of patents in its portfolio. Moreover, large players should be less afraid to engage in anticompetitive conduct in the first place if they are ensured that business can still be profitable even if they are caught by the antitrust regulators.

This *keiretsu* strategy is particularly beneficial to large players in that it helps ensure that only weak patents are available to all players, large and small. This matters, because strong patents could end up in the hands of a small “David” and enable it to better take on the “Goliaths.”

At bottom, the availability of predictable patent rights, judged to be valid or invalid based on objective facts, that can be enforced robustly whether used by large or small players is exactly what promotes both the commercialization of new ideas and competition in the market. Unfortunately, many of the reforms being discussed today shift the nature of patents to take on the attributes of property rights “at their worst,” decreasing the likely beneficial impact of these IP assets.

### 3. Patents and Developing Economies

To further illustrate the importance of property rights in IP, we turn to an illustration from the developing world and consider the recent calls by the United Nations World Health Organization (WHO) and World Intellectual Property Organization (WIPO) to abrogate patents on crucial medicines like anti-malarials and anti-

retrovirals in the name of protecting world health and fostering economic development. In fact, IP is essential for facilitating the complex business deals needed to deliver drugs in the first place.

Further, the real problems in the developing world are not drug patents. Over 95% of drugs on the WHO's essential medicines list are off-patent. When patented drugs are given to those countries for free, as they often are, the drugs are heavily taxed or outright taken by corrupt local governments—sometimes even resold on black markets to the United States, Japan, Europe, and elsewhere. All this while millions of people in the developing world are dying from war, famine, unsanitary conditions, and lack of basic health care.

Nobody is suggesting that merely adding a good patent system will immediately cause those in a less developed country to churn out the next blockbuster pharmaceutical of the type we all know takes teams of PhDs and hundreds of millions of dollars to generate. That said, strong IP rights will help protect the many creative assets in these regions. Brain power is the one natural resource that is uniformly distributed across the peoples of the world. It takes academic snobbery to think innovation cannot be valuable unless it happens at a G8 university. Many forms of valuable IP are particularly likely to be found in the less developed economies of Africa. Necessity can be the mother of invention, and regions where improvements in basic irrigation and agriculture techniques are to help the most, may be those where this innovation is likely to occur. What is more, valuable IP need not be technological. Indeed, much of the commercially successful music and fashion in the West incorporates substantial African influences. The notion that Western countries like the United States could actually be paying smaller countries for the use of their valuable IP is not a creature of fantasy. By way of example, consider the recent deal struck by the Starbucks coffee company to license Ethiopian coffee trademarks.<sup>35</sup>

This may help explain why those behind attacks on drug patents are countries that have extensive manufacturing facilities which would require payments to holders of biotechnology patents, while African countries like Botswana and Malawi are working tirelessly to

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35. See Janet Adamy, *Starbucks, Ethiopia Agree on Licensing*, WALL ST. J., June 21, 2007, at B6.

help strengthen the rule of law by enforcing property rights in intangibles, including contracts and IP. Initiatives along these lines offer hope, and the countries of the G8 should continue to spend financial and political capital to bolster such efforts.

#### IV. CONCLUSION

Prevailing voices from the political economy literature are clear. George Stigler explains how concentrated benefits and diffuse costs allow a small politically-active group of interested individuals to get through the democratic process the rules of the game they want.<sup>36</sup> James Buchanan and Gordon Tullock show that interest groups who figure this out will quickly compete for these benefits.<sup>37</sup> Fred McChesney, Hernando de Soto, and Andrei Shleifer and colleagues show that in response, government actors will also compete to attract political attention by doling out favors and other benefits.<sup>38</sup> Government actors will compete against each other to erect “toll booths” in front of the public so government officials can extract payment from interest groups wanting favorable passage. Milton Friedman similarly showed how even seemingly benign and unrelated government agencies acting in good faith can effectively be drawn into such competition through mission-creep, erecting additional toll booths and ultimately extracting additional rents.<sup>39</sup>

As a result, when thinking about how to structure a system of economic regulation, we should always try to determine how both market actors and government actors will react in the face of various possible legal regimes. We should also expect to be unable to select the true outcome in a given case with certainty, and so we should try to develop a set of comparative analyses that account for the inevitable overinclusiveness and underinclusiveness associated with different regulatory approaches. We also should develop an

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36. See George J. Stigler, *The Theory of Economic Regulation*, 2 BELL J. ECON. & MGMT. SCI. 3 (1971).

37. See JAMES M. BUCHANAN & GORDON TULLOCK *CALCULUS OF CONSENT* (1962).

38. See Fred S. McChesney, *Rent Extraction and Rent Creation in the Economic Theory of Regulation*, 16 J. LEGAL STUD. 101 (1987); HERNANDO DE SOTO, *THE OTHER PATH* (1990); Simeon Djankov et al., *The Regulation of Entry*, 117 Q. J. ECON. 1, 3 (2002).

39. See MILTON FRIEDMAN, *WHY GOVERNMENT IS THE PROBLEM* 9 (1993).

understanding of who is the lowest-cost provider and evaluator of the information needed to make an appropriate decision, and be vigilant about containing the transaction costs of different decision-making processes. Perhaps most importantly, we should be skeptical of the comparative exposure to public choice pressures of different regulatory approaches.

The observations in this Essay indicate particular circumstances where we think such an analysis weighs in favor of property-rights treatment “at its best.” That said, we recognize that each set of circumstances must be analyzed rigorously and that the right approach will, at least in part, depend on the relevant facts on the ground.